



# Cutting Tools for Steels



**NEW**

Featuring coolant-fed  
premium cobalt taps

**GUHRING**

The Tool Company

# Threading

## Coolant Fed Cobalt Taps

2B class of fit, ANSI shank and overall length  
Green color ring for easy identification



**NEW**

### Form C, Semi-Bottoming Series #3954 (UNC TiN), #3955 (UNF TiN)

| Size UNC | Size UNF | No. Flutes | Approx. Limits | Order Code |
|----------|----------|------------|----------------|------------|
| 1/4-20   | 1/4-28   | 3          | H4/H5          | 6.350      |
| 5/16-18  | 5/16-24  | 3          | H4/H5          | 7.938      |
| 3/8-16   | 3/8-24   | 3          | H5/H6          | 9.525      |
| 7/16-14  | 7/16-20  | 3          | H5/H6          | 11.113     |
| 1/2-13   | 1/2-20   | 3          | H5/H6          | 12.700     |
| 5/8-11   | 5/8-18   | 4          | H5/H6          | 15.875     |
| 3/4-10   | 3/4-16   | 4          | H5/H6          | 19.050     |

Coolant fed taps can dramatically increase tool life and improve thread quality in many applications. The axial coolant duct design helps flush chips away from the cutting edge, which reduces the frequency of chip binding and extends tool life. Thread quality is also enhanced as chips are cleanly ejected from the cutting area and cannot score existing threads. Minimal coolant pressure is required, with higher coolant pressures delivering optimum performance.



- Axial coolant fed tap for improved chip evacuation
- 40° helix, form "C" 2-3 thread chamfer lead
- TiN coated for extended tool life

## Premium Cobalt Plug Taps

2B class of fit, ANSI shank and overall length  
Green color ring for easy identification



### Form B, Plug Tap Series #3916 (UNC TiN), #3917 (UNF TiN) Series #3946 (UNC TiCN), #3947 (UNF TiCN)

| Size UNC | Size UNF | No. Flutes | Approx. Limits | Order Code |
|----------|----------|------------|----------------|------------|
| 2-56     | 2-64     | 3          | H2/H3          | 2.184      |
| 3-48     | 3-56     | 3          | H2/H3          | 2.515      |
| 4-40     | 4-48     | 3          | H2/H3          | 2.845      |
| 5-40     | 5-44     | 3          | H2/H3          | 3.175      |
| 6-32     | 6-40     | 3          | H3/H4          | 3.505      |
| 8-32     | 8-36     | 3          | H3/H4          | 4.166      |
| 10-24    | 10-32    | 3          | H3/H4          | 4.826      |
| 12-24    | 12-28    | 3          | H3/H4          | 5.486      |
| 1/4-20   | 1/4-28   | 3          | H4/H5          | 6.350      |
| 5/16-18  | 5/16-24  | 3          | H4/H5          | 7.938      |
| 3/8-16   | 3/8-24   | 3          | H5/H6          | 9.525      |
| 7/16-14  | 7/16-20  | 3          | H5/H6          | 11.113     |
| 1/2-13   | 1/2-20   | 4          | H5/H6          | 12.700     |
| 5/8-11   | 5/8-18   | 4          | H5/H6          | 15.875     |
| 3/4-10   | 3/4-16   | 4          | H5/H6          | 19.050     |
| 7/8-9    | 7/8-14   | 4          | H6/H7          | 22.225     |
| 1-8      | 1-12     | 4          | H6/H7          | 25.400     |
| 1 1/4-7  | 1 1/4-12 | 4          | H7/H8          | 31.750     |
| 1 1/2-6  | 1 1/2-12 | 5          | H7/H8          | 38.100     |

- Through hole plug tap
- Form "B" 3.5 - 5 thread chamfer lead
- Precision-ground flute form
- Oversized H7 and H11 and STI style tap series also available

### Series 3915 (Metric TiN) Series 3945 (Metric TiCN)

| Size Metric | No. Flutes | Approx. Limits | Order Code |
|-------------|------------|----------------|------------|
| M2 X 0.40   | 3          | D2/D3          | 2.000      |
| M3 X 0.50   | 3          | D2/D3          | 3.000      |
| M4 X 0.70   | 3          | D3/D4          | 4.000      |
| M5 X 0.80   | 3          | D3/D4          | 5.000      |
| M6 X 1.00   | 3          | D4/D5          | 6.000      |
| M8 X 1.25   | 3          | D4/D5          | 8.000      |
| M10 X 1.50  | 3          | D4/D5          | 10.000     |
| M12 X 1.75  | 4          | D5/D6          | 12.000     |
| M14 X 2.00  | 4          | D5/D6          | 14.000     |
| M16 X 2.00  | 4          | D6/D7          | 16.000     |
| M18 X 2.50  | 4          | D6/D7          | 18.000     |
| M20 X 2.50  | 4          | D6/D7          | 20.000     |

### Series 3973 (Metric Fine TiN)

| Size Metric Fine | No. Flutes | Approx. Limits | Order Code |
|------------------|------------|----------------|------------|
| M8 X 1.00        | 3          | D4/D5          | 8.005      |
| M10 X 1.00       | 3          | D4/D5          | 10.005     |
| M10 X 1.25       | 3          | D4/D5          | 10.006     |
| M12 X 1.00       | 4          | D4/D5          | 12.005     |
| M12 X 1.25       | 4          | D4/D5          | 12.006     |
| M12 X 1.50       | 4          | D5/D6          | 12.007     |
| M14 X 1.25       | 4          | D4/D5          | 14.006     |
| M14 X 1.50       | 4          | D4/D5          | 14.007     |
| M16 X 1.50       | 4          | D4/D5          | 16.007     |
| M18 X 1.50       | 4          | D4/D5          | 18.007     |
| M20 X 1.50       | 4          | D6/D7          | 20.007     |

To order: Series number + order code, example: 3921 8.000

| Recommended Tapping Speeds - Steels |         |               |             |
|-------------------------------------|---------|---------------|-------------|
| Material Hardness                   |         | SFM           |             |
| HRC                                 | Brinell | Bright finish | Hard coated |
| ≤ 25                                | ≤ 250   | 35 - 45       | 50 - 65     |
| ≤ 30                                | ≤ 280   | 15 - 30       | 25 - 55     |
| ≤ 35                                | ≤ 320   | 12 - 24       | 18 - 35     |

Refer to 2009 tap catalog for speeds if tapping stainless or tool steels.  
Suggested tap cutting fluid for steel is a sulphur-based oil.  
Dry tapping is not recommended.

| Material group                 | Examples   |
|--------------------------------|--|
| Unalloyed case hardened steels | 1005, 1006, 1008, 1009, 1010, 1011, 1012, 1013, 1015, 1016, 1017, 1018, 1019, 1020, 1021, 1022, 1023, 1025, 1026, 1029, 1030, 1033, 1035, 1037, 1038, 1039, 1040, 1042, 1043, 1044, 1045, 1046, 1049, 1050, 1053, 1055, 1059, 1060, 1064, 1065, 1069, 1070, 1071, 1074, 1075, 1078, 1080, 1084, 1085, 1086, 1090, 1095   |
| Alloyed case hardened steels   | 2317, 2512, 2515, 2517, 3115, 3120, 3215, 3220, 3312, 3316, 3325, 4012, 4023, 4024, 4027, 4028, 4118, 4119, 4125, 4317, 4320, 4419, 4422, 4427, 4608, 4615, 4617, 4620, 4621, 4626, 4718, 4720, 4815, 4817, 4820, 5015, 5115, 5117, 5120, 6115, 6118, 6120, 6125, 8115, 8615, 8617, 8620, 8622, 8625, 8627, 8720, 8822, 9310, 9315, 9317   |
| Alloyed heat-treatable steels  | 1330, 1335, 1340, 1345, 2340, 3140, 3145, 3150, 3230, 3240, 3335, 3340, 3435, 3450, 4032, 4037, 4063, 4130, 4135, 4137, 4140, 4142, 4145, 4147, 4150, 4161, 4337, 4340, 4640, 5045, 5046, 5060, 5130, 5132, 5135, 5140, 5145, 5157, 5150, 5155, 5160, 6130, 6135, 6140, 6145, 6150, 7140, 6145, 6150, 7140, 8630, 8632, 8635, 8637, 8640, 8642, 8645, 8650, 8650, 8660, 8735, 8740, 8742, 9250, 9254, 9255, 9260, 9262, 9840, 9850 |
| Nitriding steels               | 1132, 1137, 1138, 1139, 1140, 1141, 1144, 1145, 1146, 1151   |

# Premium Cobalt Bottoming Taps

2B class of fit, ANSI shank and overall length

Green color ring for easy identification



## Form C, Semi-Bottoming

Series #3922 (UNC TiN), #3923 (UNF TiN)

Series #3949 (UNC TiCN), #3950 (UNF TiCN)

- 40° helix, Form "C" 2-3 thread chamfer lead
- Precision-ground flute form
- TiN or TiCN coated, semi-bottoming tap
- Oversized H7 and H11 and STI style tap series also available with TiN coating

| Size UNC | Size UNF | No. Flutes | Approx. Limits | Order Code |
|----------|----------|------------|----------------|------------|
| 2-56     | 2-64     | 3          | H2/H3          | 2.184      |
| 3-48     | 3-56     | 3          | H2/H3          | 2.515      |
| 4-40     | 4-48     | 3          | H2/H3          | 2.845      |
| 5-40     | 5-44     | 3          | H2/H3          | 3.175      |
| 6-32     | 6-40     | 3          | H3/H4          | 3.505      |
| 8-32     | 8-36     | 3          | H3/H4          | 4.166      |
| 10-24    | 10-32    | 3          | H3/H4          | 4.826      |
| 12-24    | 12-28    | 3          | H3/H4          | 5.486      |
| 1/4-20   | 1/4-28   | 3          | H4/H5          | 6.350      |
| 5/16-18  | 5/16-24  | 3          | H4/H5          | 7.938      |
| 3/8-16   | 3/8-24   | 3          | H5/H6          | 9.525      |
| 7/16-14  | 7/16-20  | 3          | H5/H6          | 11.113     |
| 1/2-13   | 1/2-20   | 3          | H5/H6          | 12.700     |
| 5/8-11   | 5/8-18   | 4          | H5/H6          | 15.875     |
| 3/4-10   | 3/4-16   | 4          | H5/H6          | 19.050     |
| 7/8-9    | 7/8-14   | 4          | H6/H7          | 22.225     |
| 1-8      | 1-12     | 4          | H6/H7          | 25.400     |
| 1 1/4-7  | 1 1/4-12 | 4          | H7/H8          | 31.750     |
| 1 1/2-6  | 1 1/2-12 | 6          | H7/H8          | 38.100     |

## Series #3921 (Metric TiN)

## Series #3948 (Metric TiCN)

| Size Metric | No. Flutes | Approx. Limits | Order Code |
|-------------|------------|----------------|------------|
| M2 X 0.40   | 3          | D2/D3          | 2.000      |
| M3 X 0.50   | 3          | D2/D3          | 3.000      |
| M4 X 0.70   | 3          | D3/D4          | 4.000      |
| M5 X 0.80   | 3          | D3/D4          | 5.000      |
| M6 X 1.00   | 3          | D4/D5          | 6.000      |
| M8 X 1.25   | 3          | D4/D5          | 8.000      |
| M10 X 1.50  | 3          | D4/D5          | 10.000     |
| M12 X 1.75  | 3          | D5/D6          | 12.000     |
| M14 X 2.00  | 3          | D5/D6          | 14.000     |
| M16 X 2.00  | 4          | D6/D7          | 16.000     |
| M18 X 2.50  | 4          | D6/D7          | 18.000     |
| M20 X 2.50  | 4          | D6/D7          | 20.000     |

## Series #3974 (Metric Fine TiN)

| Size Metric Fine | No. Flutes | Approx. Limits | Order Code |
|------------------|------------|----------------|------------|
| M8 X 1.00        | 3          | D4/D5          | 8.005      |
| M10 X 1.00       | 3          | D4/D5          | 10.005     |
| M10 X 1.25       | 3          | D4/D5          | 10.006     |
| M12 X 1.00       | 3          | D4/D5          | 12.005     |
| M12 X 1.25       | 3          | D4/D5          | 12.006     |
| M12 X 1.50       | 3          | D5/D6          | 12.007     |
| M14 X 1.25       | 3          | D4/D5          | 14.006     |
| M14 X 1.50       | 3          | D4/D5          | 14.007     |
| M16 X 1.50       | 4          | D4/D5          | 16.007     |
| M18 X 1.50       | 4          | D4/D5          | 18.007     |
| M20 X 1.50       | 4          | D6/D7          | 20.007     |



## Form E, Full Bottoming

Series #3977 (UNC TiN), #3978 (UNF TiN)

- 40° helix, Form "E" 1.5-2 thread chamfer lead
- TiN coated for added tool life

| Size UNC | Size UNF | No. Flutes | Approx. Limits | Order Code |
|----------|----------|------------|----------------|------------|
| 2-56     | 2-64     | 3          | H2/H3          | 2.184      |
| 3-48     | 3-56     | 3          | H2/H3          | 2.515      |
| 4-40     | 4-48     | 3          | H2/H3          | 2.845      |
| 5-40     | 5-44     | 3          | H2/H3          | 3.175      |
| 6-32     | 6-40     | 3          | H3/H4          | 3.505      |
| 8-32     | 8-36     | 3          | H3/H4          | 4.166      |
| 10-24    | 10-32    | 3          | H3/H4          | 4.826      |
| 12-24    | 12-28    | 3          | H3/H4          | 5.486      |
| 1/4-20   | 1/4-28   | 3          | H4/H5          | 6.350      |
| 5/16-18  | 5/16-24  | 3          | H4/H5          | 7.938      |
| 3/8-16   | 3/8-24   | 3          | H5/H6          | 9.525      |
| 7/16-14  | 7/16-20  | 3          | H5/H6          | 11.113     |
| 1/2-13   | 1/2-20   | 3          | H5/H6          | 12.700     |
| 9/16-12  | 9/16-18  | 3          | H5/H6          | 14.288     |
| 5/8-11   | 5/8-18   | 4          | H5/H6          | 15.875     |
| 3/4-10   | 3/4-16   | 4          | H5/H6          | 19.050     |
| 7/8-9    | 7/8-14   | 4          | H6/H7          | 22.225     |
| 1-8      | 1-12     | 4          | H6/H7          | 25.400     |
| 1 1/4-7  | 1 1/4-12 | 4          | H7/H8          | 31.750     |
| 1 1/2-6  | 1 1/2-12 | 6          | H7/H8          | 38.100     |

## Series #3976 (Metric TiN)

| Size Metric | No. Flutes | Approx. Limits | Order Code |
|-------------|------------|----------------|------------|
| M2 X 0.40   | 3          | D2/D3          | 2.000      |
| M3 X 0.50   | 3          | D2/D3          | 3.000      |
| M4 X 0.70   | 3          | D3/D4          | 4.000      |
| M5 X 0.80   | 3          | D3/D4          | 5.000      |
| M6 X 1.00   | 3          | D4/D5          | 6.000      |
| M8 X 1.25   | 3          | D4/D5          | 8.000      |
| M10 X 1.50  | 3          | D4/D5          | 10.000     |
| M12 X 1.75  | 3          | D5/D6          | 12.000     |
| M14 X 2.00  | 3          | D5/D6          | 14.000     |
| M16 X 2.00  | 4          | D6/D7          | 16.000     |
| M18 X 2.50  | 4          | D6/D7          | 18.000     |
| M20 X 2.50  | 4          | D6/D7          | 20.000     |



To order: Series number + order code, example: 3921 8.000



## Guhring Tap Compass

Guhring has marked its standard tap series with color rings to help you quickly and confidently choose the correct tool for the job. Each ring relates to the unique machining behaviors of different materials as dictated by their type and condition. Green ring taps are your first choice for steel. Your full-line Guhring High-Performance Tap catalog has further information on this user-friendly color ring material identifier system.

# Threading

## Premium Cobalt Thread Forming Taps

2BX class of fit, ANSI shank and overall length

For blind or through hole applications



### Form C, Semi-Bottoming

Series #3940 (UNC TiN), #3941 (UNF TiN)

Series #3943 (UNC TiCN), #3944 (UNF TiCN)

- Form "C" 2-3 thread chamfer lead
- TiCN or TiN coated thread forming tap
- Premium M35 cobalt substrate
- Optimized surface finish for long life
- Lubricant grooves across the threads

| Size UNC | Size UNF | No. Flutes | Approx. Limits | Order Code |
|----------|----------|------------|----------------|------------|
| 4-40     | 4-48     | 4          | H4/H5          | 2.845      |
| 5-40     | 5-44     | 4          | H4/H5          | 3.175      |
| 6-32     | 6-40     | 4          | H5/H6          | 3.505      |
| 8-32     | 8-36     | 4          | H5/H6          | 4.166      |
| 10-24    | 10-32    | 4          | H6/H7          | 4.826      |
| 12-24    | 12-28    | 4          | H6/H7          | 5.486      |
| 1/4-20   | 1/4-28   | 4          | H7/H8          | 6.350      |
| 5/16-18  | 5/16-24  | 5          | H8/H9          | 7.938      |
| 3/8-16   | 3/8-24   | 5          | H8/H9          | 9.525      |
| 7/16-14  | 7/16-20  | 5          | H9/H10         | 11.113     |
| 1/2-13   | 1/2-20   | 5          | H10/H11        | 12.700     |
| 5/8-11   | 5/8-18   | 5          | H11/H12        | 15.875     |
| 3/4-10   | 3/4-16   | 7          | H12/H13        | 19.050     |

### Series #3939 (Metric TiN)

### Series #3942 (Metric TiCN)

| Size Metric | No. Flutes | Approx. Limits | Order Code |
|-------------|------------|----------------|------------|
| M4 X 0.70   | 4          | D6/D7          | 4.000      |
| M5 X 0.80   | 4          | D7/D8          | 5.000      |
| M6 X 1.00   | 4          | D8/D9          | 6.000      |
| M8 X 1.25   | 5          | D9/D10         | 8.000      |
| M10 X 1.50  | 5          | D10/D11        | 10.000     |
| M12 X 1.75  | 5          | D11/D12        | 12.000     |
| M14 X 2.00  | 5          | D13/D14        | 14.000     |
| M16 X 2.00  | 5          | D13/D14        | 16.000     |

### Series #3975 (Metric Fine TiN)

| Size Metric | No. Flutes | Approx. Limits | Order Code |
|-------------|------------|----------------|------------|
| M8 X 1.00   | 5          | D7/D8          | 8.005      |
| M10 X 1.00  | 5          | D7/D8          | 10.005     |
| M10 X 1.25  | 5          | D7/D8          | 10.006     |
| M12 X 1.00  | 5          | D7/D8          | 12.005     |
| M12 X 1.25  | 5          | D7/D8          | 12.006     |
| M12 X 1.50  | 5          | D8/D9          | 12.007     |
| M14 X 1.25  | 5          | D9/D10         | 14.006     |
| M14 X 1.50  | 5          | D10/D11        | 14.007     |
| M16 X 1.50  | 5          | D10/D11        | 16.007     |



### Form E, Full Bottoming Tap

Series #3959 (UNC TiN), #3972 (UNF TiN)

- Form "E" 1.5-2 thread chamfer lead
- TiN coated thread forming tap

| Size UNC | Size UNF | No. Flutes | Approx. Limits | Order Code |
|----------|----------|------------|----------------|------------|
| 4-40     | --       | 4          | H4/H5          | 2.845      |
| 6-32     | --       | 4          | H5/H6          | 3.505      |
| 8-32     | --       | 4          | H5/H6          | 4.166      |
| 10-24    | 10-32    | 4          | H6/H7          | 4.826      |
| 1/4-20   | 1/4-28   | 4          | H7/H8          | 6.350      |
| 5/16-18  | 5/16-24  | 5          | H8/H9          | 7.938      |
| 3/8-16   | 3/8-24   | 5          | H8/H9          | 9.525      |
| 7/16-14  | 7/16-20  | 5          | H9/H10         | 11.113     |
| 1/2-13   | 1/2-20   | 5          | H10/H11        | 12.700     |
| 5/8-11   | 5/8-18   | 5          | H11/H12        | 15.875     |

### Series #3979 (Metric TiN)

| Size Metric | No. Flutes | Approx. Limits | Order Code |
|-------------|------------|----------------|------------|
| M2 X 0.50   | 3          | D5/D6          | 2.000      |
| M3 X 0.50   | 4          | D5/D6          | 3.000      |
| M4 X 0.70   | 4          | D6/D7          | 4.000      |
| M5 X 0.80   | 4          | D7/D8          | 5.000      |
| M6 X 1.00   | 4          | D8/D9          | 6.000      |
| M8 X 1.25   | 5          | D9/D10         | 8.000      |
| M10 X 1.50  | 5          | D10/D11        | 10.000     |
| M12 X 1.75  | 5          | D11/D12        | 12.000     |

## Tap Operating Parameters

| Recommended Form Tapping Speeds - Steels |         |          |             |
|--|---------|----------|-------------|
| Material Hardness                        |         | SFM      |             |
| HRC                                      | Brinell | Nitrided | Hard coated |
| --                                       | ≤ 180   | 100      | 165         |
| ≤ 20                                     | ≤ 230   | 80       | 130         |
| ≤ 25                                     | ≤ 250   | 65       | 115         |
| ≤ 30                                     | ≤ 280   | 50       | 100         |
| ≤ 35                                     | ≤ 320   | 30       | 65          |

Refer to 2009 tap catalog for speeds if tapping stainless or tool steels.

To order: Series number + order code, example: 3921 8.000



Surface of a conventional form tap



Optimised surface of a Guhring form tap

Form tapping has many advantages over traditional cut tapping, and is well-suited for steel applications. A formed thread (sometimes referred to as a "rolled form") is a stronger thread than a cut thread. The flanks of the thread have an excellent surface finish and the form tapping operation is actually faster than a cut thread. Additionally, Guhring form taps incorporate premium base material with a superior post polished surface finish for added tool life and superior thread quality.



## Series 2477 (3xD), 2479 (5xD), 4044 (7xD) RT 100 X Carbide Drills

High penetration, self-centering 140° X point



- nano-FIREX® coated
- Reinforced straight shank
- Coolant through the tool



### Specialized facet-style self-centering point geometry

Promotes free cutting action, controlled chip formation

### New edge preparation technology creates ultra-precision cutting edge

Produces more accurate and consistent finish hole sizes

### Guhring's own DK 460 UF ultra-fine grain carbide substrate

Grain size 1/5th the size of traditional P40 grades, allows for sharper cutting edges and greater transverse rupture strength

### Unique cutting edge and flute profile geometry

Creates short, manageable chips which are easily evacuated, enabling higher penetration rates, eliminates peck cycle in most operations

### nano-FIREX® heat- and wear-resistant PVD coating

Micro-thin film multilayer coating can operate at temps beyond 1470° F

| Dec. inch | Diameter    |               |       | 2477 OAL mm | 2477 Flute Length mm | 2479 OAL mm | 2479 Flute Length mm | 4044 OAL mm | 4044 Flute length mm |
|-----------|-------------|---------------|-------|-------------|----------------------|-------------|----------------------|-------------|----------------------|
|           | Fract. inch | Wire / letter | mm    |             |                      |             |                      |             |                      |
| 0.1181    |             |               | 3.000 | 62.00       | 20.00                | 66.00       | 28.00                | 70.00       | 30.00                |
| 0.1220    |             |               | 3.100 | 62.00       | 20.00                | 66.00       | 28.00                | 70.00       | 30.00                |
| 0.1248    | 1/8         |               | 3.170 | 62.00       | 20.00                | 66.00       | 28.00                | 70.00       | 30.00                |
| 0.1260    |             |               | 3.200 | 62.00       | 20.00                | 66.00       | 28.00                | 70.00       | 30.00                |
| 0.1280    |             |               | 3.250 | 62.00       | 20.00                | 66.00       | 28.00                | 70.00       | 30.00                |
| 0.1299    |             |               | 3.300 | 62.00       | 20.00                | 66.00       | 28.00                | 70.00       | 30.00                |
| 0.1339    |             |               | 3.400 | 62.00       | 20.00                | 66.00       | 28.00                | 75.00       | 37.50                |
| 0.1378    |             |               | 3.500 | 62.00       | 20.00                | 66.00       | 28.00                | 75.00       | 37.50                |
| 0.1406    | 9/64        | 28            | 3.570 | 62.00       | 20.00                | 66.00       | 28.00                | 75.00       | 37.50                |
| 0.1417    |             |               | 3.600 | 62.00       | 20.00                | 66.00       | 28.00                | 75.00       | 37.50                |
| 0.1457    |             |               | 3.700 | 62.00       | 20.00                | 66.00       | 28.00                | 75.00       | 37.50                |
| 0.1496    |             | 25            | 3.800 | 66.00       | 24.00                | 74.00       | 36.00                | 75.00       | 37.50                |
| 0.1535    |             |               | 3.900 | 66.00       | 24.00                | 74.00       | 36.00                | 75.00       | 37.50                |
| 0.1563    | 5/32        |               | 3.970 | 66.00       | 24.00                | 74.00       | 36.00                | 75.00       | 37.50                |
| 0.1575    |             |               | 4.000 | 66.00       | 24.00                | 74.00       | 36.00                | 75.00       | 37.50                |
| 0.1591    |             | 21            | 4.040 | 66.00       | 24.00                | 74.00       | 36.00                | 75.00       | 37.50                |
| 0.1614    |             |               | 4.100 | 66.00       | 24.00                | 74.00       | 36.00                | 75.00       | 37.50                |
| 0.1654    |             |               | 4.200 | 66.00       | 24.00                | 74.00       | 36.00                | 75.00       | 37.50                |
| 0.1693    |             |               | 4.300 | 66.00       | 24.00                | 74.00       | 36.00                | 85.00       | 45.00                |
| 0.1720    | 11/64       |               | 4.370 | 66.00       | 24.00                | 74.00       | 36.00                | 85.00       | 45.00                |
| 0.1732    |             |               | 4.400 | 66.00       | 24.00                | 74.00       | 36.00                | 85.00       | 45.00                |
| 0.1772    |             | 16            | 4.500 | 66.00       | 24.00                | 74.00       | 36.00                | 85.00       | 45.00                |
| 0.1811    |             |               | 4.600 | 66.00       | 24.00                | 74.00       | 36.00                | 85.00       | 45.00                |
| 0.1831    |             |               | 4.650 | 66.00       | 24.00                | 74.00       | 36.00                | 85.00       | 45.00                |
| 0.1850    |             |               | 4.700 | 66.00       | 24.00                | 74.00       | 36.00                | 85.00       | 45.00                |
| 0.1874    | 3/16        |               | 4.760 | 66.00       | 28.00                | 82.00       | 44.00                | 90.00       | 50.00                |
| 0.1890    |             | 12            | 4.800 | 66.00       | 28.00                | 82.00       | 44.00                | 90.00       | 50.00                |
| 0.1929    |             |               | 4.900 | 66.00       | 28.00                | 82.00       | 44.00                | 90.00       | 50.00                |
| 0.1969    |             |               | 5.000 | 66.00       | 28.00                | 82.00       | 44.00                | 90.00       | 50.00                |
| 0.2008    |             |               | 5.100 | 66.00       | 28.00                | 82.00       | 44.00                | 90.00       | 50.00                |
| 0.2012    |             | 7             | 5.110 | 66.00       | 28.00                | 82.00       | 44.00                | 90.00       | 50.00                |
| 0.2031    | 13/64       |               | 5.160 | 66.00       | 28.00                | 82.00       | 44.00                | 90.00       | 50.00                |
| 0.2047    |             |               | 5.200 | 66.00       | 28.00                | 82.00       | 44.00                | 90.00       | 50.00                |
| 0.2087    |             |               | 5.300 | 66.00       | 28.00                | 82.00       | 44.00                | 90.00       | 50.00                |
| 0.2126    |             |               | 5.400 | 66.00       | 28.00                | 82.00       | 44.00                | 90.00       | 50.00                |
| 0.2130    |             | 3             | 5.410 | 66.00       | 28.00                | 82.00       | 44.00                | 90.00       | 50.00                |
| 0.2165    |             |               | 5.500 | 66.00       | 28.00                | 82.00       | 44.00                | 97.00       | 57.00                |
| 0.2185    |             |               | 5.550 | 66.00       | 28.00                | 82.00       | 44.00                |             |                      |
| 0.2189    | 7/32        |               | 5.560 | 66.00       | 28.00                | 82.00       | 44.00                | 97.00       | 57.00                |
| 0.2205    |             |               | 5.600 | 66.00       | 28.00                | 82.00       | 44.00                | 97.00       | 57.00                |
| 0.2224    |             |               | 5.650 | 66.00       | 28.00                | 82.00       | 44.00                |             |                      |
| 0.2244    |             |               | 5.700 | 66.00       | 28.00                | 82.00       | 44.00                | 97.00       | 57.00                |
| 0.2283    |             |               | 5.800 | 66.00       | 28.00                | 82.00       | 44.00                | 97.00       | 57.00                |
| 0.2323    |             |               | 5.900 | 66.00       | 28.00                | 82.00       | 44.00                | 97.00       | 57.00                |
| 0.2343    | 15/64       |               | 5.950 | 66.00       | 28.00                | 82.00       | 44.00                | 97.00       | 57.00                |
| 0.2362    |             |               | 6.000 | 66.00       | 28.00                | 82.00       | 44.00                | 97.00       | 57.00                |
| 0.2402    |             |               | 6.100 | 79.00       | 34.00                | 91.00       | 53.00                | 97.00       | 57.00                |

| Dec. inch | Diameter    |               |       | 2477 OAL mm | 2477 Flute Length mm | 2479 OAL mm | 2479 Flute Length mm | 4044 OAL mm | 4044 Flute length mm |
|-----------|-------------|---------------|-------|-------------|----------------------|-------------|----------------------|-------------|----------------------|
|           | Fract. inch | Wire / letter | mm    |             |                      |             |                      |             |                      |
| 0.2441    |             |               | 6.200 | 79.00       | 34.00                | 91.00       | 53.00                | 106.00      | 66.00                |
| 0.2480    |             |               | 6.300 | 79.00       | 34.00                | 91.00       | 53.00                | 106.00      | 66.00                |
| 0.2500    | 1/4         | E             | 6.350 | 79.00       | 34.00                | 91.00       | 53.00                | 106.00      | 66.00                |
| 0.2520    |             |               | 6.400 | 79.00       | 34.00                | 91.00       | 53.00                | 106.00      | 66.00                |
| 0.2559    |             |               | 6.500 | 79.00       | 34.00                | 91.00       | 53.00                | 106.00      | 66.00                |
| 0.2571    |             | F             | 6.530 | 79.00       | 34.00                | 91.00       | 53.00                | 106.00      | 66.00                |
| 0.2598    |             |               | 6.600 | 79.00       | 34.00                | 91.00       | 53.00                | 106.00      | 66.00                |
| 0.2638    |             |               | 6.700 | 79.00       | 34.00                | 91.00       | 53.00                | 106.00      | 66.00                |
| 0.2657    | 17/64       | H             | 6.750 | 79.00       | 34.00                | 91.00       | 53.00                | 106.00      | 66.00                |
| 0.2677    |             |               | 6.800 | 79.00       | 34.00                | 91.00       | 53.00                | 106.00      | 66.00                |
| 0.2717    |             | I             | 6.900 | 79.00       | 34.00                | 91.00       | 53.00                | 116.00      | 76.00                |
| 0.2756    |             |               | 7.000 | 79.00       | 34.00                | 91.00       | 53.00                | 116.00      | 76.00                |
| 0.2795    |             |               | 7.100 | 79.00       | 41.00                | 91.00       | 53.00                | 116.00      | 76.00                |
| 0.2811    | 9/32        | K             | 7.140 | 79.00       | 41.00                | 91.00       | 53.00                | 116.00      | 76.00                |
| 0.2835    |             |               | 7.200 | 79.00       | 41.00                | 91.00       | 53.00                | 116.00      | 76.00                |
| 0.2874    |             |               | 7.300 | 79.00       | 41.00                | 91.00       | 53.00                | 116.00      | 76.00                |
| 0.2913    |             |               | 7.400 | 79.00       | 41.00                | 91.00       | 53.00                | 116.00      | 76.00                |
| 0.2953    |             |               | 7.500 | 79.00       | 41.00                | 91.00       | 53.00                | 116.00      | 76.00                |
| 0.2969    | 19/64       |               | 7.540 | 79.00       | 41.00                | 91.00       | 53.00                | 116.00      | 76.00                |
| 0.2972    |             |               | 7.550 | 79.00       | 41.00                | 91.00       | 53.00                |             |                      |
| 0.2992    |             |               | 7.600 | 79.00       | 41.00                | 91.00       | 53.00                | 116.00      | 76.00                |
| 0.3012    |             |               | 7.650 | 79.00       | 41.00                | 91.00       | 53.00                |             |                      |
| 0.3031    |             |               | 7.700 | 79.00       | 41.00                | 91.00       | 53.00                | 116.00      | 76.00                |
| 0.3071    |             |               | 7.800 | 79.00       | 41.00                | 91.00       | 53.00                | 116.00      | 76.00                |
| 0.3110    |             |               | 7.900 | 79.00       | 41.00                | 91.00       | 53.00                | 116.00      | 76.00                |
| 0.3126    | 5/16        |               | 7.940 | 79.00       | 41.00                | 91.00       | 53.00                | 116.00      | 76.00                |
| 0.3150    |             |               | 8.000 | 89.00       | 47.00                | 91.00       | 53.00                | 116.00      | 76.00                |
| 0.3189    |             |               | 8.100 | 89.00       | 47.00                | 103.00      | 61.00                | 131.00      | 87.00                |
| 0.3228    |             | P             | 8.200 | 89.00       | 47.00                | 103.00      | 61.00                | 131.00      | 87.00                |
| 0.3268    |             |               | 8.300 | 89.00       | 47.00                | 103.00      | 61.00                | 131.00      | 87.00                |
| 0.3280    | 21/64       |               | 8.330 | 89.00       | 47.00                | 103.00      | 61.00                | 131.00      | 87.00                |
| 0.3307    |             |               | 8.400 | 89.00       | 47.00                | 103.00      | 61.00                | 131.00      | 87.00                |
| 0.3346    |             |               | 8.500 | 89.00       | 47.00                | 103.00      | 61.00                | 131.00      | 87.00                |
| 0.3386    |             |               | 8.600 | 89.00       | 47.00                | 103.00      | 61.00                | 131.00      | 87.00                |
| 0.3425    |             |               | 8.700 | 89.00       | 47.00                | 103.00      | 61.00                | 131.00      | 87.00                |
| 0.3437    | 11/32       |               | 8.730 | 89.00       | 47.00                | 103.00      | 61.00                | 131.00      | 87.00                |
| 0.3465    |             |               | 8.800 | 89.00       | 47.00                | 103.00      | 61.00                | 131.00      | 87.00                |
| 0.3504    |             |               | 8.900 | 89.00       | 47.00                | 103.00      | 61.00                | 131.00      | 87.00                |
| 0.3543    |             |               | 9.000 | 89.00       | 47.00                | 103.00      | 61.00                | 131.00      | 87.00                |
| 0.3583    |             |               | 9.100 | 89.00       | 47.00                | 103.00      | 61.00                | 139.00      | 95.00                |
| 0.3594    | 23/64       |               | 9.130 | 89.00       | 47.00                | 103.00      | 61.00                | 139.00      | 95.00                |
| 0.3622    |             |               | 9.200 | 89.00       | 47.00                | 103.00      | 61.00                | 139.00      | 95.00                |
| 0.3642    |             |               | 9.250 | 89.00       | 47.00                | 103.00      | 61.00                | 139.00      | 95.00                |
| 0.3661    |             |               | 9.300 | 89.00       | 47.00                | 103.00      | 61.00                | 139.00      | 95.00                |
| 0.3677    |             | U             | 9.340 | 89.00       | 47.00                | 103.00      | 61.00                | 139.00      | 95.00                |
| 0.3701    |             |               | 9.400 | 89.00       | 47.00                | 103.00      | 61.00                | 139.00      | 95.00                |
| 0.3740    |             |               | 9.500 | 89.00       | 47.00                | 103.00      | 61.00                | 139.00      | 95.00                |



# Drilling

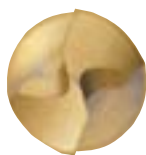
| Dec. inch | Diameter    |               | 2477 OAL mm | 2477 Flute Length mm | 2479 OAL mm | 2479 Flute Length mm | 4044 OAL mm | 4044 Flute length mm |        |
|-----------|-------------|---------------|-------------|----------------------|-------------|----------------------|-------------|----------------------|--------|
|           | Fract. inch | Wire / letter |             |                      |             |                      |             |                      | mm     |
| 0.3748    | 3/8         | W             | 9.520       | 89.00                | 47.00       | 103.00               | 61.00       | 139.00               | 95.00  |
| 0.3759    |             |               | 9.550       | 89.00                | 47.00       | 103.00               | 61.00       |                      |        |
| 0.3780    | 9.600       |               | 89.00       | 47.00                | 103.00      | 61.00                | 139.00      | 95.00                |        |
| 0.3819    |             |               | 9.700       | 89.00                | 47.00       | 103.00               | 61.00       | 139.00               | 95.00  |
| 0.3858    | 9.800       | W             | 89.00       | 47.00                | 103.00      | 61.00                | 139.00      | 95.00                |        |
| 0.3898    |             |               | 89.00       | 47.00                | 103.00      | 61.00                | 139.00      | 95.00                |        |
| 0.3906    | 25/64       |               | 9.920       | 89.00                | 47.00       | 103.00               | 61.00       | 139.00               | 95.00  |
| 0.3937    |             |               | 10.000      | 102.00               | 55.00       | 103.00               | 61.00       | 139.00               | 95.00  |
| 0.3976    | 10.100      |               | 10.200      | 102.00               | 55.00       | 118.00               | 71.00       | 155.00               | 106.00 |
| 0.4016    |             |               | 10.200      | 102.00               | 55.00       | 118.00               | 71.00       | 155.00               | 106.00 |
| 0.4055    | 10.300      |               | 10.200      | 102.00               | 55.00       | 118.00               | 71.00       | 155.00               | 106.00 |
| 0.4063    |             |               | 10.320      | 102.00               | 55.00       | 118.00               | 71.00       | 155.00               | 106.00 |
| 0.4094    | 10.400      |               | 10.200      | 102.00               | 55.00       | 118.00               | 71.00       | 155.00               | 106.00 |
| 0.4134    |             |               | 10.500      | 102.00               | 55.00       | 118.00               | 71.00       | 155.00               | 106.00 |
| 0.4173    | 10.600      |               | 10.200      | 102.00               | 55.00       | 118.00               | 71.00       | 155.00               | 106.00 |
| 0.4213    |             |               | 10.700      | 102.00               | 55.00       | 118.00               | 71.00       | 155.00               | 106.00 |
| 0.4220    | 27/64       |               | 10.720      | 102.00               | 55.00       | 118.00               | 71.00       | 155.00               | 106.00 |
| 0.4252    |             |               | 10.800      | 102.00               | 55.00       | 118.00               | 71.00       | 155.00               | 106.00 |
| 0.4291    | 10.900      |               | 10.200      | 102.00               | 55.00       | 118.00               | 71.00       | 155.00               | 106.00 |
| 0.4331    |             |               | 11.000      | 102.00               | 55.00       | 118.00               | 71.00       | 155.00               | 106.00 |
| 0.4370    | 11.100      |               | 10.200      | 102.00               | 55.00       | 118.00               | 71.00       | 155.00               | 106.00 |
| 0.4374    |             |               | 7/16        | 11.110               | 102.00      | 55.00                | 118.00      | 71.00                | 163.00 |
| 0.4409    | 11.200      |               | 10.200      | 102.00               | 55.00       | 118.00               | 71.00       | 163.00               | 114.00 |
| 0.4449    |             |               | 11.300      | 102.00               | 55.00       | 118.00               | 71.00       | 155.00               | 106.00 |
| 0.4488    | 11.400      |               | 10.200      | 102.00               | 55.00       | 118.00               | 71.00       | 155.00               | 106.00 |
| 0.4528    |             |               | 11.500      | 102.00               | 55.00       | 118.00               | 71.00       | 163.00               | 114.00 |
| 0.4531    | 29/64       |               | 11.510      | 102.00               | 55.00       | 118.00               | 71.00       | 155.00               | 106.00 |
| 0.4567    |             |               | 11.600      | 102.00               | 55.00       | 118.00               | 71.00       | 155.00               | 106.00 |
| 0.4606    | 11.700      |               | 10.200      | 102.00               | 55.00       | 118.00               | 71.00       | 155.00               | 106.00 |
| 0.4646    |             |               | 11.800      | 102.00               | 55.00       | 118.00               | 71.00       | 163.00               | 114.00 |
| 0.4685    | 11.900      |               | 10.200      | 102.00               | 55.00       | 118.00               | 71.00       | 163.00               | 114.00 |
| 0.4689    |             |               | 15/32       | 11.910               | 102.00      | 55.00                | 118.00      | 71.00                | 163.00 |
| 0.4724    | 12.000      |               | 10.200      | 102.00               | 55.00       | 118.00               | 71.00       | 163.00               | 114.00 |
| 0.4764    |             |               | 12.100      | 107.00               | 60.00       | 124.00               | 77.00       | 182.00               | 133.00 |
| 0.4803    | 12.200      |               | 10.200      | 102.00               | 55.00       | 118.00               | 71.00       | 163.00               | 114.00 |
| 0.4843    |             |               | 31/64       | 12.300               | 107.00      | 60.00                | 124.00      | 77.00                | 182.00 |
| 0.4882    | 12.400      |               | 10.200      | 102.00               | 55.00       | 118.00               | 71.00       | 182.00               | 133.00 |
| 0.4921    |             |               | 12.500      | 107.00               | 60.00       | 124.00               | 77.00       | 182.00               | 133.00 |
| 0.4961    | 12.600      |               | 10.200      | 102.00               | 55.00       | 118.00               | 71.00       | 182.00               | 133.00 |
| 0.5000    |             |               | 1/2         | 12.700               | 107.00      | 60.00                | 124.00      | 77.00                | 182.00 |
| 0.5039    | 12.800      |               | 10.200      | 102.00               | 55.00       | 118.00               | 71.00       | 182.00               | 133.00 |
| 0.5079    |             |               | 12.900      | 107.00               | 60.00       | 124.00               | 77.00       | 182.00               | 133.00 |
| 0.5118    | 13.000      |               | 10.200      | 102.00               | 55.00       | 118.00               | 71.00       | 182.00               | 133.00 |
| 0.5157    |             |               | 13.100      | 107.00               | 60.00       | 124.00               | 77.00       | 182.00               | 133.00 |
| 0.5197    | 13.200      |               | 10.200      | 102.00               | 55.00       | 118.00               | 71.00       | 182.00               | 133.00 |
| 0.5236    |             |               | 13.300      | 107.00               | 60.00       | 124.00               | 77.00       | 182.00               | 133.00 |
| 0.5276    | 13.400      |               | 10.200      | 102.00               | 55.00       | 118.00               | 71.00       | 182.00               | 133.00 |
| 0.5311    |             |               | 17/32       | 13.490               | 107.00      | 60.00                | 124.00      | 77.00                | 182.00 |
| 0.5315    | 13.500      |               | 10.200      | 102.00               | 55.00       | 118.00               | 71.00       | 182.00               | 133.00 |
| 0.5354    |             |               | 13.600      | 107.00               | 60.00       | 124.00               | 77.00       | 182.00               | 133.00 |
| 0.5394    | 13.700      | 107.00        | 60.00       | 124.00               | 77.00       | 182.00               | 133.00      |                      |        |

| Dec. inch | Diameter    |               | 2477 OAL mm | 2477 Flute Length mm | 2479 OAL mm | 2479 Flute Length mm | 4044 OAL mm | 4044 Flute length mm |        |
|-----------|-------------|---------------|-------------|----------------------|-------------|----------------------|-------------|----------------------|--------|
|           | Fract. inch | Wire / letter |             |                      |             |                      |             |                      | mm     |
| 0.5433    | 35/64       |               | 13.800      | 107.00               | 60.00       | 124.00               | 77.00       | 182.00               | 133.00 |
| 0.5469    |             |               | 13.890      | 107.00               | 60.00       | 124.00               | 77.00       |                      |        |
| 0.5472    | 13.900      |               | 107.00      | 60.00                | 124.00      | 77.00                |             |                      |        |
| 0.5512    |             |               | 14.000      | 115.00               | 65.00       | 124.00               | 77.00       | 182.00               | 133.00 |
| 0.5551    | 14.100      |               | 115.00      | 65.00                | 133.00      | 83.00                | 204.00      | 152.00               |        |
| 0.5591    |             |               | 14.200      | 115.00               | 65.00       | 133.00               | 83.00       | 204.00               | 152.00 |
| 0.5626    | 9/16        |               | 14.290      | 115.00               | 65.00       | 133.00               | 83.00       | 204.00               | 152.00 |
| 0.5630    |             |               | 14.300      | 115.00               | 65.00       |                      |             |                      |        |
| 0.5669    | 14.400      |               | 115.00      | 65.00                | 133.00      | 83.00                |             |                      |        |
| 0.5709    |             |               | 14.500      | 115.00               | 65.00       | 133.00               | 83.00       | 204.00               | 152.00 |
| 0.5748    | 14.600      |               | 115.00      | 65.00                | 133.00      | 83.00                |             |                      |        |
| 0.5780    |             |               | 37/64       | 14.680               | 115.00      | 65.00                | 133.00      | 83.00                |        |
| 0.5787    | 14.700      |               | 115.00      | 65.00                | 133.00      | 83.00                |             |                      |        |
| 0.5827    |             |               | 14.800      | 115.00               | 65.00       | 133.00               | 83.00       |                      |        |
| 0.5866    | 14.900      |               | 115.00      | 65.00                | 133.00      | 83.00                |             |                      |        |
| 0.5906    |             |               | 15.000      | 115.00               | 65.00       | 133.00               | 83.00       | 204.00               | 152.00 |
| 0.5937    | 19/32       |               | 15.080      | 115.00               | 65.00       | 133.00               | 83.00       |                      |        |
| 0.5945    |             |               | 15.100      | 115.00               | 65.00       | 133.00               | 83.00       | 204.00               | 152.00 |
| 0.5984    | 15.200      |               | 115.00      | 65.00                | 133.00      | 83.00                |             |                      |        |
| 0.6024    |             |               | 15.300      | 115.00               | 65.00       | 133.00               | 83.00       |                      |        |
| 0.6063    | 15.400      |               | 115.00      | 65.00                | 133.00      | 83.00                |             |                      |        |
| 0.6094    |             |               | 39/64       | 15.480               | 115.00      | 65.00                | 133.00      | 83.00                | 204.00 |
| 0.6102    | 15.500      |               | 115.00      | 65.00                | 133.00      | 83.00                | 204.00      | 152.00               |        |
| 0.6142    |             |               | 15.600      | 115.00               | 65.00       | 133.00               | 83.00       |                      |        |
| 0.6181    | 15.700      |               | 115.00      | 65.00                | 133.00      | 83.00                |             |                      |        |
| 0.6220    |             |               | 15.800      | 115.00               | 65.00       | 133.00               | 83.00       |                      |        |
| 0.6248    | 15.870      |               | 115.00      | 65.00                | 133.00      | 83.00                | 204.00      | 152.00               |        |
| 0.6260    |             |               | 15.900      | 123.00               | 73.00       | 133.00               | 83.00       |                      |        |
| 0.6299    | 16.000      |               | 123.00      | 73.00                | 133.00      | 83.00                | 204.00      | 152.00               |        |
| 0.6378    |             |               | 16.200      | 123.00               | 73.00       |                      |             |                      |        |
| 0.6406    | 41/64       |               | 16.270      | 123.00               | 73.00       | 143.00               | 93.00       |                      |        |
| 0.6496    |             |               | 16.500      | 123.00               | 73.00       | 143.00               | 93.00       | 223.00               | 171.00 |
| 0.6563    | 21/32       |               | 16.670      | 123.00               | 73.00       | 143.00               | 93.00       |                      |        |
| 0.6654    |             |               | 16.900      | 123.00               | 73.00       | 223.00               | 171.00      |                      |        |
| 0.6693    | 17.000      |               | 123.00      | 73.00                | 143.00      | 93.00                | 223.00      | 171.00               |        |
| 0.6720    |             |               | 43/64       | 17.070               | 131.00      | 79.00                | 143.00      | 93.00                |        |
| 0.6874    | 11/16       |               | 17.460      | 131.00               | 79.00       | 143.00               | 93.00       |                      |        |
| 0.6890    |             |               | 17.500      | 131.00               | 79.00       | 143.00               | 93.00       | 223.00               | 171.00 |
| 0.7031    | 45/64       |               | 17.860      | 131.00               | 79.00       | 143.00               | 93.00       |                      |        |
| 0.7087    |             |               | 18.000      | 131.00               | 79.00       | 143.00               | 93.00       | 223.00               | 171.00 |
| 0.7189    | 23/32       |               | 18.260      | 131.00               | 79.00       | 153.00               | 101.00      |                      |        |
| 0.7283    |             |               | 18.500      | 131.00               | 79.00       | 153.00               | 101.00      | 244.00               | 190.00 |
| 0.7441    | 3/4         |               | 18.900      | 131.00               | 79.00       | 153.00               | 101.00      | 244.00               | 190.00 |
| 0.7480    |             |               | 19.000      | 131.00               | 79.00       | 153.00               | 101.00      | 244.00               | 190.00 |
| 0.7500    | 19.050      |               | 131.00      | 79.00                | 153.00      | 101.00               | 244.00      | 190.00               |        |
| 0.7579    |             |               | 19.250      | 131.00               | 79.00       | 153.00               | 101.00      |                      |        |
| 0.7598    | 19.300      |               | 131.00      | 79.00                | 153.00      | 101.00               |             |                      |        |
| 0.7656    |             |               | 49/64       | 19.446               | 131.00      | 79.00                | 153.00      | 101.00               |        |
| 0.7677    | 19.500      |               | 153.00      | 101.00               | 244.00      | 190.00               |             |                      |        |
| 0.7811    |             |               | 25/32       | 19.840               | 153.00      | 101.00               | 244.00      | 190.00               |        |
| 0.7874    | 20.000      |               | 153.00      | 101.00               | 244.00      | 190.00               |             |                      |        |

To order: Series number + mm size, example: 2479 15.300

## Drill Operating Parameters

| Drill Series | Material group                  | Hardness                     | SFM      | Feed Rate - IPR  |                  |                  |                   |                   |                   |
|--------------|---------------------------------|------------------------------|----------|------------------|------------------|------------------|-------------------|-------------------|-------------------|
|              |                                 |                              |          | 1/8 in. 3.170 mm | 1/4 in. 6.350 mm | 3/8 in. 9.520 mm | 1/2 in. 12.700 mm | 5/8 in. 15.870 mm | 3/4 in. 19.050 mm |
| 2477, 2479   | Common structural steels        | ≤100 Bhn                     | 475      | 0.0065           | 0.0100           | 0.0125           | 0.0160            | 0.0180            | 0.0200            |
|              |                                 | >100-260 Bhn                 | 395      | 0.0050           | 0.0080           | 0.0100           | 0.0125            | 0.0140            | 0.0160            |
|              | Free-cutting steels             | ≤24 Rc                       | 560      | 0.0080           | 0.0125           | 0.0160           | 0.0200            | 0.0220            | 0.0245            |
|              |                                 | >24-30 Rc                    | 475      | 0.0080           | 0.0125           | 0.0160           | 0.0200            | 0.0220            | 0.0245            |
|              | Unalloyed heat-treatable steels | ≤16 Rc                       | 425      | 0.0080           | 0.0125           | 0.0160           | 0.0200            | 0.0200            | 0.0220            |
|              |                                 | 16-24 Rc                     | 410      | 0.0065           | 0.0100           | 0.0125           | 0.0160            | 0.0180            | 0.0200            |
|              | Alloyed heat-treatable steels   | 24-30 Rc                     | 395      | 0.0065           | 0.0100           | 0.0125           | 0.0160            | 0.0180            | 0.0200            |
|              |                                 | >30-38 Rc                    | 345      | 0.0065           | 0.0100           | 0.0125           | 0.0160            | 0.0180            | 0.0200            |
|              | Unalloyed case hardened steels  | ≤230 Bhn                     | 475      | 0.0080           | 0.0125           | 0.0160           | 0.0200            | 0.0200            | 0.0220            |
|              |                                 | Alloyed case hardened steels | 24-30 Rc | 395              | 0.0065           | 0.0100           | 0.0125            | 0.0160            | 0.0180            |
|              | >30-38 Rc                       | 280                          | 0.0040   | 0.0065           | 0.0080           | 0.0100           | 0.0100            | 0.0110            |                   |
| 4044         | Common structural steels        | ≤100 Bhn                     | 460      | 0.0050           | 0.0080           | 0.0100           | 0.0125            | 0.0125            | 0.0140            |
|              |                                 | >100-260 Bhn                 | 395      | 0.0040           | 0.0065           | 0.0080           | 0.0100            | 0.0100            | 0.0110            |
|              | Free-cutting steels             | ≤24 Rc                       | 550      | 0.0065           | 0.0100           | 0.0125           | 0.0160            | 0.0160            | 0.0180            |
|              |                                 | >24-30 Rc                    | 480      | 0.0065           | 0.0100           | 0.0125           | 0.0160            | 0.0160            | 0.0180            |
|              | Unalloyed heat-treatable steels | ≤16 Rc                       | 415      | 0.0065           | 0.0100           | 0.0125           | 0.0160            | 0.0160            | 0.0180            |
|              |                                 | 16-24 Rc                     | 400      | 0.005            |                  |                  |                   |                   |                   |



- Straight shank
- 130° Form A Point

# Series 549 (5xD), 658 (5xD) GT 100 Drills

Parabolic flute form provides superior drill performance



**Series 549:** High speed steel, polished flutes; nitrided lands above 2.36mm dia.  
130° Form A point geometry reduces axial thrust requirements  
Recommended for free-cutting and unalloyed steels  
Parabolic flute form allows increased penetration rates; reduces peck cycles

**Series 658:** Premium M35 cobalt substrate for high heat applications  
TiN coated for increased tool life  
Recommended for alloyed and hardened steels  
Reduced heel design improves chip evacuation

| Dec. inch | Diameter    |                  | 549 OAL mm | 549 Flute Length mm | 658 OAL mm | 658 Flute Length mm |
|-----------|-------------|------------------|------------|---------------------|------------|---------------------|
|           | Fract. inch | Wire / letter mm |            |                     |            |                     |
| 0.0236    |             | 0.600            | 24.00      | 7.00                |            |                     |
| 0.0276    |             | 0.700            | 28.00      | 9.00                |            |                     |
| 0.0280    |             | 0.710            | 28.00      | 9.00                |            |                     |
| 0.0311    | 1/32        | 68               | 30.00      | 10.00               |            |                     |
| 0.0315    |             | 0.800            | 30.00      | 10.00               |            |                     |
| 0.0350    |             | 0.890            | 32.00      | 11.00               |            |                     |
| 0.0374    |             | 0.950            | 32.00      | 11.00               |            |                     |
| 0.0382    |             | 0.970            | 34.00      | 12.00               |            |                     |
| 0.0390    |             | 0.990            | 34.00      | 12.00               |            |                     |
| 0.0394    |             | 1.000            | 34.00      | 12.00               | 34.00      | 12.00               |
| 0.0402    |             | 1.020            | 34.00      | 12.00               | 34.00      | 12.00               |
| 0.0409    |             | 1.040            | 34.00      | 12.00               |            |                     |
| 0.0413    |             | 1.050            | 34.00      | 12.00               | 34.00      | 12.00               |
| 0.0421    |             | 1.070            | 36.00      | 14.00               | 36.00      | 14.00               |
| 0.0429    |             | 1.090            | 36.00      | 14.00               |            |                     |
| 0.0433    |             | 1.100            | 36.00      | 14.00               | 36.00      | 14.00               |
| 0.0445    |             | 1.130            |            |                     | 36.00      | 14.00               |
| 0.0453    |             | 1.150            | 36.00      | 14.00               | 36.00      | 14.00               |
| 0.0465    |             | 1.180            | 36.00      | 14.00               |            |                     |
| 0.0469    | 3/64        | 1.190            | 38.00      | 16.00               | 38.00      | 16.00               |
| 0.0472    |             | 1.200            | 38.00      | 16.00               | 38.00      | 16.00               |
| 0.0480    |             | 1.220            | 38.00      | 16.00               |            |                     |
| 0.0488    |             | 1.240            | 38.00      | 16.00               |            |                     |
| 0.0492    |             | 1.250            | 38.00      | 16.00               |            |                     |
| 0.0512    |             | 1.300            | 38.00      | 16.00               | 38.00      | 16.00               |
| 0.0520    |             | 1.320            | 38.00      | 16.00               | 38.00      | 16.00               |
| 0.0531    |             | 1.350            | 40.00      | 18.00               | 40.00      | 18.00               |
| 0.0551    |             | 1.400            | 40.00      | 18.00               | 40.00      | 18.00               |
| 0.0571    |             | 1.450            | 40.00      | 18.00               | 40.00      | 18.00               |
| 0.0575    |             | 1.460            | 40.00      | 18.00               |            |                     |
| 0.0591    |             | 1.500            | 40.00      | 18.00               | 40.00      | 18.00               |
| 0.0594    |             | 1.510            | 43.00      | 20.00               |            |                     |
| 0.0610    |             | 1.550            | 43.00      | 20.00               | 43.00      | 20.00               |
| 0.0614    |             | 1.560            | 43.00      | 20.00               |            |                     |
| 0.0618    |             | 1.570            | 43.00      | 20.00               |            |                     |
| 0.0622    |             | 1.580            | 43.00      | 20.00               |            |                     |
| 0.0626    | 1/16        | 1.590            | 43.00      | 20.00               | 43.00      | 20.00               |
| 0.0630    |             | 1.600            | 43.00      | 20.00               | 43.00      | 20.00               |
| 0.0634    |             | 1.610            | 43.00      | 20.00               | 43.00      | 20.00               |
| 0.0638    |             | 1.620            | 43.00      | 20.00               |            |                     |
| 0.0642    |             | 1.630            |            |                     | 43.00      | 20.00               |
| 0.0650    |             | 1.650            | 43.00      | 20.00               | 43.00      | 20.00               |
| 0.0654    |             | 1.660            | 43.00      | 20.00               |            |                     |
| 0.0657    |             | 1.670            | 43.00      | 20.00               |            |                     |
| 0.0661    |             | 1.680            | 43.00      | 20.00               |            |                     |
| 0.0665    |             | 1.690            | 43.00      | 20.00               |            |                     |
| 0.0669    |             | 1.700            | 43.00      | 20.00               | 43.00      | 20.00               |
| 0.0689    |             | 1.750            | 46.00      | 22.00               |            |                     |
| 0.0701    |             | 1.780            | 46.00      | 22.00               | 46.00      | 22.00               |
| 0.0709    |             | 1.800            | 46.00      | 22.00               | 46.00      | 22.00               |
| 0.0728    |             | 1.850            | 46.00      | 22.00               | 46.00      | 22.00               |
| 0.0732    |             | 1.860            | 46.00      | 22.00               |            |                     |
| 0.0748    |             | 1.900            | 46.00      | 22.00               | 46.00      | 22.00               |
| 0.0760    |             | 1.930            | 49.00      | 24.00               | 49.00      | 24.00               |
| 0.0768    |             | 1.950            | 49.00      | 24.00               | 49.00      | 24.00               |
| 0.0780    | 5/64        | 1.980            | 49.00      | 24.00               | 49.00      | 24.00               |
| 0.0783    |             | 1.990            | 49.00      | 24.00               | 49.00      | 24.00               |
| 0.0787    |             | 2.000            | 49.00      | 24.00               | 49.00      | 24.00               |
| 0.0795    |             | 2.020            | 49.00      | 24.00               |            |                     |
| 0.0807    |             | 2.050            | 49.00      | 24.00               | 49.00      | 24.00               |
| 0.0811    |             | 2.060            | 49.00      | 24.00               | 49.00      | 24.00               |
| 0.0819    |             | 2.080            | 49.00      | 24.00               | 49.00      | 24.00               |
| 0.0827    |             | 2.100            | 49.00      | 24.00               | 49.00      | 24.00               |
| 0.0846    |             | 2.150            | 53.00      | 27.00               | 53.00      | 27.00               |
| 0.0858    |             | 2.180            | 53.00      | 27.00               | 53.00      | 27.00               |
| 0.0866    |             | 2.200            | 53.00      | 27.00               | 53.00      | 27.00               |
| 0.0886    |             | 2.250            | 53.00      | 27.00               | 53.00      | 27.00               |
| 0.0890    |             | 2.260            | 53.00      | 27.00               | 53.00      | 27.00               |
| 0.0906    |             | 2.300            | 53.00      | 27.00               |            |                     |

| Dec. inch | Diameter    |                  | 549 OAL mm | 549 Flute Length mm | 658 OAL mm | 658 Flute Length mm |
|-----------|-------------|------------------|------------|---------------------|------------|---------------------|
|           | Fract. inch | Wire / letter mm |            |                     |            |                     |
| 0.0917    |             | 2.330            | 53.00      | 27.00               |            |                     |
| 0.0925    |             | 2.350            | 53.00      | 27.00               | 53.00      | 27.00               |
| 0.0933    |             | 2.370            | 57.00      | 30.00               | 57.00      | 30.00               |
| 0.0937    | 3/32        |                  | 2.380      | 57.00               | 57.00      | 30.00               |
| 0.0945    |             | 2.400            | 57.00      | 30.00               | 57.00      | 30.00               |
| 0.0953    |             | 2.420            | 57.00      | 30.00               |            |                     |
| 0.0961    |             | 2.440            | 57.00      | 30.00               | 57.00      | 30.00               |
| 0.0965    |             | 2.450            | 57.00      | 30.00               | 57.00      | 30.00               |
| 0.0976    |             | 2.480            | 57.00      | 30.00               |            |                     |
| 0.0980    |             | 2.490            | 57.00      | 30.00               | 57.00      | 30.00               |
| 0.0984    |             | 2.500            | 57.00      | 30.00               | 57.00      | 30.00               |
| 0.0996    |             | 2.530            | 57.00      | 30.00               | 57.00      | 30.00               |
| 0.1004    |             | 2.550            | 57.00      | 30.00               | 57.00      | 30.00               |
| 0.1016    |             | 2.580            | 57.00      | 30.00               | 57.00      | 30.00               |
| 0.1024    |             | 2.600            | 57.00      | 30.00               | 57.00      | 30.00               |
| 0.1039    |             | 2.640            | 57.00      | 30.00               | 57.00      | 30.00               |
| 0.1043    |             | 2.650            | 57.00      | 30.00               | 57.00      | 30.00               |
| 0.1063    |             | 2.700            | 61.00      | 33.00               | 61.00      | 33.00               |
| 0.1067    |             | 2.710            | 61.00      | 33.00               |            |                     |
| 0.1083    |             | 2.750            | 61.00      | 33.00               |            |                     |
| 0.1094    | 7/64        |                  | 2.780      | 61.00               | 61.00      | 33.00               |
| 0.1098    |             | 2.790            | 61.00      | 33.00               | 61.00      | 33.00               |
| 0.1102    |             | 2.800            | 61.00      | 33.00               | 61.00      | 33.00               |
| 0.1110    |             | 2.820            | 61.00      | 33.00               | 61.00      | 33.00               |
| 0.1122    |             | 2.850            | 61.00      | 33.00               |            |                     |
| 0.1130    |             | 2.870            | 61.00      | 33.00               | 61.00      | 33.00               |
| 0.1142    |             | 2.900            | 61.00      | 33.00               | 61.00      | 33.00               |
| 0.1161    |             | 2.950            | 61.00      | 33.00               | 61.00      | 33.00               |
| 0.1173    |             | 2.980            | 61.00      | 33.00               |            |                     |
| 0.1181    |             | 3.000            | 61.00      | 33.00               | 61.00      | 33.00               |
| 0.1201    |             | 3.050            | 65.00      | 36.00               | 65.00      | 36.00               |
| 0.1213    |             | 3.080            | 65.00      | 36.00               |            |                     |
| 0.1220    |             | 3.100            | 65.00      | 36.00               | 65.00      | 36.00               |
| 0.1240    |             | 3.150            | 65.00      | 36.00               |            |                     |
| 0.1248    | 1/8         |                  | 3.170      | 65.00               | 65.00      | 36.00               |
| 0.1260    |             | 3.200            | 65.00      | 36.00               | 65.00      | 36.00               |
| 0.1268    |             | 3.220            | 65.00      | 36.00               |            |                     |
| 0.1272    |             | 3.230            | 65.00      | 36.00               |            |                     |
| 0.1280    |             | 3.250            | 65.00      | 36.00               | 65.00      | 36.00               |
| 0.1283    |             | 3.260            | 65.00      | 36.00               | 65.00      | 36.00               |
| 0.1299    |             | 3.300            | 65.00      | 36.00               | 65.00      | 36.00               |
| 0.1319    |             | 3.350            | 65.00      | 36.00               |            |                     |
| 0.1339    |             | 3.400            | 70.00      | 39.00               | 70.00      | 39.00               |
| 0.1358    |             | 3.450            | 70.00      | 39.00               | 70.00      | 39.00               |
| 0.1378    |             | 3.500            | 70.00      | 39.00               | 70.00      | 39.00               |
| 0.1398    |             | 3.550            | 70.00      | 39.00               |            |                     |
| 0.1406    | 9/64        |                  | 3.570      | 70.00               | 70.00      | 39.00               |
| 0.1409    |             | 3.580            | 70.00      | 39.00               |            |                     |
| 0.1417    |             | 3.600            | 70.00      | 39.00               | 70.00      | 39.00               |
| 0.1441    |             | 3.660            | 70.00      | 39.00               | 70.00      | 39.00               |
| 0.1449    |             | 3.680            | 70.00      | 39.00               |            |                     |
| 0.1457    |             | 3.700            | 70.00      | 39.00               | 70.00      | 39.00               |
| 0.1469    |             | 3.730            | 70.00      | 39.00               | 70.00      | 39.00               |
| 0.1476    |             | 3.750            | 70.00      | 39.00               | 70.00      | 39.00               |
| 0.1496    |             | 3.800            | 75.00      | 43.00               | 75.00      | 43.00               |
| 0.1520    |             | 3.860            | 75.00      | 43.00               | 75.00      | 43.00               |
| 0.1524    |             | 3.870            | 75.00      | 43.00               |            |                     |
| 0.1535    |             | 3.900            | 75.00      | 43.00               | 75.00      | 43.00               |
| 0.1539    |             | 3.910            | 75.00      | 43.00               |            |                     |
| 0.1555    |             | 3.950            | 75.00      | 43.00               |            |                     |
| 0.1563    | 5/32        |                  | 3.970      | 75.00               | 75.00      | 43.00               |
| 0.1571    |             | 3.990            | 75.00      | 43.00               |            |                     |
| 0.1575    |             | 4.000            | 75.00      | 43.00               | 75.00      | 43.00               |
| 0.1591    |             | 4.040            | 75.00      | 43.00               | 75.00      | 43.00               |
| 0.1610    |             | 4.090            | 75.00      | 43.00               | 75.00      | 43.00               |
| 0.1614    |             | 4.100            | 75.00      | 43.00               | 75.00      | 43.00               |
| 0.1634    |             | 4.150            | 75.00      | 43.00               |            |                     |
| 0.1654    |             | 4.200            | 75.00      | 43.00               | 75.00      | 43.00               |
| 0.1661    |             | 4.220            | 75.00      | 43.00               | 75.00      | 43.00               |



# Drilling

| Dec. inch | Diameter    |               | 549 OAL mm | 549 Flute Length mm | 658 OAL mm | 658 Flute Length mm |
|-----------|-------------|---------------|------------|---------------------|------------|---------------------|
|           | Fract. inch | Wire / letter |            |                     |            |                     |
| 0.1673    |             |               | 75.00      | 43.00               | 75.00      | 43.00               |
| 0.1693    |             | 18            | 80.00      | 47.00               | 80.00      | 47.00               |
| 0.1720    | 11/64       |               | 80.00      | 47.00               | 80.00      | 47.00               |
| 0.1728    |             | 17            | 80.00      | 47.00               |            |                     |
| 0.1732    |             |               | 80.00      | 47.00               | 80.00      | 47.00               |
| 0.1752    |             |               | 80.00      | 47.00               |            |                     |
| 0.1772    |             | 16            | 80.00      | 47.00               | 80.00      | 47.00               |
| 0.1791    |             |               | 80.00      | 47.00               |            |                     |
| 0.1799    |             | 15            | 80.00      | 47.00               | 80.00      | 47.00               |
| 0.1811    |             |               | 80.00      | 47.00               | 80.00      | 47.00               |
| 0.1819    |             | 14            | 80.00      | 47.00               |            |                     |
| 0.1831    |             |               | 80.00      | 47.00               |            |                     |
| 0.1850    |             | 13            | 80.00      | 47.00               | 80.00      | 47.00               |
| 0.1870    |             |               | 80.00      | 47.00               |            |                     |
| 0.1874    | 3/16        |               | 86.00      | 52.00               | 86.00      | 52.00               |
| 0.1890    |             | 12            | 86.00      | 52.00               | 86.00      | 52.00               |
| 0.1909    |             | 11            | 86.00      | 52.00               | 86.00      | 52.00               |
| 0.1929    |             |               | 86.00      | 52.00               | 86.00      | 52.00               |
| 0.1937    |             | 10            | 86.00      | 52.00               | 86.00      | 52.00               |
| 0.1949    |             |               | 86.00      | 52.00               |            |                     |
| 0.1961    |             | 9             | 86.00      | 52.00               | 86.00      | 52.00               |
| 0.1969    |             |               | 86.00      | 52.00               | 86.00      | 52.00               |
| 0.1988    |             |               | 86.00      | 52.00               |            |                     |
| 0.1992    |             | 8             | 86.00      | 52.00               |            |                     |
| 0.2008    |             |               | 86.00      | 52.00               | 86.00      | 52.00               |
| 0.2012    |             | 7             | 86.00      | 52.00               |            |                     |
| 0.2028    |             |               | 86.00      | 52.00               |            |                     |
| 0.2031    | 13/64       |               | 86.00      | 52.00               | 86.00      | 52.00               |
| 0.2039    |             | 6             | 86.00      | 52.00               |            |                     |
| 0.2047    |             |               | 86.00      | 52.00               | 86.00      | 52.00               |
| 0.2055    |             | 5             | 86.00      | 52.00               |            |                     |
| 0.2067    |             |               | 86.00      | 52.00               |            |                     |
| 0.2087    |             |               | 86.00      | 52.00               | 86.00      | 52.00               |
| 0.2091    |             | 4             | 93.00      | 57.00               |            |                     |
| 0.2106    |             |               | 93.00      | 57.00               |            |                     |
| 0.2126    |             |               | 93.00      | 57.00               | 93.00      | 57.00               |
| 0.2130    |             | 3             | 93.00      | 57.00               |            |                     |
| 0.2146    |             |               | 93.00      | 57.00               |            |                     |
| 0.2165    |             |               | 93.00      | 57.00               | 93.00      | 57.00               |
| 0.2189    | 7/32        |               | 93.00      | 57.00               | 93.00      | 57.00               |
| 0.2205    |             |               | 93.00      | 57.00               | 93.00      | 57.00               |
| 0.2209    |             | 2             | 93.00      | 57.00               | 93.00      | 57.00               |
| 0.2224    |             |               | 93.00      | 57.00               |            |                     |
| 0.2244    |             |               | 93.00      | 57.00               | 93.00      | 57.00               |
| 0.2264    |             |               | 93.00      | 57.00               |            |                     |
| 0.2280    |             | 1             | 93.00      | 57.00               |            |                     |
| 0.2283    |             |               | 93.00      | 57.00               | 93.00      | 57.00               |
| 0.2303    |             |               | 93.00      | 57.00               |            |                     |
| 0.2323    |             |               | 93.00      | 57.00               | 93.00      | 57.00               |
| 0.2339    |             | A             | 93.00      | 57.00               |            |                     |
| 0.2343    | 15/64       |               | 93.00      | 57.00               | 93.00      | 57.00               |
| 0.2362    |             |               | 93.00      | 57.00               | 93.00      | 57.00               |
| 0.2378    |             | B             | 101.00     | 63.00               |            |                     |
| 0.2402    |             |               | 101.00     | 63.00               | 101.00     | 63.00               |
| 0.2421    |             | C             | 101.00     | 63.00               | 101.00     | 63.00               |
| 0.2441    |             |               | 101.00     | 63.00               | 101.00     | 63.00               |
| 0.2461    |             | D             | 101.00     | 63.00               |            |                     |
| 0.2480    |             |               | 101.00     | 63.00               | 101.00     | 63.00               |
| 0.2500    | 1/4         | E             | 101.00     | 63.00               | 101.00     | 63.00               |
| 0.2520    |             |               | 101.00     | 63.00               | 101.00     | 63.00               |
| 0.2559    |             |               | 101.00     | 63.00               | 101.00     | 63.00               |
| 0.2571    |             | F             | 101.00     | 63.00               | 101.00     | 63.00               |
| 0.2598    |             |               | 101.00     | 63.00               | 101.00     | 63.00               |
| 0.2610    |             | G             | 101.00     | 63.00               |            |                     |
| 0.2638    |             |               | 101.00     | 63.00               | 101.00     | 63.00               |
| 0.2657    | 17/64       | H             | 109.00     | 69.00               | 109.00     | 69.00               |
| 0.2677    |             |               | 109.00     | 69.00               | 109.00     | 69.00               |
| 0.2689    |             |               | 109.00     | 69.00               |            |                     |
| 0.2717    |             | I             | 109.00     | 69.00               | 109.00     | 69.00               |
| 0.2756    |             |               | 109.00     | 69.00               | 109.00     | 69.00               |
| 0.2768    |             | J             | 109.00     | 69.00               |            |                     |
| 0.2772    |             |               | 109.00     | 69.00               |            |                     |
| 0.2776    |             |               | 109.00     | 69.00               |            |                     |
| 0.2795    |             |               | 109.00     | 69.00               | 109.00     | 69.00               |
| 0.2811    | 9/32        | K             | 109.00     | 69.00               | 109.00     | 69.00               |
| 0.2835    |             |               | 109.00     | 69.00               | 109.00     | 69.00               |
| 0.2854    |             |               | 109.00     | 69.00               |            |                     |
| 0.2874    |             |               | 109.00     | 69.00               | 109.00     | 69.00               |
| 0.2902    |             | L             | 109.00     | 69.00               |            |                     |
| 0.2913    |             |               | 109.00     | 69.00               | 109.00     | 69.00               |
| 0.2949    |             | M             | 109.00     | 69.00               |            |                     |
| 0.2953    |             |               | 109.00     | 69.00               | 109.00     | 69.00               |
| 0.2969    | 19/64       |               | 117.00     | 75.00               |            |                     |
| 0.2992    |             |               | 117.00     | 75.00               | 117.00     | 75.00               |
| 0.3020    |             | N             | 117.00     | 75.00               |            |                     |
| 0.3031    |             |               | 117.00     | 75.00               | 117.00     | 75.00               |
| 0.3051    |             |               | 117.00     | 75.00               |            |                     |
| 0.3071    |             |               | 117.00     | 75.00               | 117.00     | 75.00               |
| 0.3110    |             |               | 117.00     | 75.00               | 117.00     | 75.00               |
| 0.3126    | 5/16        |               | 117.00     | 75.00               | 117.00     | 75.00               |
| 0.3150    |             |               | 117.00     | 75.00               | 117.00     | 75.00               |

| Dec. inch | Diameter    |               | 549 OAL mm | 549 Flute Length mm | 658 OAL mm | 658 Flute Length mm |
|-----------|-------------|---------------|------------|---------------------|------------|---------------------|
|           | Fract. inch | Wire / letter |            |                     |            |                     |
| 0.3161    |             | O             | 8.030      | 117.00              | 75.00      |                     |
| 0.3189    |             |               | 8.100      | 117.00              | 75.00      | 117.00 75.00        |
| 0.3228    |             | P             | 8.200      | 117.00              | 75.00      | 117.00 75.00        |
| 0.3248    |             |               | 8.250      | 117.00              | 75.00      |                     |
| 0.3268    |             |               | 8.300      | 117.00              | 75.00      | 117.00 75.00        |
| 0.3280    | 21/64       |               | 8.330      | 117.00              | 75.00      |                     |
| 0.3307    |             |               | 8.400      | 117.00              | 75.00      | 117.00 75.00        |
| 0.3319    |             | Q             | 8.430      | 117.00              | 75.00      |                     |
| 0.3346    |             |               | 8.500      | 117.00              | 75.00      | 117.00 75.00        |
| 0.3386    |             |               | 8.600      | 125.00              | 81.00      | 125.00 81.00        |
| 0.3390    |             | R             | 8.610      | 125.00              | 81.00      |                     |
| 0.3425    |             |               | 8.700      | 125.00              | 81.00      | 125.00 81.00        |
| 0.3437    | 11/32       |               | 8.730      | 125.00              | 81.00      | 125.00 81.00        |
| 0.3445    |             |               | 8.750      | 125.00              | 81.00      | 125.00 81.00        |
| 0.3465    |             |               | 8.800      | 125.00              | 81.00      | 125.00 81.00        |
| 0.3480    |             | S             | 8.840      | 125.00              | 81.00      |                     |
| 0.3504    |             |               | 8.900      | 125.00              | 81.00      | 125.00 81.00        |
| 0.3543    |             |               | 9.000      | 125.00              | 81.00      | 125.00 81.00        |
| 0.3579    |             | T             | 9.090      | 125.00              | 81.00      |                     |
| 0.3583    |             |               | 9.100      | 125.00              | 81.00      |                     |
| 0.3594    | 23/64       |               | 9.130      | 125.00              | 81.00      | 125.00 81.00        |
| 0.3622    |             |               | 9.200      | 125.00              | 81.00      | 125.00 81.00        |
| 0.3642    |             |               | 9.250      | 125.00              | 81.00      |                     |
| 0.3661    |             |               | 9.300      | 125.00              | 81.00      | 125.00 81.00        |
| 0.3677    |             | U             | 9.340      | 125.00              | 81.00      |                     |
| 0.3681    |             |               | 9.350      | 125.00              | 81.00      |                     |
| 0.3701    |             |               | 9.400      | 125.00              | 81.00      |                     |
| 0.3740    |             |               | 9.500      | 125.00              | 81.00      | 125.00 81.00        |
| 0.3748    | 3/8         |               | 9.520      | 133.00              | 87.00      | 133.00 87.00        |
| 0.3772    |             | V             | 9.580      | 133.00              | 87.00      |                     |
| 0.3780    |             |               | 9.600      | 133.00              | 87.00      | 133.00 87.00        |
| 0.3819    |             |               | 9.700      | 133.00              | 87.00      |                     |
| 0.3839    |             |               | 9.750      | 133.00              | 87.00      |                     |
| 0.3858    |             | W             | 9.800      | 133.00              | 87.00      | 133.00 87.00        |
| 0.3898    |             |               | 9.900      | 133.00              | 87.00      | 133.00 87.00        |
| 0.3906    | 25/64       |               | 9.920      | 133.00              | 87.00      | 133.00 87.00        |
| 0.3937    |             |               | 10.000     | 133.00              | 87.00      | 133.00 87.00        |
| 0.3969    |             | X             | 10.080     | 133.00              | 87.00      |                     |
| 0.3976    |             |               | 10.100     | 133.00              | 87.00      | 133.00 87.00        |
| 0.4016    |             |               | 10.200     | 133.00              | 87.00      | 133.00 87.00        |
| 0.4039    |             | Y             | 10.260     | 133.00              | 87.00      |                     |
| 0.4055    |             |               | 10.300     | 133.00              | 87.00      | 133.00 87.00        |
| 0.4063    | 13/32       |               | 10.320     | 133.00              | 87.00      | 133.00 87.00        |
| 0.4094    |             |               | 10.400     | 133.00              | 87.00      |                     |
| 0.4130    |             | Z             | 10.490     | 133.00              | 87.00      |                     |
| 0.4134    |             |               | 10.500     | 133.00              | 87.00      | 133.00 87.00        |
| 0.4173    |             |               | 10.600     | 133.00              | 87.00      |                     |
| 0.4213    |             |               | 10.700     | 142.00              | 94.00      |                     |
| 0.4220    | 27/64       |               | 10.720     | 142.00              | 94.00      | 142.00 94.00        |
| 0.4232    |             |               | 10.750     | 142.00              | 94.00      |                     |
| 0.4252    |             |               | 10.800     | 142.00              | 94.00      | 142.00 94.00        |
| 0.4291    |             |               | 10.900     | 142.00              | 94.00      |                     |
| 0.4331    |             |               | 11.000     | 142.00              | 94.00      | 142.00 94.00        |
| 0.4370    |             |               | 11.100     | 142.00              | 94.00      |                     |
| 0.4374    | 7/16        |               | 11.110     | 142.00              | 94.00      | 142.00 94.00        |
| 0.4409    |             |               | 11.200     | 142.00              | 94.00      | 142.00 94.00        |
| 0.4449    |             |               | 11.300     | 142.00              | 94.00      |                     |
| 0.4488    |             |               | 11.400     | 142.00              | 94.00      | 142.00 94.00        |
| 0.4528    |             |               | 11.500     | 142.00              | 94.00      |                     |
| 0.4531    | 29/64       |               | 11.510     | 142.00              | 94.00      |                     |
| 0.4567    |             |               | 11.600     | 142.00              | 94.00      |                     |
| 0.4606    |             |               | 11.700     | 142.00              | 94.00      | 142.00 94.00        |
| 0.4626    |             |               | 11.750     | 142.00              | 94.00      |                     |
| 0.4646    |             |               | 11.800     | 142.00              | 94.00      |                     |
| 0.4685    |             |               | 11.900     | 151.00              | 101.00     |                     |
| 0.4689    | 15/32       |               | 11.910     | 151.00              | 101.00     | 151.00 101.00       |
| 0.4724    |             |               | 12.000     | 151.00              | 101.00     | 151.00 101.00       |
| 0.4764    |             |               | 12.100     | 151.00              | 101.00     |                     |
| 0.4783    |             |               | 12.150     | 151.00              | 101.00     |                     |
| 0.4803    |             |               | 12.200     | 151.00              | 101.00     |                     |
| 0.4843    | 31/64       |               | 12.300     | 151.00              | 101.00     |                     |
| 0.4921    |             |               | 12.500     | 151.00              | 101.00     | 151.00 101.00       |
| 0.5000    | 1/2         |               | 12.700     | 151.00              | 101.00     |                     |
| 0.5020    |             |               | 12.750     | 151.00              | 101.00     |                     |
| 0.5039    |             |               | 12.800     | 151.00              | 101.00     |                     |
| 0.5079    |             |               | 12.900     | 151.00              | 101.00     |                     |
| 0.5118    |             |               | 13.000     | 151.00              | 101.00     | 151.00 101.00       |
| 0.5157    | 33/64       |               | 13.100     | 151.00              | 101.00     |                     |
| 0.5197    |             |               | 13.200     | 151.00              | 101.00     |                     |
| 0.5311    | 17/32       |               | 13.490     | 160.00              | 108.00     |                     |
| 0.5315    |             |               | 13.500     | 160.00              | 108.00     |                     |
| 0.5354    |             |               | 13.600     | 160.00              | 108.00     |                     |
| 0.5394    |             |               | 13.700     | 160.00              | 108.00     |                     |
| 0.5469    | 35/64       |               | 13.890     | 160.00              | 108.00     |                     |
| 0.5512    |             |               | 14.000     | 160.00              | 108.00     |                     |
| 0.5626    | 9/16        |               | 14.290     | 169.00              | 114.00     |                     |
| 0.5669    |             |               | 14.400     | 169.00              | 114.00     |                     |
| 0.5709    |             |               | 14.500     | 169.00              | 114.00     |                     |
| 0.5780    | 37/64       |               | 14.680     | 169.00              | 114.00     |                     |
| 0.5906    |             |               | 15.000     | 169.00              | 114.00     |                     |
| 0.5937    | 19/32       |               | 15.080     | 178.00              | 120.00     |                     |
| 0.6094    | 39/64       |               | 15.480     | 178.00              | 120.00     |                     |
| 0.6102    |             |               | 15.500     | 178.00              | 120.00     |                     |
| 0.6201    |             |               | 15.750     | 178.00              | 120.00     |                     |
| 0.6248    | 5/8         |               | 15.870     | 178.00              | 120.00     |                     |
| 0.6299    |             |               | 16.000     | 178.00              | 120.00     |                     |



## Drill Operating Parameters

| Drill Series | Material group                  | Hardness                       | SFM       | Feed Rate - IPR      |                     |                     |                     |                      |                      |
|--------------|---------------------------------|--------------------------------|-----------|----------------------|---------------------|---------------------|---------------------|----------------------|----------------------|
|              |                                 |                                |           | 1/16 in.<br>1.590 mm | 1/8 in.<br>3.170 mm | 1/4 in.<br>6.350 mm | 3/8 in.<br>9.520 mm | 1/2 in.<br>12.700 mm | 5/8 in.<br>15.870 mm |
| 549          | Common structural steels        | ≤100 Bhn<br>>100-260 Bhn       | 100<br>80 | 0.0017<br>0.0015     | 0.0050<br>0.0040    | 0.0080<br>0.0065    | 0.0100<br>0.0080    | 0.0125<br>0.0100     | 0.0125<br>0.0100     |
|              | Free-cutting steels             | ≤24 Rc<br>>24-30 Rc            | 100<br>80 | 0.0017<br>0.0015     | 0.0050<br>0.0040    | 0.0080<br>0.0065    | 0.0100<br>0.0080    | 0.0125<br>0.0100     | 0.0125<br>0.0100     |
|              | Unalloyed heat-treatable steels | ≤16 Rc<br>16-24 Rc<br>24-30 Rc | 100<br>80 | 0.0015<br>0.0015     | 0.0040<br>0.0040    | 0.0065<br>0.0065    | 0.0080<br>0.0080    | 0.0100<br>0.0100     | 0.0100<br>0.0100     |
|              | Alloyed heat-treatable steels   | 24-30 Rc<br>>30-38 Rc          |           |                      |                     |                     |                     |                      |                      |
|              | Unalloyed case hardened steels  | ≤230 Bhn                       | 100       | 0.0017               | 0.0050              | 0.0080              | 0.0100              | 0.0125               | 0.0125               |
|              | Alloyed case hardened steels    | 24-30 Rc<br>>30-38 Rc          |           |                      |                     |                     |                     |                      |                      |
|              | Common structural steels        | ≤100 Bhn<br>>100-260 Bhn       |           |                      |                     |                     |                     |                      |                      |
|              | Free-cutting steels             | ≤24 Rc<br>>24-30 Rc            | 115       | 0.0015               | 0.0040              | 0.0065              | 0.0080              | 0.0100               |                      |
| 658          | Unalloyed heat-treatable steels | ≤16 Rc<br>16-24 Rc<br>24-30 Rc | 100<br>55 | 0.0015<br>0.0012     | 0.0040<br>0.0030    | 0.0065<br>0.0050    | 0.0080<br>0.0065    | 0.0100<br>0.0080     |                      |
|              | Alloyed heat-treatable steels   | 24-30 Rc<br>>30-38 Rc          | 70<br>55  | 0.0012<br>0.0010     | 0.0030<br>0.0025    | 0.0050<br>0.0040    | 0.0065<br>0.0050    | 0.0080<br>0.0065     |                      |
|              | Unalloyed case hardened steels  | ≤230 Bhn                       |           |                      |                     |                     |                     |                      |                      |
|              | Alloyed case hardened steels    | 24-30 Rc<br>>30-38 Rc          | 65<br>45  | 0.0012<br>0.0010     | 0.0030<br>0.0025    | 0.0050<br>0.0040    | 0.0065<br>0.0050    | 0.0080<br>0.0065     |                      |

Shank Diameter info, Series 658, 549:  
Cutting diameter = shank diameter

## Carbide Drill Alternatives:

### Micro Drills:

**Series 6400** - Carbide micro drill, 4xD drilling depth, reinforced straight shank, Super-A™ coated, diameters from 0.80 - 3.0mm.

\* **Series 6401** - Carbide micro drill, 7xD drilling depth, Super-A™ coated, diameters from 0.80 - 3.0mm.

**Series 6408\*** - Coolant fed carbide micro drill, 8xD drilling depth, reinforced straight shank, TiAlN coated, dia. from 1.4 - 3.0mm.

**Series 6412** - Coolant fed carbide micro drill, 15xD drilling depth, reinforced straight shank, TiAlN coated, dia. from 1.4 - 3.0mm.



**Series 609** - GS 200 U three-flute high-precision carbide drill, 150° point, 5xD drilling depth, external coolant, TiN coated, dia. from 3.0 - 20.0mm



**Series 5510** - RT 100 U high penetration carbide drill, 140° point, 3xD, reinforced str. shank, coolant fed, FIREX® coated, dia. from 3.0 - 20.0mm

\* **Series 5511\*** - RT 100 U high penetration carbide drill, 140° point, 5xD drilling depth, coolant fed, FIREX® coated, dia. range from 3.0 - 20.0mm.

**Series 5512** - RT 100 U high penetration carbide drill, 140° point, 7xD drilling depth, coolant fed, FIREX® coated, dia. range from 3.0 - 20.0mm.

### Deep Hole Drills:



**Series 6511 (20xD)**  
**Series 6512 (25xD)**  
**Series 6513\* (30xD)**  
**Series 6514 (40xD)**  
Carbide RT 100 T style drill, high penetration, coolant through, reinforced straight shank, TiAlN coated. Diameters from 3.00-14.00 mm.

### Larger Diameter Drills:



**Series 4112 (insert)**  
**Series 4107 (3xD holder)**  
**Series 4108 (5xD holder)**  
**Series 4109 (7xD holder)**

**Series 1047 (insert)**  
**Series 5242 (3xD holder)**  
**Series 5243 (5xD holder)**  
**Series 5248 (7xD holder)**  
TiN coated carbide insert for HT800WP\* or RT800 WP style holders. Insert diameters from 11.0-25.5 mm (series 4112), or 16.0-40.5 mm (series 2485).

## HSS/Cobalt Drill Alternatives:

### GT 500 Cobalt Drills:



**Series 515** - Cobalt GT 500 DZ style drill, screw machine length, straight shank, 130° cone-relief point, FIREX® coated, dia. range from 1.0-14.0mm.

**Series 530** - Cobalt GT 500 DZ style drill, jobber length, straight shank, 130° cone-relief point, FIREX® coated, dia. range from 1.0-14.0mm.

### GT Style Drills:



\* **Series 329** - Heavy duty, screw machine length 3xD cobalt drill, 130° point, straight shank, oxidized, cutting diameters from 0.4 - 25.5 mm.

**Series 622\*** - GT100 deep hole cobalt drill, jobber length, 130° point, straight shank, nitrided lands, diameters from 1.0 - 13 mm.



# Milling

## RF 100 Variable Helix End Mills

Solid carbide, RF 100 U / F styles well-suited to tackle steels  
Variable helix dampens vibration, provides improved surface finish quality



Series 3082 - RF 100 U/HF

| Cut Diameter | Shank Diameter | Length of Cut | OAL   | No. Flutes | Order Code |
|--------------|----------------|---------------|-------|------------|------------|
| 1/4          | 1/4            | 3/4           | 2 1/2 | 4          | 6.350      |
| 5/16         | 5/16           | 13/16         | 2 1/2 | 4          | 7.940      |
| 3/8          | 3/8            | 1             | 2 1/2 | 4          | 9.520      |
| 1/2          | 1/2            | 1 1/4         | 3 1/2 | 4          | 12.700     |
| 5/8          | 5/8            | 1 1/4         | 3 1/2 | 4          | 15.870     |
| 3/4          | 3/4            | 1 1/2         | 4     | 4          | 19.050     |
| 1            | 1              | 1 1/2         | 4     | 4          | 25.400     |



Series 3078 - RF 100 F

| Cut Diameter | Shank Diameter | Length of Cut | OAL   | No. Flutes | Order Code |
|--------------|----------------|---------------|-------|------------|------------|
| 3/16         | 3/16           | 5/8           | 2     | 4          | 4.760      |
| 1/4          | 1/4            | 3/4           | 2 1/2 | 4          | 6.350      |
| 5/16         | 5/16           | 13/16         | 2 1/2 | 4          | 7.940      |
| 3/8          | 3/8            | 1             | 2 1/2 | 4          | 9.520      |
| 1/2          | 1/2            | 1 1/4         | 3 1/2 | 4          | 12.700     |
| 5/8          | 5/8            | 1 1/4         | 3 1/2 | 4          | 15.870     |
| 3/4          | 3/4            | 1 1/2         | 4     | 4          | 19.050     |



Series 3113 - RF 100 U (stub length)

| Cut Diameter | Shank Diameter | Length of Cut | OAL   | No. Flutes | Order Code |
|--------------|----------------|---------------|-------|------------|------------|
| 3/16         | 3/16           | 3/8           | 2     | 4          | 4.760      |
| 1/4          | 1/4            | 1/2           | 2     | 4          | 6.350      |
| 5/16         | 5/16           | 1/2           | 2     | 4          | 7.940      |
| 3/8          | 3/8            | 5/8           | 2     | 4          | 9.520      |
| 1/2          | 1/2            | 5/8           | 2 1/2 | 4          | 12.700     |
| 5/8          | 5/8            | 3/4           | 3     | 4          | 15.870     |
| 3/4          | 3/4            | 1             | 3     | 4          | 19.050     |
| 1            | 1              | 1             | 3     | 4          | 25.400     |



Series 3114 - RF 100 U (standard length)

| Cut Diameter | Shank Diameter | Length of Cut | OAL   | No. Flutes | Order Code |
|--------------|----------------|---------------|-------|------------|------------|
| 3/16         | 3/16           | 5/8           | 2     | 4          | 4.760      |
| 1/4          | 1/4            | 3/4           | 2 1/2 | 4          | 6.350      |
| 5/16         | 5/16           | 13/16         | 2 1/2 | 4          | 7.940      |
| 3/8          | 3/8            | 1             | 2 1/2 | 4          | 9.520      |
| 7/16         | 7/16           | 1             | 2 3/4 | 4          | 11.110     |
| 1/2          | 1/2            | 1             | 3     | 4          | 12.700     |
| 5/8          | 5/8            | 1 1/4         | 3 1/2 | 4          | 15.870     |
| 3/4          | 3/4            | 1 1/2         | 4     | 4          | 19.050     |
| 1            | 1              | 1 1/2         | 4     | 4          | 25.400     |

### Roughing end mill features:

- Coarse truncated tooth profile for increased tool life
- Superior surface finish vs. conventional knuckle-type roughers
- FIREX® coating - outstanding heat and wear resistance
- 30°/32° variable helix design
- Weldon flats on diameters from 1/2" to 1.0"

### 4-flute multi-purpose end mill features:

- Designed for free-cutting materials <30 HRC
- Suitable for roughing and finishing, slot or periphery milling
- Chamfer edge protection for longer tool life
- FIREX® coating - extremely heat and wear resistant
- Weldon flats on diameters from 1/2" to 1.0"
- 40°/42° variable helix design
- Metric sizes available in series 3629

### Universal style end mill features:

- 4-flute design for excellent chip evacuation
- Low radial rake and radial relief for cutting edge strength
- 35°/38° variable helix design
- FIREX® coating - outstanding heat and wear resistance
- Also available in long length series
- Metric sizes available in series 3736



Detailed information and additional end mill options can be found in our RF 100 or full-line end mill catalogs, or by contacting Guhring Tech Support at (800) 776-6170. Catalog PDFs are available on our website [www.guhring.com](http://www.guhring.com).



# Reconditioning

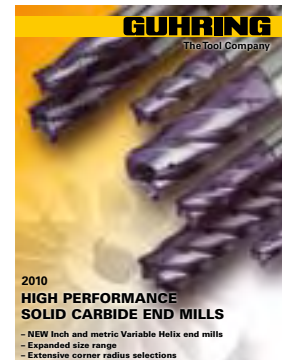
Guhring can restore used standard and special carbide and PCD drills, step drills, reamers, and end mills to their original factory quality, condition and performance. We also recoat in the same facility that we recondition, allowing for quicker turn-around and excellent quality control.



- High-precision CNC grinding machines
- Personalized customer service
- Reconditioning and coating at one facility
- Two U.S. locations; quick turnaround



*For product details and the full offering of Guhring high-performance cutting tools, please see our full-line drill, tap and end mill catalogs:*



**Don't forget to visit the newly renovated [www.guhring.com](http://www.guhring.com)**

## GUHRING

[www.guhring.com](http://www.guhring.com)

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