










# SELECTION GUIDE

# SPADE DRILLS

## SPADE DRILL INSERTS

| ITEM             | MODEL   | DESCRIPTION  | SIZE       |             | Non-<br>alloyed<br>Steels,<br>Free<br>Machining<br>Steels | Carbon Steels      |                    | Alloy Steels       |                    | High Alloyed steels |                    | Structural Steels  |                    | Tool Steels        |                    | Stainless Steels   |                    | Cast Iron          |                    | Aluminum          |        | Copper Alloys |   |
|------------------|---|--|------------|-------------|---|--------------------|--------------------|--------------------|--------------------|---------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|-------------------|--------|---------------|---|
|                  |   |  | MIN        | MAX         |   | ~HRc24<br>(~HB250) | ~HRc28<br>(~HB275) | HRc28~<br>(HB275~) | ~HRc28<br>(~HB275) | HRc28~<br>(HB275~)  | ~HRc37<br>(~HB350) | HRc37~<br>(HB350~) | ~HRc24<br>(~HB250) | HRc24~<br>(HB250~) | ~HRc13<br>(~HB200) | HRc13~<br>(HB200~) | ~HRc28<br>(~HB275) | ~HRc19<br>(~HB220) | HRc19~<br>(HB220~) | ~HRc8<br>(~HB180) | ~HB110 |               |   |
|                  |   |  |            |             |   |                    |                    |                    |                    |                     |                    |                    |                    |                    |                    |                    |                    |                    |                    |                   |        |               |   |
| SERIES 1~8       |    | SPADE DRILL INSERTS - HSS M4                       | .7031 (#1) | 4.5000 (#8) | ○   | ○                  | ○                  | ○                  |                    | ○                   |                    | ○                  | ○                  |                    |                    | ⊙                  | ⊙                  | ○                  | ⊙                  | ⊙                 |        |               |   |
| SERIES Y,Z,0,1~8 |    | SPADE DRILL INSERTS - SUPER HSS T15                | .3740 (#Y) | 4.5000 (#8) | ⊙   | ⊙                  | ⊙                  | ⊙                  | ○                  | ○                   | ○                  | ⊙                  | ⊙                  | ○                  | ○                  | ○                  | ○                  | ⊙                  | ○                  | ○                 | ○      | ○             | ○ |
| SERIES Y,Z,0,1,2 |    | SPADE DRILL INSERTS - PREMIUM HSS M48              | .3740 (#Y) | 1.3780 (#2) | ⊙   | ⊙                  | ⊙                  | ⊙                  | ⊙                  | ⊙                   | ⊙                  | ⊙                  | ⊙                  | ⊙                  | ⊙                  | ○                  | ○                  | ⊙                  | ○                  | ○                 | ○      | ○             | ○ |
| SERIES Y,Z,0,1~3 |    | CARBIDE BLADE INSERTS-C2(K20)                      | .3740 (#Y) | 1.8750 (#3) | ○   | ○                  | ○                  | ○                  | ○                  | ⊙                   | ⊙                  | ○                  | ○                  | ○                  | ○                  | ⊙                  | ○                  | ○                  | ○                  | ⊙                 | ⊙      |               |   |
| SERIES Y,Z,0,1~3 |   | CARBIDE BLADE INSERTS-C5(P40)                      | .3740 (#Y) | 1.8750 (#3) | ⊙   | ⊙                  | ⊙                  | ⊙                  | ⊙                  | ⊙                   | ⊙                  | ⊙                  | ⊙                  | ⊙                  | ⊙                  | ○                  | ○                  | ○                  | ○                  | ○                 | ○      | ○             | ○ |
| SERIES Y,Z,0,1~2 |  | CARBIDE BLADE INSERTS-C3(K10)                      | .3740 (#Y) | 1.3780 (#2) |   |                    |                    |                    |                    |                     |                    |                    |                    |                    |                    |                    |                    | ⊙                  | ⊙                  |                   |        |               |   |
| SERIES Y,Z,0,1~8 |  | SM-POINT SPADE DRILL INSERTS - SUPER COBALT(T15)   | .3740 (#Y) | 4.5000 (#8) | ⊙   | ⊙                  | ⊙                  | ⊙                  | ○                  | ○                   | ○                  | ⊙                  | ⊙                  | ○                  | ○                  | ○                  | ○                  | ⊙                  | ○                  | ○                 | ○      | ○             | ○ |
| SERIES Y,Z,0,1~3 |  | SM-POINT SPADE DRILL INSERTS - CARBIDE(C5)         | .3740 (#Y) | 1.8750 (#3) | ⊙   | ⊙                  | ⊙                  | ⊙                  | ⊙                  | ⊙                   | ⊙                  | ⊙                  | ⊙                  | ⊙                  | ⊙                  | ○                  | ○                  | ○                  | ○                  | ○                 | ○      | ○             | ○ |
| SERIES Y,Z,0,1,2 |  | SPADE DRILL FLAT BOTTOM INSERTS - SUPER COBALT T15 | .3750 (#Y) | 1.3750 (#2) | ⊙   | ⊙                  | ⊙                  | ⊙                  | ○                  | ○                   | ○                  | ⊙                  | ⊙                  | ○                  | ○                  | ○                  | ○                  | ⊙                  | ○                  | ○                 | ○      | ○             | ○ |

⊙ : Excellent  
○ : Good

## SPADE BLADE INSERTS HORSEPOWER CONSUMPTION RATE

### Metal Removal Rates (MRR)

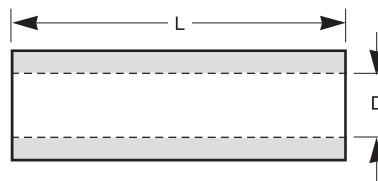
Example: 1.50 Dia. Drill @ 6.412 I.P.M.

### Volume of Cylinder Method: $D^2 \times .785 \times L$

D = Hole Diameter

L = Length in I.P.M.

.785 is Constant



Material Drilled 4140 250 BHN:

Cutting Data: 180 S.F.M. (458 R.P.M.) x .014 Feed per Rev.

458 R.P.M. x .014 = 6.412 I.P.M. (L)

$D^2 (1.5)^2 \times .785 \times L (6.412) = 11.3 \text{ C.U.In./ Min (MRR)}$

**MRR of 11.3 x 1.4 Energy Value = 15.8HP.**

## metal removal rates (mrR)

- Cubic inches of metal removal per unit of horsepower.
- Unit horsepower ( $HP_u$ ) is the amount of power to remove a volume of metal in a period of time.
  - $HP_u$  = power to cut 1 cubic inch per minute – found in tables

| Average Unit Horsepower Values of Energy Per Unit Volume |         |                                     |
|--|---------|-------------------------------------|
| Material   | BHN     | $HP_u$ (HP/(in <sup>3</sup> /min.)) |
| Carbon Steels  | 150-200 | 1.0                                 |
|  | 200-250 | 1.4                                 |
|  | 250-350 | 1.6                                 |
| Leaded Steels  | 150-175 | 0.7                                 |
| Cast Irons   | 125-190 | 0.5                                 |
|  | 190-250 | 1.6                                 |
| Stainless Steels   | 135-275 | 1.5                                 |
| Aluminum Alloys  | 50-100  | 0.3                                 |
| Magnesium Alloys   | 40-90   | 0.2                                 |
| Copper   | 125-140 | 0.7                                 |
| Copper Alloys  | 100-150 | 0.7                                 |



## COOLANT RECOMMENDATIONS (SPADE BLADE)

| Material  | Material Hardness (BHN) | Coolant Pressure (PSI)            |                    |                    |                |                 |                |                |
|---|-------------------------|-----------------------------------|--------------------|--------------------|----------------|-----------------|----------------|----------------|
|   |                         | Coolant Volumetric Flowrate (GPM) |                    |                    |                |                 |                |                |
|   |                         | 3/8 ~ 1/2                         | 33/64 ~ 11/16      | 23/32 ~ 1          | 1 ~ 1-1/4      | 1-1/4 ~ 2       | 2 ~ 3          | 3 ~ 4          |
| Free Machining Steel<br>1118, 1215, 12L14, etc.                 | 100 - 250               | 175-185<br>2.5-2.6                | 100-120<br>2.8-3.0 | 105-140<br>4.4-5.2 | 80-115<br>7-8  | 75-100<br>12-14 | 40-50<br>30-33 | 65-90<br>38-44 |
| Low Carbon Steel<br>1010, 1020, 1025, 1522, etc.                | 85 - 275                | 165-170<br>2.4-2.5                | 75-90<br>2.4-2.6   | 75-95<br>3.7-4.2   | 60-80<br>6-7   | 55-75<br>11-12  | 30-40<br>26-30 | 50-65<br>33-38 |
| Medium Carbon Steel<br>1030, 1040, 1050, 1527, 1140, 1151, etc. | 125 - 325               | 160-165<br>2.3-2.4                | 70-85<br>2.3-2.6   | 70-90<br>3.6-4.1   | 55-75<br>5-6   | 50-70<br>10-12  | 30-40<br>26-30 | 50-65<br>33-38 |
| Alloy Steel<br>4140, 5140, 8640, etc.                           | 125 - 375               | 160-165<br>2.3-2.4                | 66-75<br>2.2-2.4   | 65-80<br>3.5-3.9   | 50-70<br>5-6   | 45-60<br>10-11  | 30-35<br>26-28 | 40-50<br>30-33 |
| High Strength Alloy<br>4340, 4330V, 300M, etc.                  | 225 - 400               | 150-155<br>2.3-2.4                | 55-60<br>2.1-2.2   | 45-50<br>2.9-3.1   | 25-30<br>4-5   | 25-30<br>7-8    | 20-25<br>21-23 | 25-30<br>23-26 |
| Structural Steel<br>A36, A285, A516, etc.                       | 100 - 350               | 160-165<br>2.3-2.4                | 75-85<br>2.4-2.6   | 65-80<br>3.5-3.9   | 40-55<br>5-6   | 40-50<br>9-10   | 25-30<br>23-26 | 40-50<br>30-33 |
| High Temp. Alloy<br>Hastelloy B, Inconel 600, etc.              | 140 - 310               | 150-155<br>2.3-2.4                | 60-65<br>2.2-2.3   | 50-55<br>3.1-3.2   | 30-35<br>4-5   | 25-30<br>7-8    | 25-30<br>23-26 | -<br>-         |
| Stainless Steel<br>301, 316, 330, 17-4PH, etc.                  | 135 - 275               | 165-170<br>2.4-2.5                | 70-85<br>2.3-2.6   | 65-75<br>3.5-3.7   | 40-55<br>5-6   | 40-50<br>9-10   | 25-30<br>23-26 | 35-45<br>28-31 |
| Tool Steel<br>H-13, H-21, A-4, O-2, S-3, etc.                   | 150 - 250               | 150-155<br>2.3-2.4                | 55-60<br>2.1-2.2   | 45-50<br>2.9-3.1   | 25-30<br>4-5   | 25-30<br>7-8    | 20-25<br>21-23 | 25-30<br>23-26 |
| Aluminum  | 30 - 180                | 190-210<br>2.6-2.7                | 140-180<br>3.3-3.7 | 150-200<br>5.3-6.1 | 115-160<br>8-9 | 90-125<br>14-16 | 40-50<br>30-33 | 60-80<br>36-42 |
| Cast Iron   | 120 - 320               | 155-160<br>2.3-2.4                | 60-65<br>2.2-2.3   | 50-60<br>3.1-3.3   | 30-40<br>4-5   | 30-35<br>8-9    | 25-30<br>23-26 | 30-35<br>26-28 |

i-DREAM  
DRILLSDREAM  
DRILLSDREAM  
DRILLS  
-INOXDREAM  
DRILLS  
-ALUDREAM  
DRILLS  
-MQL TYPEDREAM  
DRILLS  
for HARDENED  
STEELSSTANDARD  
CARBIDE  
DRILLSMULTI-1  
DRILLS

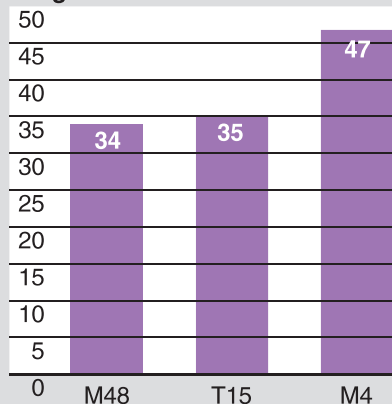
HPD DRILLS

GOLD-P  
DRILLSSTRAIGHT  
SHANK  
DRILLSAIRCRAFT  
DRILLSSILVER &  
DEMING  
DRILLSTAPER  
SHANK  
DRILLSNC SPOTTING  
DRILLSCOMBINATION  
DRILL &  
COUNTER  
SINKSPADE  
DRILLSTECHNICAL  
DATA

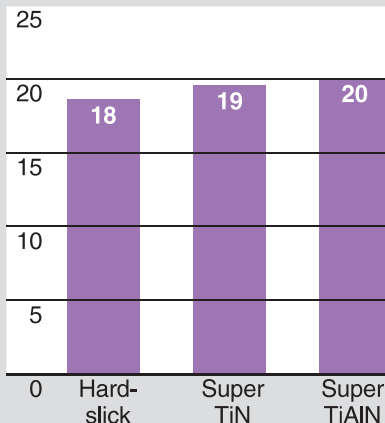


**SPADE BLADE INSERTS SELECTION & APPLICATIONS HSS**

**Toughness Values**



**Wear Values**



- **WHEN TO USE M4**
  - Loose or Manual Machines
  - If T15 Breaks
- **WHEN TO USE T15**
  - When M4 Life needs to be Extended
  - If M48 Breaks
- **WHEN TO USE M48**
  - Extend Life T15
- **WHEN TO USE SM POINT**
  - Reduce Thrust
  - Smoother Entry
  - Improve Hole Quality
  - Higher Speeds and Feeds

**SPEEDS – FEED RECOMMENDATIONS (STD POINT-SM POINT)**

STANDARD GEOMETRY  
SM POINT

| Material                                       | Material Hardness (BHN) | SFM Surface Footage | Feed (IPR) |      |               |      |               |      |               |      |                 |      |                  |      |                 |      |      |
|--|-------------------------|---------------------|------------|------|---------------|------|---------------|------|---------------|------|-----------------|------|------------------|------|-----------------|------|------|
|  |                         |                     | 3/8 ~ 1/2  |      | 33/64 ~ 11/16 |      | 45/64 ~ 15/16 |      | 31/32 ~ 1-3/8 |      | 1-13/32 ~ 1-7/8 |      | 1-29/32 ~ 2-9/16 |      | 2-19/32 ~ 4-1/2 |      |      |
| Free Machining Steel<br>1118, 1215, 12L14      | 100 - 150               | 280                 | 330        | .007 | .008          | .010 | .012          | .013 | .016          | .016 | .019            | .020 | .020             | .023 | .023            | .028 | .028 |
|  | 150 - 200               | 260                 | 305        | .007 | .007          | .010 | .011          | .013 | .015          | .016 | .017            | .020 | .020             | .023 | .023            | .028 | .028 |
|  | 200 - 250               | 240                 | 285        | .007 | .006          | .010 | .010          | .013 | .014          | .016 | .016            | .020 | .020             | .023 | .023            | .028 | .028 |
| Low & Medium Carbon Steel<br>1018, 1040, 1140  |                         | 240                 | 280        | .006 | .007          | .009 | .010          | .012 | .014          | .015 | .017            | .019 | .019             | .023 | .023            | .027 | .027 |
|  |                         | 225                 | 265        | .005 | .006          | .008 | .009          | .010 | .013          | .014 | .016            | .018 | .018             | .021 | .021            | .024 | .024 |
|  |                         | 210                 | 245        | .005 | .006          | .008 | .009          | .010 | .013          | .014 | .016            | .018 | .018             | .021 | .021            | .024 | .024 |
|  |                         | 195                 | 230        | .004 | .005          | .007 | .008          | .009 | .012          | .012 | .015            | .016 | .016             | .019 | .019            | .022 | .022 |
| Alloy Steel<br>4140, 5140, 8640                | 125 - 175               | 210                 | 245        | .006 | .007          | .008 | .010          | .010 | .014          | .014 | .017            | .017 | .017             | .019 | .019            | .022 | .022 |
|  | 175 - 225               | 195                 | 230        | .005 | .006          | .008 | .009          | .010 | .013          | .014 | .016            | .017 | .017             | .019 | .019            | .022 | .022 |
|  | 225 - 275               | 180                 | 215        | .005 | .006          | .007 | .009          | .010 | .013          | .014 | .016            | .017 | .017             | .019 | .019            | .022 | .022 |
|  | 275 - 325               | 170                 | 200        | .004 | .005          | .006 | .008          | .009 | .012          | .012 | .015            | .015 | .015             | .017 | .017            | .020 | .020 |
|  | 325 - 375               | 155                 | 185        | .003 | .004          | .006 | .007          | .009 | .011          | .012 | .014            | .015 | .015             | .017 | .017            | .020 | .020 |
| High Strength Alloy Steel<br>4340, 4330V, 300M |                         | 110                 | 130        | .005 | .006          | .007 | .009          | .009 | .011          | .010 | .013            | .014 | .014             | .017 | .017            | .020 | .020 |
|  |                         | 85                  | 105        | .004 | .005          | .007 | .008          | .009 | .010          | .010 | .012            | .014 | .014             | .017 | .017            | .020 | .020 |
|  |                         | 70                  | 85         | .003 | .004          | .006 | .007          | .008 | .009          | .009 | .011            | .012 | .012             | .015 | .015            | .018 | .018 |
| Structural Steel<br>A36, A285, A516            | 100 - 150               | 200                 | 240        | .006 | .008          | .010 | .011          | .012 | .015          | .014 | .017            | .018 | .018             | .021 | .021            | .026 | .026 |
|  | 150 - 250               | 170                 | 195        | .005 | .006          | .009 | .010          | .010 | .013          | .012 | .015            | .016 | .016             | .019 | .019            | .024 | .024 |
|  | 250 - 350               | 140                 | 165        | .004 | .005          | .008 | .009          | .009 | .012          | .010 | .013            | .014 | .014             | .017 | .017            | .020 | .020 |
| High Temp, Alloy<br>Hastelloy B, Inconel 600   |                         | 40                  | 50         | .003 | .004          | .006 | .007          | .007 | .009          | .008 | .011            | .010 | .012             | .012 | .015            | .015 | .017 |
|  |                         | 35                  | 45         | .003 | .004          | .006 | .006          | .007 | .008          | .008 | .010            | .010 | .010             | .012 | .012            | .015 | .014 |
| Stainless Steel<br>303, 416, 420, 17-4 PH      | 135 - 185               | 105                 | 125        | .006 | .007          | .008 | .009          | .009 | .012          | .011 | .014            | .014 | .014             | .016 | .016            | .020 | .020 |
|  | 185 - 275               | 90                  | 110        | .005 | .006          | .007 | .008          | .008 | .011          | .010 | .012            | .012 | .012             | .014 | .014            | .018 | .018 |
| Tool Steel<br>H-13, H021, A04, O-2, S-3        |                         | 110                 | 130        | .004 | .004          | .006 | .007          | .008 | .010          | .010 | .012            | .012 | .012             | .015 | .015            | .017 | .017 |
|  |                         | 90                  | 110        | .004 | .004          | .006 | .007          | .008 | .010          | .010 | .012            | .012 | .012             | .015 | .015            | .017 | .017 |
| Aluminum                                       | 30                      | 850                 | -          | .008 | -             | .013 | -             | .016 | -             | .020 | -               | .022 | .022             | .025 | .025            | .025 | .025 |
|  | 180                     | 450                 | -          | .008 | -             | .013 | -             | .016 | -             | .018 | -               | .022 | .022             | .025 | .025            | .025 | .025 |
| Cast Iron<br>Gray, Ductile, Nodular            |                         | 250                 | 295        | .007 | .008          | .012 | .012          | .016 | .016          | .020 | .020            | .024 | .024             | .027 | .027            | .030 | .030 |
|  |                         | 225                 | 265        | .006 | .007          | .011 | .011          | .014 | .015          | .018 | .019            | .022 | .022             | .025 | .025            | .028 | .028 |
|  |                         | 195                 | 230        | .006 | .006          | .009 | .009          | .012 | .013          | .016 | .017            | .018 | .018             | .021 | .021            | .024 | .024 |
|  |                         | 165                 | 195        | .005 | .005          | .007 | .008          | .009 | .011          | .012 | .014            | .014 | .014             | .017 | .017            | .020 | .020 |
|  |                         | 135                 | 160        | .004 | .005          | .006 | .007          | .007 | .010          | .009 | .011            | .012 | .012             | .014 | .014            | .016 | .016 |

The recommendations for speed, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points. Speed and feed reduction (20% reduction in speed and 10% reduction in feed) are recommended.

SPADE BLADE INSERTS SELECTION & APPLICATIONS **CARBIDE**

### Toughness Values

| Grade | Toughness Value |
|-------|-----------------|
| C5    | 30              |
| P40   | 43              |
| C2    | 45              |

### Wear Values

| Grade | Wear Value |
|-------|------------|
| C5    | 45         |
| P40   | 43         |
| C2    | 30         |

| Grade    | Geometry and Application                                     | Stocked Coatings |
|----------|--|------------------|
| P40 & C5 | Steel Cutting  | Super TiN TiAIN  |
| C3       | Cast Iron  | Super TiN TiAIN  |
| P40 & C2 | Ductile Iron<br>Stainless Steel<br>Aluminum<br>Exotic Alloys | Super TiN TiAINE |

**Note:** Carbide has a lower transverse rupture strength than HSS and is prone to chipping and breakage. Recutting of chips or lack of rigidity can cause breakage. Check Coolant Recommendations Chart on Page 461 for flow rates.

**If C5 chips try C2 at 10% – 20% lower S.F.M. than C5 rating**

**SPEEDS – FEED RECOMMENDATIONS (STD POINT-SM POINT)**

STANDARD GEOMETRY (Yellow)  
SM POINT (Red)

| Material                                       | Material Hardness (BHN) | SFM Surface Footage |     | Feed (IPR) |      |               |      |               |      |               |      |                 |   |
|--|-------------------------|---------------------|-----|------------|------|---------------|------|---------------|------|---------------|------|-----------------|---|
|  |                         |                     |     | 3/8 ~ 1/2  |      | 33/64 ~ 11/16 |      | 45/64 ~ 15/16 |      | 31/32 ~ 1-3/8 |      | 1-13/32 ~ 1-7/8 |   |
| Free Machining Steel<br>1118, 1215, 12L14      | 100 - 150               | 420                 | 485 | .006       | .008 | .009          | .012 | .012          | .016 | .015          | .019 | .019            | - |
|  | 150 - 200               | 360                 | 420 | .006       | .007 | .008          | .011 | .011          | .015 | .013          | .017 | .017            | - |
|  | 200 - 250               | 340                 | 395 | .005       | .006 | .008          | .010 | .010          | .014 | .012          | .016 | .015            | - |
| Low & Medium Carbon Steel<br>1018, 1040, 1140  | 125 - 175               | 340                 | 395 | .005       | .007 | .008          | .010 | .010          | .014 | .014          | .017 | .017            | - |
|  | 175 - 225               | 310                 | 360 | .005       | .006 | .007          | .009 | .008          | .013 | .012          | .016 | .016            | - |
|  | 225 - 275               | 270                 | 315 | .004       | .006 | .007          | .009 | .008          | .013 | .012          | .016 | .015            | - |
| Alloy Steel<br>4140, 5140, 8640                | 275 - 325               | 230                 | 270 | .004       | .005 | .006          | .008 | .006          | .012 | .010          | .015 | .014            | - |
|  | 125 - 175               | 325                 | 380 | .005       | .007 | .008          | .010 | .010          | .014 | .013          | .017 | .016            | - |
|  | 175 - 225               | 300                 | 350 | .005       | .006 | .007          | .009 | .009          | .013 | .012          | .016 | .015            | - |
| High Strength Alloy Steel<br>4340, 4330V, 300M | 225 - 275               | 270                 | 315 | .004       | .006 | .007          | .009 | .009          | .013 | .012          | .016 | .015            | - |
|  | 275 - 325               | 250                 | 290 | .004       | .005 | .006          | .008 | .008          | .012 | .011          | .015 | .014            | - |
|  | 325 - 375               | 220                 | 260 | .003       | .004 | .005          | .007 | .008          | .011 | .010          | .014 | .013            | - |
| Structural Steel<br>A36, A285, A516            | 225 - 300               | 200                 | 235 | .005       | .006 | .007          | .009 | .008          | .011 | .010          | .013 | .014            | - |
|  | 300 - 350               | 180                 | 210 | .004       | .005 | .006          | .008 | .007          | .010 | .009          | .012 | .012            | - |
|  | 350 - 400               | 160                 | 190 | .003       | .004 | .005          | .007 | .006          | .009 | .008          | .011 | .010            | - |
| High Temp, Alloy<br>Hastelloy B, Inconel 600   | 100 - 150               | 310                 | 360 | .006       | .008 | .010          | .011 | .011          | .015 | .012          | .017 | .016            | - |
|  | 150 - 250               | 250                 | 290 | .005       | .006 | .008          | .010 | .009          | .013 | .011          | .015 | .015            | - |
|  | 250 - 350               | 230                 | 270 | .004       | .005 | .007          | .009 | .008          | .012 | .009          | .013 | .013            | - |
| Stainless Steel<br>303, 416, 420, 17-4 PH      | 140 - 220               | 80                  | 125 | .003       | .004 | .006          | .007 | .007          | .009 | .009          | .011 | .011            | - |
|  | 220 - 310               | 60                  | 100 | .003       | .004 | .005          | .006 | .006          | .008 | .008          | .010 | .010            | - |
| Tool Steel<br>H-13, H021, A04, O-2, S-3        | 135 - 185               | 210                 | 245 | .006       | .007 | .008          | .009 | .009          | .012 | .011          | .014 | .013            | - |
|  | 185 - 275               | 160                 | 190 | .005       | .006 | .007          | .008 | .008          | .011 | .010          | .012 | .011            | - |
| Aluminum                                       | 150 - 200               | 220                 | 260 | .003       | .004 | .005          | .007 | .007          | .010 | .009          | .012 | .011            | - |
|  | 200 - 250               | 170                 | 200 | .003       | .004 | .005          | .007 | .007          | .010 | .009          | .012 | .011            | - |
| Cast Iron<br>Gray, Ductile, Nodular            | 30                      | 1500                | -   | .008       | -    | .013          | -    | .016          | -    | .020          | -    | .022            | - |
|  | 180                     | 1000                | -   | .007       | -    | .011          | -    | .014          | -    | .018          | -    | .020            | - |
|  | 120 - 150               | 460                 | 505 | .006       | .008 | .009          | .012 | .011          | .015 | .015          | .019 | .020            | - |
|  | 150 - 200               | 400                 | 485 | .005       | .007 | .008          | .011 | .010          | .013 | .014          | .017 | .018            | - |
| Cast Iron<br>Gray, Ductile, Nodular            | 200 - 220               | 360                 | 435 | .005       | .006 | .007          | .009 | .008          | .012 | .012          | .015 | .015            | - |
|  | 220 - 260               | 310                 | 375 | .004       | .005 | .006          | .008 | .007          | .011 | .010          | .013 | .013            | - |
|  | 260 - 320               | 270                 | 340 | .004       | .005 | .005          | .007 | .006          | .010 | .008          | .011 | .011            | - |

The recommendations for speed, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points. Speed and feed reduction (20% reduction in speed and 10% reduction in feed) are recommended.



## SUPER COBALT T15 FLAT BOTTOM

| Material   | Material Hardness (BHN) | Speed (SFM) |       | Feed      |               |               |               |
|--|-------------------------|-------------|-------|-----------|---------------|---------------|---------------|
|  |                         | TiN         | TiAlN | 3/8 ~ 1/2 | 33/64 ~ 11/16 | 45/64 ~ 15/16 | 31/32 ~ 1-3/8 |
| <b>Free machining Steel</b><br>1213, 12L13, 1215<br>12L14, 1118                        | 100 - 150               | 165         | 220   | 0.005     | 0.007         | 0.010         | 0.013         |
|  | 150 - 200               | 150         | 215   | 0.005     | 0.007         | 0.010         | 0.013         |
|  | 200 - 250               | 135         | 190   | 0.004     | 0.007         | 0.010         | 0.012         |
| <b>Low Carbon Steel</b><br>1015, 1020, 1140,<br>1025                                   | 85 - 125                | 140         | 195   | 0.005     | 0.007         | 0.009         | 0.012         |
|  | 125 - 175               | 135         | 190   | 0.005     | 0.007         | 0.009         | 0.012         |
|  | 175 - 225               | 125         | 180   | 0.004     | 0.006         | 0.008         | 0.011         |
|  | 225 - 275               | 115         | 175   | 0.004     | 0.006         | 0.008         | 0.011         |
| <b>Medium Carbon Steel</b><br>1035, 1050, 1045<br>1055, 1140                           | 125 - 175               | 135         | 195   | 0.004     | 0.007         | 0.009         | 0.011         |
|  | 175 - 225               | 125         | 180   | 0.004     | 0.006         | 0.007         | 0.011         |
|  | 225 - 275               | 115         | 165   | 0.004     | 0.006         | 0.007         | 0.011         |
|  | 275 - 325               | 105         | 150   | 0.003     | 0.005         | 0.007         | 0.009         |
| <b>Structural Steel</b><br>A36, A516, A182   | 100 - 150               | 115         | 165   | 0.004     | 0.007         | 0.009         | 0.011         |
|  | 150 - 250               | 100         | 140   | 0.004     | 0.007         | 0.008         | 0.009         |
|  | 250 - 350               | 80          | 115   | 0.003     | 0.006         | 0.007         | 0.008         |
| <b>Cast Iron / S,G Iron</b><br>A48-76 GR30/GR45<br>A536-72 60-40-18<br>A220-76 GR40010 | 120 - 150               | 145         | 215   | 0.005     | 0.010         | 0.014         | 0.016         |
|  | 150 - 200               | 130         | 190   | 0.005     | 0.008         | 0.011         | 0.016         |
|  | 200 - 220               | 110         | 165   | 0.005     | 0.008         | 0.010         | 0.014         |
|  | 220 - 260               | 95          | 150   | 0.004     | 0.006         | 0.008         | 0.010         |
|  | 260 - 320               | 80          | 120   | 0.004     | 0.005         | 0.006         | 0.008         |
| <b>Alloy Steel</b><br>8620, 4130, 4137<br>4140, 6150                                   | 125 - 175               | 125         | 165   | 0.005     | 0.006         | 0.008         | 0.011         |
|  | 175 - 225               | 115         | 150   | 0.004     | 0.006         | 0.008         | 0.011         |
|  | 225 - 275               | 105         | 145   | 0.004     | 0.005         | 0.007         | 0.011         |
|  | 275 - 325               | 100         | 140   | 0.003     | 0.005         | 0.007         | 0.009         |
|  | 325 - 375               | 90          | 120   | 0.003     | 0.005         | 0.007         | 0.009         |
| <b>Tool Steel</b><br>H13, H21, A2, S1  | 150 - 200               | 65          | 90    | 0.003     | 0.005         | 0.006         | 0.008         |
|  | 200 - 250               | 45          | 75    | 0.003     | 0.005         | 0.006         | 0.008         |
| <b>High Temp. Alloy</b><br>Hastelloy B, Inconel  | 140 - 220               | 20          | 30    | 0.003     | 0.005         | 0.006         | 0.008         |
|  | 220 - 310               | 15          | 25    | 0.003     | 0.004         | 0.006         | 0.006         |
|  | 225 - 300               | 65          | 90    | 0.004     | 0.006         | 0.007         | 0.008         |
| <b>High Strength Alloy</b><br>9840, 4340, 4330V  | 300 - 350               | 45          | 70    | 0.003     | 0.006         | 0.007         | 0.008         |
|  | 350 - 400               | 40          | 60    | 0.003     | 0.005         | 0.006         | 0.007         |
| <b>Aluminium</b><br>2014, 6061, 7075   | 30                      | 520         | 700   | 0.007     | 0.011         | 0.014         | 0.017         |
|  | 180                     | 255         | 390   | 0.007     | 0.011         | 0.014         | 0.016         |
| <b>Stainless Steel</b><br>310, 316, 410, 330   | 135 - 185               | 60          | 90    | 0.005     | 0.007         | 0.008         | 0.009         |
|  | 185 - 275               | 50          | 80    | 0.004     | 0.006         | 0.007         | 0.009         |

RPM = revolution per minute (rev/min)

SFM = surface feet per minute (ft/min)

DIA = diameter of drill (inch)

IPR = feed rate (in/rev)

IPM = inch per minute penetration rate

## \* Formulas :

$$\text{SFM} = (\text{RPM}) \cdot (.262) \cdot (\text{DIA.})$$

$$\text{IPM} = (\text{RPM}) \cdot (\text{IPR})$$

$$\text{RPM} = \frac{(\text{SFM}) \cdot (3.82)}{(\text{DIA.})}$$

The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points. Speed and feed reductions (20% reduction in speed and 10% reduction in feed) are recommended.