METRIC

Material			Tensile Strength	Hardness		Cutting Speed	Feed [mm/rev]				
			[N/mm²]	HB	HRc	Vc [M/min]	Ø12.0 ~ Ø14.9	Ø15.0 ~ Ø17.9	Ø18.0 ~ Ø21.9	Ø22.0 ~ Ø26.9	Ø27.0 ~ Ø31.9
Non-alloyed steels, Cast steels Free-machining steels	1213, 13L13, 1215, 12L14,1118 etc	Y03□/ Y13□	~500	100~150		95~120	0.16~0.28	0.21~0.35	0.27~0.40	0.34~0.52	0.37~0.55
			500~850	150~250	~24	80~105	0.14~0.24	0.21~0.35	0.27~0.40	0.34~0.52	0.37~0.55
Low-alloyed steels, Cast steels(<5%) Carbon steels	1015, 1020, 1140, 1025,1035, 1050, 1045, 1055 etc		~450	85~125		90~115	0.14~0.25	0.20~0.33	0.25~0.39	0.31~0.47	0.34~0.50
			450~755	125~225	~19	70~90	0.12~0.20	0.17~0.28	0.22~0.32	0.30~0.46	0.33~0.49
			755~900	225~265	19~27	60~80	0.12~0.20	0.17~0.28	0.22~0.32	0.30~0.46	0.33~0.49
			900~1200	265~350	27~37	55~70	0.10~0.16	0.15~0.25	0.21~0.30	0.25~0.38	0.29~0.43
Alloyed steels	8620, 4130, 4137, 4140,6150 etc		~600	125~175	~7	80~100	0.14~0.24	0.17~0.28	0.22~0.32	0.30~0.46	0.34~0.50
			600~800	175~235	7~22	70~90	0.12~0.20	0.17~0.28	0.22~0.32	0.30~0.46	0.34~0.50
			800~950	235~280	22~29	60~80	0.12~0.20	0.15~0.25	0.22~0.32	0.30~0.46	0.34~0.50
			950~1110	280~330	29~35	55~70	0.10~0.16	0.13~0.21	0.21~0.30	0.25~0.38	0.29~0.43
			1110~1230	330~360	35~39	45~60	0.08~0.12	0.13~0.21	0.21~0.30	0.25~0.38	0.29~0.43
High-alloyed steels	A355. 9840, 4340 etc		600~1020	225~300	19~32	45~60	0.12~0.20	0.15~0.25	0.21~0.30	0.20~0.31	0.24~0.35
			1020~1200	300~355	32~38	40~55	0.10~0.16	0.11~0.18	0.21~0.30	0.20~0.31	0.24~0.35
			1200~1330	355~390	38~42	40~50	0.08~0.12	0.09~0.14	0.18~0.26	0.19~0.29	0.23~0.34
Structural steels	A36, A516, A182 etc		350~500	100~150		75~95	0.14~0.24	0.21~0.35	0.27~0.39	0.29~0.44	0.32~0.47
			500~850	150~250	~24	60~75	0.12~0.20	0.20~0.33	0.22~0.32	0.25~0.38	0.29~0.43
			850~1200	250~355	24~38	50~65	0.10~0.16	0.17~0.28	0.21~0.30	0.21~0.32	0.26~0.38
Tool steels	H13, H21, A2, S1 etc		500~705	150~210	~16	50~65	0.10~0.16	0.13~0.21	0.18~0.26	0.20~0.31	0.24~0.35
			705~950	210~280	16~29	40~50	0.10~0.16	0.13~0.21	0.18~0.26	0.20~0.31	0.24~0.35
Grey cast iron	Pearlitic, Ferritic		500~700	150~210	~16	100~125	0.15~0.26	0.20~0.37	0.27~0.42	0.36~0.51	0.40~0.55
	Pearlitic		700~850	210~250	16~24	75~95	0.11~0.20	0.16~0.29	0.20~0.30	0.25~0.35	0.29~0.40
Cast iron nodular	Ferritic		540	165	4	95~120	0.13~0.22	0.17~0.31	0.21~0.32	0.28~0.40	0.32~0.44
	Pearlitic		850	250	24	75~95	0.11~0.20	0.14~0.26	0.19~0.29	0.25~0.35	0.29~0.40
Malleable cast iron	Ferritic		450	125		100~125	0.13~0.22	0.17~0.31	0.21~0.32	0.28~0.40	0.32~0.44
	Pearlitic		780	230	21	75~95	0.11~0.18	0.14~0.26	0.19~0.29	0.25~0.35	0.29~0.40
Aluminum alloys (Wrought)	not heat treatable			65		250~330	0.30~0.40	0.35~0.45	0.40~0.50	0.45~0.55	0.50~0.60
	hardened			150		200~250	0.30~0.40	0.35~0.45	0.40~0.50	0.45~0.55	0.50~0.60
Aluminum alloys (Cast)	≤12% Si, not heat treatable			75		200~50	0.25~0.35	0.30~0.40	0.35~0.45	0.40~0.50	0.45~0.55
	≤12% Si, hardened			90		150~220	0.25~0.35	0.30~0.40	0.35~0.45	0.40~0.50	0.45~0.55
	>12% Si, not heat treatable			130		100~200	0.20~0.30	0.25~0.35	0.30~0.40	0.35~0.45	0.40~0.50
Copper alloys	Free machining(Pb>1%)			110		115~145	0.16~0.28	0.23~0.36	0.29~0.36	0.37~0.45	0.41~0.48
	Brass			90		145~185	0.17~0.29	0.24~0.37	0.30~0.38	0.38~0.46	0.42~0.49
	Electrolitic copper			100		95~120	0.06~0.09	0.09~0.13	0.11~0.13	0.15~0.18	0.19~0.22
Non ferrous material	Duroplastics										
	Fiber plastics										
	Hard rubber										
Stainless steels	Austenitic and Austenitic / ferritic	Y13□	450~610	135~185	~9	45~60	0.10~0.16	0.12~0.18	0.14~0.20	0.15~0.26	0.18~0.28
			610~930	185~275	9~28	30~45	0.08~0.14	0.09~0.15	0.10~0.16	0.12~0.20	0.14~0.22

RPM = revolution per minute (rev/min)
M/min = surface meter per minute(M/min)
DIA. = diameter of drill (mm)
mm/rev = feed rate(mm/rev)

*Formulas :

$$\text{M/min} = \frac{(\text{RPM}) \cdot \pi \cdot (\text{DIA.})}{1000}$$

$$\text{mm/min} = (\text{RPM}) \cdot (\text{mm/rev})$$

$$\text{RPM} = \frac{(\text{M/min}) \cdot 1000}{(\pi) \cdot (\text{DIA.})}$$

▶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.
▶Recommend you to reduce the feed rate to 85%,70% when you use 5xD,7xD holders.
▶For use of 7xD holder, we recommend to drill a centering pre-hole with equal to or larger than 140° point angle to min. 2/3 cutting diameter.
The use of the centering pre-hole improves hole location, roundness and surface finish.

INCH

Material			Tensile Strength	Hardness		Cutting Speed	Feed [IPR]				
			MPa	HB	HRc	Vc [SFM]	∅31/64 ~ ∅37/64	∅19/32 ~ ∅45/64	∅23/32 ~ ∅55/64	∅7/8 ~ ∅1-1/16	∅1-3/32 ~ ∅1-1/4
Non-alloyed steels, Cast steels Free-machining steels	1213, 13L13, 1215, 12L14,1118 etc	Y03□/Y13□	~500	100~150		312~394	.006~.011	.008~.014	.011~.016	.013~.020	.015~.022
			500~850	150~250	~24	262~344	.006~.009	.008~.014	.011~.016	.013~.020	.015~.022
Low-alloyed steels, Cast steels(<5%) Carbon steels	1015, 1020, 1140, 1025,1035, 1050, 1045, 1055 etc		~450	85~125		295~377	.006~.010	.008~.013	.010~.015	.012~.019	.013~.020
			450~755	125~225	~19	230~295	.005~.008	.007~.011	.009~.013	.012~.018	.013~.019
			755~900	225~265	19~27	197~262	.005~.008	.007~.011	.009~.013	.012~.018	.013~.019
			900~1200	265~350	27~37	180~230	.004~.006	.006~.010	.008~.012	.010~.015	.011~.017
Alloyed steels	8620, 4130, 4137, 4140,6150 etc		~600	125~175	~7	262~328	.006~.009	.007~.011	.009~.013	.012~.018	.013~.020
			600~800	175~235	7~22	230~295	.005~.008	.007~.011	.009~.013	.012~.018	.013~.020
			800~950	235~280	22~29	197~262	.005~.008	.006~.010	.009~.013	.012~.018	.013~.020
			950~1110	280~330	29~35	180~230	.004~.006	.005~.008	.008~.012	.010~.015	.011~.017
			1110~1230	330~360	35~39	148~197	.003~.005	.005~.008	.008~.012	.010~.015	.011~.017
High-alloyed steels	A355. 9840, 4340 etc		600~1020	225~300	19~32	148~197	.005~.008	.006~.010	.008~.012	.008~.012	.009~.014
			1020~1200	300~355	32~38	131~180	.004~.006	.004~.007	.008~.012	.008~.012	.009~.014
			1200~1330	355~390	38~42	131~164	.003~.005	.004~.006	.007~.010	.007~.011	.009~.013
Structural steels	A36, A516, A182 etc		350~500	100~150		246~312	.006~.009	.008~.014	.011~.015	.011~.017	.013~.019
			500~850	150~250	~24	197~246	.005~.008	.008~.013	.009~.013	.010~.015	.011~.017
			850~1200	250~355	24~38	164~213	.004~.006	.007~.011	.008~.012	.008~.013	.010~.015
Tool steels	H13, H21, A2, S1 etc		500~705	150~210	~16	164~213	.004~.006	.005~.008	.007~.010	.008~.012	.009~.014
			705~950	210~280	16~29	131~164	.004~.006	.005~.008	.007~.010	.008~.012	.009~.014
Grey cast iron	Pearlitic, Ferritic		500~700	150~210	~16	328~410	.006~.010	.008~.015	.011~.017	.014~.020	.016~.022
	Pearlitic		700~850	210~250	16~24	246~312	.004~.008	.006~.011	.008~.012	.010~.014	.011~.016
Cast iron nodular	Ferritic		540	165	4	312~394	.005~.009	.007~.012	.008~.013	.011~.016	.013~.017
	Pearlitic		850	250	24	246~312	.004~.008	.006~.010	.007~.011	.010~.014	.011~.016
Malleable cast iron	Ferritic		450	125		328~410	.005~.009	.007~.012	.008~.013	.011~.016	.013~.017
	Pearlitic		780	230	21	246~312	.004~.007	.006~.010	.007~.011	.010~.014	.011~.016
Aluminum alloys (Wrought)	not heat treatable			65		820~1083	.0118~.0157	.0138~.0177	.0157~.0197	.0177~.0217	.0197~.0236
	hardened			150		656~820	.0118~.0157	.0138~.0177	.0157~.0197	.0177~.0217	.0197~.0236
Aluminum alloys (Cast)	≤12% Si, not heat treatable			75		656~820	.0098~.0138	.0118~.0157	.0138~.0177	.0157~.0197	.0177~.0217
	≤12% Si, hardened			90		492~722	.0098~.0138	.0118~.0157	.0138~.0177	.0157~.0197	.0177~.0217
	>12% Si, not heat treatable			130		328~656	.0079~.0118	.0098~.0138	.0118~.0157	.0138~.0177	.0157~.0197
Copper alloys	Free machining(Pb>1%)			110		377~476	.006~.011	.009~.014	.011~.014	.015~.018	.016~.019
	Brass			90		476~607	.007~.011	.009~.015	.012~.015	.015~.018	.017~.019
	Electrolitic copper			100		312~394	.002~.004	.004~.005	.004~.005	.006~.007	.007~.009
Non ferrous material	Duroplastics										
	Fiber plastics										
	Hard rubber										
Stainless steels	Austenitic and Austenitic / ferritic	Y13□	450~610	135~185	~9	145~197	.004~.006	.005~.007	.006~.008	.006~.011	.007~.011
			610~930	185~275	9~28	89~145	.003~.005	.004~.006	.004~.006	.005~.008	.006~.009

RPM = revolution per minute (rev/min)
SFM = surface feet per minute (ft/min)
DIA. = diameter of drill (inch)
IPR = feed rate (inch/rev)
IPM = inch per minute penetration rate

*Formulas :

$$SFM = \frac{(RPM) \cdot \pi \cdot (DIA.)}{12}$$

$$IPM = (RPM) \cdot (IPR)$$

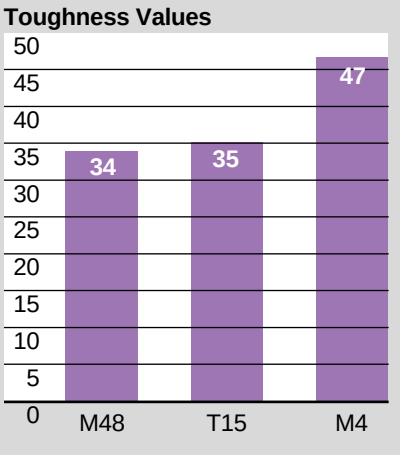
$$RPM = \frac{(SFM) \cdot 12}{(\pi) \cdot (DIA.)}$$

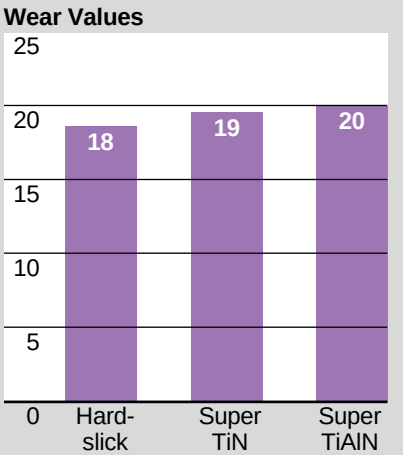
▶ The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.
Speed and feed reductions (20% reduction in speed and 10% reduction in feed) are recommended.
▶ Recommend you to reduce the feed rate to 85%,70% when you use 5xD,7xD holders.
▶ For use of 7xD holder, we recommend to drill a centering pre-hole with equal to or larger than 140° point angle to min. 2/3 cutting diameter.
The use of the centering pre-hole improves hole location, roundness and surface finish.

SPADE DRILLS

RECOMMENDED CUTTING CONDITIONS

SPADE BLADE INSERTS SELECTION & APPLICATIONS HSS





- **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)

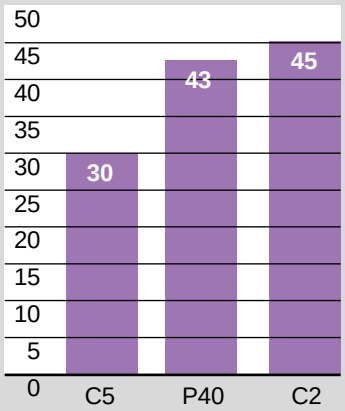
STANDARD GEOMETRY
SM POINT

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	100 - 150	280	330	.007	.008	.010	.012	.013	.016	.016	.019	.020	.020	.023	.023	.028	.028
1118, 1215, 12L14	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		240	280	.006	.007	.009	.010	.012	.014	.015	.017	.019	.019	.023	.023	.027	.027
1018, 1040, 1140		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	125 - 175	210	245	.006	.007	.008	.010	.010	.014	.014	.017	.017	.017	.019	.019	.022	.022
4140, 5140, 8640	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 Stee		110	130	.005	.006	.007	.009	.009	.011	.010	.013	.014	.014	.017	.017	.020	.020
4340, 4330V, 300M		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	100 - 150	200	240	.006	.008	.010	.011	.012	.015	.014	.017	.018	.018	.021	.021	.026	.026
A36, A285, A516	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		40	50	.003	.004	.006	.007	.007	.009	.008	.011	.010	.012	.012	.015	.015	.017
Hastelloy B, Inconel 600		35	45	.003	.004	.006	.006	.007	.008	.008	.010	.010	.010	.012	.012	.015	.014
Stainless Steel	135 - 185	105	125	.006	.007	.008	.009	.009	.012	.011	.014	.014	.014	.016	.016	.020	.020
303, 416, 420, 17-4 PH	185 - 275	90	110	.005	.006	.007	.008	.008	.011	.010	.012	.012	.012	.014	.014	.018	.018
Tool Steel		110	130	.004	.004	.006	.007	.008	.010	.010	.012	.012	.012	.015	.015	.017	.017
H-13, H021, A04, 0-2, S-3		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		250	295	.007	.008	.012	.012	.016	.016	.020	.020	.024	.024	.027	.027	.030	.030
Gray, Ductile, Nodular		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

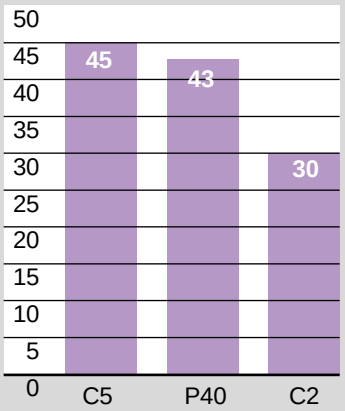
The recommendations for speed, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points. Speed and feed reduction (20% reduction in speed and 10% reduction in feed) are recommended.

SPADE BLADE INSERTS SELECTION & APPLICATIONS CARBIDE

Toughness Values



Wear Values



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

Grade	Geometry and Application	Stocked Coatings
P40 & C5	Steel Cutting	Super TiN TiAIN
C3	Cast Iron	Super TiN TiAIN
P40 & C2	Ductile Iron Stainless Steel Aluminum 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.

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	
Free Machining Steel 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 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	-
	275 - 325	230	270	.004	.005	.006	.008	.006	.012	.010	.015	.014	-
Alloy Steel 4140, 5140, 8640	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	-
	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	-
High Strength Alloy Stee 4340, 4330V, 300M	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	-
Structural Steel A36, A285, A516	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	-
High Temp, Alloy Hastelloy B, Inconel 600	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	-
Stainless Steel 303, 416, 420, 17-4 PH	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	-
Tool Steel H-13, H021, A04, 0-2, S-3	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	-
Aluminum	30	1500	-	.008	-	.013	-	.016	-	.020	-	.022	-
	180	1000	-	.007	-	.011	-	.014	-	.018	-	.020	-
Cast Iron Gray, Ductile, Nodular	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	-
	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
Free machining Steel 1213, 12L13, 1215 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
Low Carbon Steel 1015, 1020, 1140, 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
Medium Carbon Steel 1035, 1050, 1045 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
Structural Steel 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
Cast Iron / S,G Iron A48-76 GR30/GR45 A536-72 60-40-18 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
Alloy Steel 8620, 4130, 4137 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
Tool Steel 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
High Temp. Alloy 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
High Strength Alloy 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
Aluminium 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
Stainless Steel 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 :**

$$SFM = (RPM) \cdot (.262) \cdot (DIA.)$$

$$IPM = (RPM) \cdot (IPR)$$

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

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.