



# DRILLING APPLICATION GUIDE

2018/19 Cutting Tool Solutions Page Number					Carbide													Powdered Metal		HSS-Va & HSS-Co					
Work Material	Material Designation	Material Condition	Hardness		60-66	67-70	71-78	79-93	94-102	103-110	111-129	143-146	147-149	151	152-166	184-195	176-183	220-229	230-232	233-234	235-241	242-244	245-249	250-255	256-286
			BHN	HRC	A Brand® ADO-TRS <i>Coolant-Through</i>	A Brand® ADFO <i>Coolant-Through</i>	A Brand® ADF	A Brand® ADO 3D-8D <i>Coolant-Through</i>	A Brand® ADO 10D-30D <i>Coolant-Through</i>	A Brand® AD	A Brand® ADO-SUS <i>Coolant-Through</i>	EXOPRO® WHO-Ni <i>Coolant-Through</i>	EXOCARB® WH70	EXOCARB® MAX-OIL AL <i>Coolant-Through</i>	EXOCARB® MAX-MINI*	HY-PRO® CARB <i>Coolant-Through</i>	HY-PRO® CARB	VPH GDS & GDR	Vp® GDR	V-HO GDR <i>Coolant-Through</i>	HELIOS®	V-Select	NEXUS	EX-GOLD®	EX-SUS-GOLD
P	Low Carbon Steel	1010, 1018	Normalized	~190	~10	●	●	●	●	●	●	●	●	●	●	●	●	○	○	●	●	○	●	●	●
	Medium Carbon Steel	1035, 1045	Normalized	~208	~15	●	●	●	●	●	●	○	○	○	●	●	●	●	○	○	●	●	○	●	○
	High Carbon Steel	1065, 1095	Normalized	~253	~25	●	●	●	●	●	○	○	○	○	●	●	●	●	○	○	●	●	○	○	○
Alloy Steel	4140, 4340, 8620	Normalized	253~301	25~32	●	●	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	4140, 4340, 8620	Hardened	327~390	35~42	●	●	●	●	○	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
M	Stainless Steel	300 Series / 400 Series	Annealed	~253	~25	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
		300 Series / 400 Series	Hardened	327~390	35~42	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
		17-4, 15-5, A286	Annealed	~253	~25	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
		17-4, 15-5, A286	Hardened	327~390	35~42	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
K	Cast Iron	Nodular, Grey	As Cast	~208	~15	●	●	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
N	Aluminum Alloy	6061, 7075, 2011	Normalized	~150		○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	Die Cast Aluminum	356AL, 390AL	As Cast	~150		○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
S	Nickel Based Alloy	Inconel 718, 625	Annealed	253~301	25~32																				
		Inconel 718	Hardened	327~390	35~42																				
		Hastelloy, Waspaloy	Normalized		25~40																				
		Kovar	Normalized		25~40																				
	Titanium Alloy	6Al4V	Annealed	253~301	25~32																				
		6Al4V, 6Al6V	Hardened	327~390	35~42																				
H	Tool Steel	D2, H13, P20, S7	Annealed	190~253	10~25	●	●	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
		H13	Hardened	327~450	35~48	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
		D2, A2	Hardened		48~55																				
		D2, A2	Hardened		55~70																				
Other	Magnesium			~100		○	○	○	○																
	Brass, Bronze			~150			○	○	○																
	Copper			~150			○	○	○																
	Beryllium Copper			~253	~25																				
	Cobalt-Chrome	Stellite																							

\*EXOCARB® MAX-MINI covers different materials for each list number. Verify recommended materials on each product page in the 2018/19 Cutting Tool Solutions catalog.

● = 1<sup>st</sup> Choice ○ = 2<sup>nd</sup> Choice



# TAPPING SPEED/APPLICATION GUIDE

2018/19 Cutting Tool Solutions Page Number				Form Taps				Cut Taps										Pipe Taps	
Work Material	Material Designation	Material Condition	Hardness		390-410	375-386	370-374	387-389	See Index	See Index	414-419 422-424	420-421	483-486 489-491	487-488	466-467 529-530	556-557	See Index	629-641	
			BHN	HRC	EXOTAP® NRT & HY-PRO® NRT	EXOPRO® XPF	EXOPRO® XPF-OIL <i>Coolant-Through</i>	EXOCARB® Carbide	General	General <i>Coolant-Through</i>	A Brand® A-SFT	A Brand® A-OIL-SFT <i>Coolant-Through</i>	A Brand® A-POT	A Brand® A-OIL-POT <i>Coolant-Through</i>	HY-PRO® Synchro AL	EXOCARB® VX	Carbide	Pipe Taps	
P	Low Carbon Steel	1010, 1018	Normalized	~190	~10	35-130	50-115	75-130	40-145	25-80	50-120	80-120	100-200	80-120	100-200	85-105	-	35-100	15-40
	Medium Carbon Steel	1035, 1045	Normalized	~208	~15	20-50	50-115	75-130	25-60	20-50	45-110	80-120	100-200	80-120	100-200	85-105	-	30-70	10-25
	High Carbon Steel	1065, 1095	Normalized	~253	~25	15-30	50-85	65-100	20-35	20-45	40-100	80-120	100-200	80-120	100-200	70-85	-	30-60	10-20
	Alloy Steel	4140, 4340, 8620	Normalized	253~301	25~32	15-30	50-85	65-100	20-35	20-50	45-110	35-50	50-100	40-65	50-120	70-85	-	30-70	10-25
4140, 4340, 8620		Hardened	327~390	35~42	-	10-40	20-50	-	15-20	20-60	20-40	40-80	35-55	45-110	-	-	20-35	10-15	
M	Stainless Steel	300 Series / 400 Series	Annealed	~253	~25	15-40	15-40	20-50	20-60	20-45	30-70	15-35	25-70	25-75	40-120	-	-	25-55	10-25
		300 Series / 400 Series	Hardened	327~390	35~42	15-35	15-35	20-45	20-50	12-20	20-50	15-35	25-70	25-75	40-120	-	-	15-30	8-12
		17-4, 15-5, A286	Annealed	~253	~25	15-25	15-30	20-40	20-40	15-20	20-50	15-25	25-50	25-60	40-100	-	-	20-35	8-12
		17-4, 15-5, A286	Hardened	327~390	35~42	-	10-25	15-30	-	8-20	15-40	15-25	25-50	25-60	40-100	-	-	10-25	8-12
K	Cast Iron	Nodular, Grey	As Cast	~208	~15	-	-	-	-	25-75	40-100	50-80	60-150	60-100	80-160	-	-	40-90	15-50
N	Aluminum Alloy	6061, 7075, 2011	Normalized	~150		50-150	65-115	80-130	60-160	40-80	50-125	70-120	90-220	70-120	90-220	300-800	-	50-100	15-40
	Die Cast Aluminum	356AL, 390AL	As Cast	~150		45-130	65-90	75-110	55-120	40-65	50-110	70-120	90-220	70-120	90-220	200-700	-	50-80	20-35
S	Nickel Based Alloy	Inconel 718, 625	Annealed	253~301	25~32	-	8-12	8-10	-	8-15	-	-	-	-	-	-	-	10-20	-
		Inconel 718	Hardened	327~390	35~42	-	8-10	-	-	8-15	-	-	-	-	-	-	-	10-20	-
		Hastelloy, Waspaloy	Normalized		25~40	-	-	-	-	8-15	-	-	-	-	-	-	-	10-20	-
		Kovar	Normalized		25~40	-	-	-	-	8-15	-	-	-	-	-	-	-	10-20	-
	Titanium Alloy	6Al4V	Annealed	253~301	25~32	-	8-15	8-10	-	15-20	-	-	-	-	-	-	-	20-30	-
		6Al4V, 6Al6V	Hardened	327~390	35~42	-	8-12	-	-	3-10	-	-	-	-	-	-	-	5-12	-
H	Tool Steel	D2, H13, P20, S7	Annealed	190~253	10~25	20-45	15-50	20-65	25-60	15-35	20-60	30-55	50-110	40-65	60-120	-	-	20-50	10-20
		H13	Hardened	327~450	35~48	10-15	12-25	20-35	15-30	8-15	15-50	-	-	20-50	30-80	-	-	10-20	8-12
		D2, A2	Hardened		48~55	-	-	-	-	3-10	-	-	-	15-40	25-75	-	5-12	5-12	-
		D2, A2	Hardened		55~70	-	-	-	-	3-8	-	-	-	-	-	-	3-10	3-10	-
Other	MMC					-	-	-	-	-	-	-	-	-	-	-	30-60	-	
	Copper Alloys					-	-	-	-	-	-	-	-	-	-	-	40-330	-	
	Fiberglass					-	-	-	-	-	-	-	-	-	-	-	30-60	-	
	Cobalt-Chrome					-	-	-	-	-	-	-	-	-	-	-	15-60	-	

In the above chart, if a product shows a recommended speed range then it is recommended for that material. More detailed application recommendations are available on pages 338-357 in the 2018/19 Cutting Tool Solutions catalog. For thread mill speeds please refer to pages 677-681 in the 2018/19 Cutting Tool Solutions catalog. For conversions to RPM please refer to page 652 in the 2018/19 Cutting Tool Solutions catalog.

