GARR TOOL Drilling Guide

Metric

Type	Rc Hardness	RECOMMENDED M/Min. BY SERIES			
		1100, 1120	1200, 1205, 1520, 1600, 1400	1500, 1510, 1300	1800H
COBALT BASE ALLOYS					
Powdered Metal, Stellite, Hs-21, Haynes 25/188, X-40, L-605	< 35 > 35	25 - 40 -	30 - 45 25 - 35	30 - 45 25 - 35	- -
NICKEL BASE ALLOYS					
Invar, Kovar, Inconel-625/718, Waspaloy, Rene, Hastelloy, A286	< 35 > 35	30 - 40 -	30 - 45 25 - 40	40 - 50 25 - 40	- -
IRON BASE ALLOYS					
Incoloy 800-802, Multimet N-155, Timkin 16-25-6, Carpenter 22-b3	< 35 > 35	30 - 40 -	40 - 50 30 - 40	40 - 50 30 - 45	- -
MONEL					
Monel - 65% Nickel		-	30 - 45	30 - 45	-
TITANIUM ALLOYS					
Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si		-	45 - 60	45 - 60	-
STAINLESS STEELS					
(Precipitation) 13/8, 15/5, 17-4, pH Types	< 35 > 35	-	40 - 50 25 - 40	45 - 60 30 - 45	- -
(Austentic) Inox, 200 Series, 300 Series	< 35 > 35	-	30 - 50 30 - 40	45 - 60 40 - 45	- -
(Austentic) 304L, 316L, Nitronic 50, Inox	< 35 > 35	-	25 - 30 20 - 30	30 - 40 25 - 30	- -
(Martensitic) 400 Series	< 35 > 35	-	30 - 45 25 - 40	40 - 55 30 - 45	- -
HIGH STRENGTH TOOL STEELS					
4140, 4340, 6150, 5210, A2, D2, P20, H11, H13, S2, O1	< 35 35 - 50	- -	30 - 55 25 - 40	40 - 55 25 - 40	- -
Thompson Shaft, Armor Plate (Class 1)	> 50	-	-	20 - 30	- -
MEDIUM ALLOY TOOL STEELS					
200, 250, 300, 8620	< 35 > 35	-	40 - 55 30 - 45	40 - 55 30 - 45	- -
CARBON STEELS					
Platinum, A36, 12L14, 1000's, 1100's, 1300's	< 35 > 35	-	40 - 55 30 - 40	45 - 60 30 - 55	- -
CAST MATERIAL					
Steel		45 - 60	40 - 55	-	-
Ductile Iron		60 - 120	40 - 60	45 - 75	-
Gray Iron		50 - 90	30 - 60	45 - 75	-
Aluminum		60 - 120	45 - 70	-	70 - 120
ALUMINUM					
Aircraft Grade (6061, 7075)		-	75 - 100	-	70 - 120
MAGNESIUM					
		-	60 - 90	-	60 - 120
COPPER					
Copper Alloys		-	45 - 70	-	-
BRASS, BRONZE					
Brass, Aluminum/Bronze, Low Silicon Bronze		- -	45 - 90 40 - 60	- -	60 - 120 60 - 120
COMPOSITE MATERIAL					
Glass Epoxy, Fiberglass, Plastics, Graphite, G10		60	45 - 90	45 - 90	-

NOTE - ABOVE ARE STARTING PARAMETERS ONLY. HIGHER RESULTS MAY BE ACHIEVED WITH OPTIMUM CONDITIONS.

Type	Rc Hardness	CHIPLOAD PER FLUTE (Fz)				
		2.0 - 3.0	3.0 - 6.0	6.0 - 10.0	10.0 - 13.0	13.0 - 16.0
COBALT BASE ALLOYS						
Powdered Metal, Stellite, Hs-21, Haynes 25/188, X-4. L-605	< 35	.010 - .025	.020 - .050	.040 - .065	.050 - .100	.065 - .125
	> 35	.010 - .025	.013 - .025	.025 - .040	.025 - .050	.040 - .075
NICKEL BASE ALLOYS						
Invar, Kovar, Inconel-625/718, Waspaloy, Rene, Hastelloy, A286	< 35	.013 - .040	.025 - .040	.040 - .065	.050 - .100	.065 - .125
	> 35	.010 - .025	.020 - .040	.025 - .040	.040 - .075	.050 - .100
IRON BASE ALLOYS						
Incoloy 800-802, Multimet N-155, Timkin 16-25-6, Carpenter 22-b3	< 35	.025 - .040	.025 - .050	.040 - .090	.050 - .100	.075 - .150
	> 35	.020 - .040	.025 - .050	.040 - .065	.040 - .075	.065 - .125
MONEL						
Monel - 65% Nickel		.010 - .025	.020 - .040	.025 - .040	.040 - .075	.050 - .100
TITANIUM ALLOYS						
Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si		.020 - .040	.025 - .050	.040 - .075	.050 - .100	.065 - .125
STAINLESS STEELS						
(Precipitation) 13/8, 15/5, 17-4, pH Types	< 35	.013 - .040	.025 - .050	.040 - .090	.050 - .100	.065 - .125
	> 35	.010 - .025	.020 - .040	.025 - .040	.040 - .075	.050 - .100
(Austentic) Inox, 200 Series, 300 Series	< 35	.013 - .040	.025 - .050	.040 - .090	.050 - .100	.065 - .125
	> 35	.010 - .025	.020 - .040	.025 - .040	.040 - .075	.050 - .100
(Austentic) 304L, 316L, Nitronic 50, Inox	< 35	.010 - .025	.020 - .040	.025 - .040	.040 - .075	.050 - .100
	> 35	.008 - .020	.013 - .025	.025 - .040	.025 - .050	.040 - .075
(Martensitic) 400 Series	< 35	.013 - .040	.025 - .050	.040 - .090	.050 - .100	.065 - .125
	> 35	.010 - .025	.020 - .040	.025 - .040	.040 - .075	.050 - .100
HIGH STRENGTH TOOL STEELS						
4140, 4340, 6150, 5210, A2, D2, P20, H11, H13, S2, O1	< 35	.013 - .040	.025 - .050	.040 - .065	.050 - .100	.075 - .125
	35 - 50	.010 - .025	.020 - .050	.025 - .050	.030 - .075	.040 - .100
Thompson Shaft, Armor Plate (Class 1)	> 50	.008 - .020	.010 - .030	.015 - .040	.020 - .060	.030 - .080
MEDIUM ALLOY TOOL STEELS						
200, 250, 300, 8620	< 35	.025 - .040	.040 - .065	.050 - .075	.050 - .100	.065 - .125
	> 35	.013 - .040	.025 - .050	.025 - .065	.040 - .075	.050 - .100
CARBON STEELS						
Platinum, A36, 12L14, 1000's, 1100's, 1300's	< 35	.025 - .040	.040 - .065	.050 - .075	.050 - .100	.065 - .125
	> 35	.013 - .040	.025 - .050	.025 - .065	.040 - .090	.050 - .100
CAST MATERIAL						
Steel		.020 - .040	.025 - .050	.040 - .075	.050 - .100	.065 - .125
Ductile Iron		.025 - .050	.025 - .075	.040 - .090	.065 - .100	.075 - .125
Gray Iron		.025 - .050	.025 - .075	.040 - .090	.065 - .100	.075 - .125
Aluminum		.025 - .050	.025 - .100	.050 - .125	.075 - .150	.090 - .180
ALUMINUM						
Aircraft Grade (6061, 7075)		.025 - .050	.025 - .100	.050 - .125	.075 - .150	.090 - .180
MAGNESIUM						
		.025 - .050	.025 - .075	.040 - .090	.065 - .100	.075 - .125
COPPER						
Copper Alloys		.025 - .050	.025 - .075	.040 - .090	.065 - .100	.075 - .125
BRASS, BRONZE						
Brass, Aluminum/Bronze, Low Silicon Bronze		.025 - .050	.025 - .075	.040 - .090	.065 - .100	.075 - .125
		.020 - .040	.025 - .050	.040 - .075	.050 - .100	.065 - .125
COMPOSITE MATERIAL						
Glass Epoxy, Fiberglass, Plastics, Graphite, G10		.015 - .040	.020 - .050	.025 - .065	.040 - .075	.050 - .100

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