

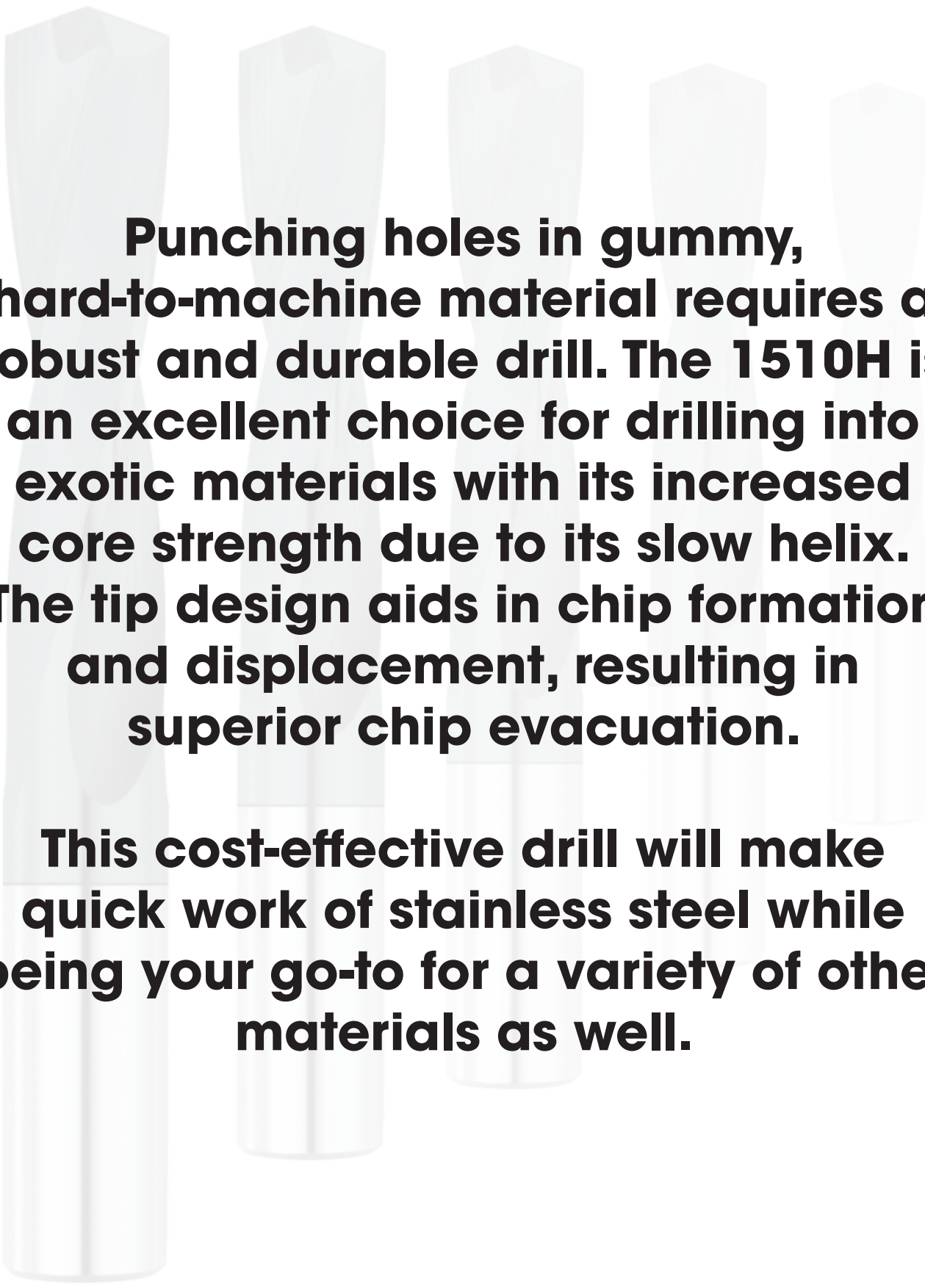


VERSATILE USE in several materials including Stainless Steels, Alloys, and Super Alloys

Uso VERSÁTIL en varios materiales incluyendo Aceros Inoxidables, Aleaciones y Súper Aleaciones

Sử dụng linh hoạt trong một số vật liệu bao gồm Thép không gỉ, hợp kim và siêu hợp kim

1510H



Punching holes in gummy, hard-to-machine material requires a robust and durable drill. The 1510H is an excellent choice for drilling into exotic materials with its increased core strength due to its slow helix. The tip design aids in chip formation and displacement, resulting in superior chip evacuation.

This cost-effective drill will make quick work of stainless steel while being your go-to for a variety of other materials as well.

Series 1510H

.0625" - .1575"
(1.588mm - 4.000mm)



TECH
PAGES
302-305

TOLERANCES

d	+.0000" - .0005" (+.0000 - .0127mm)	
l ₁	≤ 1/8"	+.125" - .062" (+3.175 - 1.588mm)
	> 1/8"	+.125" - .125" (+3.175 - 3.175mm)
l ₂	≤ 1/8"	+.125" - .062" (+3.175 - 1.588mm)
	> 1/8"	+.125" - .125" (+3.175 - 3.175mm)

Recommended for titanium, inconel, hastelloy, waspaloy, and stainless steel

Slow Helix

Hardlube Coating

Solid submicron grain carbide drill

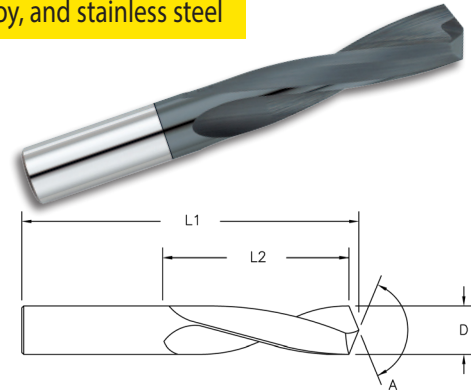
Excellent heat resistance and lubricity

Heavy web for extra rigidity and added strength

Thinned point

Live tooling recommended on lathe processes

Uncoated - page 59



EDP#	d †		l ₁	l ₂	1-11	12-24	25-49	50-100
	Decimal	Diameter						
19071	.0625	1/16"	1.588	1-3/4"	5/8"	9.51	9.10	8.68
19076	.0635	#52	1.613	1-3/4"	11/16"	9.64	9.22	8.80
19081	.0670	#51	1.702	1-3/4"	11/16"	9.74	9.32	8.89
19086	.0700	#50	1.778	1-3/4"	11/16"	9.94	9.50	9.07
19091	.0730	#49	1.854	1-3/4"	11/16"	10.14	9.70	9.26
19096	.0760	#48	1.930	1-3/4"	11/16"	10.40	9.94	9.49
19101	.0781	5/64"	1.984	1-3/4"	11/16"	10.72	10.25	9.79
19106	.0785	#47	1.994	1-3/4"	3/4"	11.01	10.53	10.05
19116	.0787		2.000	45	19	11.14	10.66	10.17
19121	.0810	#46	2.057	1-3/4"	3/4"	11.29	10.80	10.31
19126	.0820	#45	2.083	1-3/4"	3/4"	11.58	11.08	10.57
19131	.0860	#44	2.184	1-3/4"	3/4"	11.88	11.36	10.85
19136	.0890	#43	2.261	1-3/4"	3/4"	12.18	11.65	11.12
19141	.0935	#42	2.375	1-3/4"	3/4"	12.31	11.77	11.24
19146	.0938	3/32"	2.383	1-3/4"	3/4"	12.56	12.01	11.47
19151	.0960	#41	2.438	1-13/16"	13/16"	12.64	12.09	11.54
19156	.0980	#40	2.489	1-13/16"	13/16"	12.79	12.23	11.68
19161	.0984		2.500	46	21	12.86	12.30	11.74
19166	.0995	#39	2.527	1-13/16"	13/16"	12.93	12.36	11.80
19171	.1015	#38	2.578	1-13/16"	13/16"	13.00	12.43	11.87
19176	.1040	#37	2.642	1-13/16"	13/16"	13.08	12.51	11.94
19181	.1065	#36	2.705	1-13/16"	13/16"	13.17	12.60	12.02
19186	.1094	7/64"	2.779	1-13/16"	13/16"	13.25	12.67	12.10
19191	.1100	#35	2.794	1-7/8"	7/8"	13.31	12.73	12.15
19196	.1110	#34	2.819	1-7/8"	7/8"	13.43	12.85	12.26
19201	.1130	#33	2.870	1-7/8"	7/8"	13.51	12.93	12.34
19206	.1160	#32	2.946	1-7/8"	7/8"	13.60	13.01	12.42
19211	.1181		3.000	48	22	13.72	13.12	12.53
19216	.1200	#31	3.048	1-7/8"	7/8"	13.81	13.21	12.61
19221	.1250	1/8"	3.175	1-7/8"	7/8"	13.96	13.35	12.75
19226	.1285	#30	3.264	1-15/16"	15/16"	14.27	13.65	13.03
19231	.1360	#29	3.454	1-15/16"	15/16"	14.58	13.95	13.31
19236	.1378		3.500	49	24	15.00	14.34	13.69
19241	.1405	#28	3.569	1-15/16"	15/16"	15.17	14.51	13.85
19246	.1406	9/64"	3.571	1-15/16"	15/16"	15.28	14.62	13.95
19251	.1440	#27	3.658	2-1/16"	1"	16.48	15.76	15.05
19256	.1470	#26	3.734	2-1/16"	1"	16.63	15.91	15.18
19261	.1495	#25	3.797	2-1/16"	1"	16.82	16.09	15.36
19266	.1520	#24	3.861	2-1/16"	1"	16.85	16.12	15.38
19271	.1540	#23	3.912	2-1/16"	1"	16.94	16.20	15.47
19276	.1562	5/32"	3.967	2-1/16"	1"	17.03	16.29	15.55
19281	.1570	#22	3.988	2-1/8"	1-1/16"	17.96	17.18	16.40
19286	.1575		4.000	54	27	18.16	17.37	16.58

EDP#	d^+ Diameter		l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100
	Decimal	Metric						
19291	.1590	#21	4.039	2-1/8"	1-1/16"	18.37	17.57	16.77
19296	.1610	#20	4.089	2-1/8"	1-1/16"	18.50	17.70	16.89
19301	.1660	#19	4.216	2-1/8"	1-1/16"	19.16	18.33	17.49
19306	.1695	#18	4.305	2-1/8"	1-1/16"	19.37	18.52	17.68
19311	.1719	11/64"	4.366	2-1/8"	1-1/16"	19.72	18.87	18.01
19316	.1730	#17	4.394	2-3/16"	1-1/8"	19.98	19.11	18.24
19321	.1770	#16	4.496	2-3/16"	1-1/8"	20.18	19.31	18.43
19326	.1772		4.500	56	29	20.26	19.38	18.50
19331	.1800	#15	4.572	2-3/16"	1-1/8"	20.34	19.46	18.57
19336	.1820	#14	4.623	2-3/16"	1-1/8"	20.77	19.87	18.96
19341	.1850	#13	4.700	2-3/16"	1-1/8"	20.92	20.01	19.10
19346	.1875	3/16"	4.763	2-3/16"	1-1/8"	20.98	20.06	19.15
19351	.1890	#12	4.801	2-1/4"	1-3/16"	23.07	22.07	21.06
19356	.1910	#11	4.851	2-1/4"	1-3/16"	23.31	22.30	21.28
19361	.1935	#10	4.915	2-1/4"	1-3/16"	24.22	23.17	22.11
19366	.1960	#9	4.978	2-1/4"	1-3/16"	24.76	23.68	22.61
19371	.1969		5.000	57	30	24.87	23.79	22.71
19376	.1990	#8	5.055	2-1/4"	1-3/16"	25.01	23.93	22.84
19381	.2010	#7	5.105	2-1/4"	1-3/16"	25.66	24.54	23.43
19386	.2031	13/64"	5.159	2-1/4"	1-3/16"	25.81	24.68	23.56
19391	.2040	#6	5.182	2-3/8"	1-1/4"	26.28	25.14	23.99
19396	.2055	#5	5.220	2-3/8"	1-1/4"	26.75	25.59	24.42
19401	.2090	#4	5.309	2-3/8"	1-1/4"	27.14	25.96	24.78
19406	.2130	#3	5.410	2-3/8"	1-1/4"	27.57	26.37	25.17
19411	.2165		5.500	60	32	27.76	26.55	25.35
19416	.2188	7/32"	5.558	2-3/8"	1-1/4"	27.93	26.72	25.50
19421	.2210	#2	5.613	2-7/16"	1-5/16"	28.52	27.28	26.04
19426	.2280	#1	5.791	2-7/16"	1-5/16"	28.68	27.43	26.19
19431	.2340	A	5.944	2-7/16"	1-5/16"	28.75	27.50	26.25
19436	.2344	15/64"	5.954	2-7/16"	1-5/16"	28.78	27.53	26.28
19441	.2362		6.000	64	35	28.88	27.62	26.37
19446	.2380	B	6.045	2-1/2"	1-3/8"	28.97	27.71	26.45
19451	.2420	C	6.147	2-1/2"	1-3/8"	29.15	27.89	26.62
19456	.2460	D	6.248	2-1/2"	1-3/8"	29.35	28.07	26.80
19461	.2500	1/4" / E	6.350	2-1/2"	1-3/8"	29.52	28.24	26.95
19466	.2559		6.500	67	37	32.84	31.42	29.99
19471	.2570	F	6.528	2-5/8"	1-7/16"	33.41	31.96	30.50
19476	.2610	G	6.629	2-5/8"	1-7/16"	33.96	32.48	31.01
19481	.2656	17/64"	6.746	2-5/8"	1-7/16"	34.52	33.02	31.52
19486	.2660	H	6.756	2-11/16"	1-1/2"	35.33	33.79	32.26
19491	.2720	I	6.909	2-11/16"	1-1/2"	35.66	34.11	32.56
19496	.2756		7.000	68	38	35.90	34.34	32.78
19501	.2770	J	7.036	2-11/16"	1-1/2"	36.18	34.61	33.03
19506	.2810	K	7.137	2-11/16"	1-1/2"	36.44	34.86	33.27
19511	.2812	9/32"	7.142	2-11/16"	1-1/2"	36.57	34.98	33.39
19516	.2900	L	7.366	2-3/4"	1-9/16"	37.71	36.07	34.43
19521	.2950	M	7.493	2-3/4"	1-9/16"	39.93	38.19	36.46
19526	.2953		7.500	70	40	39.93	38.19	36.46
19531	.2969	19/64"	7.541	2-3/4"	1-9/16"	40.10	38.36	36.61
19536	.3020	N	7.671	2-15/16"	1-5/8"	41.94	40.12	38.29
19541	.3125	5/16"	7.938	2-15/16"	1-5/8"	42.08	40.25	38.42
19546	.3150		8.000	75	43	44.69	42.75	40.80
19551	.3160	O	8.026	2-15/16"	1-11/16"	44.69	42.75	40.80
19556	.3230	P	8.204	2-15/16"	1-11/16"	45.01	43.05	41.10
19561	.3281	21/64"	8.334	2-15/16"	1-11/16"	45.25	43.29	41.32
19566	.3320	Q	8.433	3"	1-11/16"	46.16	44.15	42.15
19571	.3346		8.500	76	43	46.54	44.52	42.49

continued →

Series 1510H (continued)

.3390" - .6299"
(8.611mm - 16.000mm)

EDP#	$d^{\dagger}$ Diameter			l_1 Overall Length	l_2 Flute Length	1-11	12-24	25-49	50-100
	Decimal		Metric						
19576	.3390	R	8.611	3"	1-11/16"	47.79	45.72	43.64	41.56
19581	.3438	11/32"	8.733	3"	1-11/16"	49.50	47.34	45.19	43.04
19586	.3480	S	8.839	3-1/16"	1-3/4"	52.27	50.00	47.72	45.45
19591	.3543		9.000	78	44	52.57	50.28	48.00	45.71
19596	.3580	T	9.093	3-1/16"	1-3/4"	52.69	50.40	48.11	45.82
19601	.3594	23/64"	9.129	3-1/16"	1-3/4"	53.03	50.72	48.42	46.11
19606	.3680	U	9.347	3-1/8"	1-13/16"	57.27	54.78	52.29	49.80
19611	.3740		9.500	79	46	57.73	55.22	52.71	50.20
19616	.3750	3/8"	9.525	3-1/8"	1-13/16"	58.12	55.59	53.07	50.54
19621	.3770	V	9.576	3-1/4"	1-7/8"	60.29	57.67	55.05	52.43
19626	.3860	W	9.804	3-1/4"	1-7/8"	61.35	58.69	56.02	53.35
19631	.3906	25/64"	9.921	3-1/4"	1-7/8"	62.11	59.41	56.71	54.01
19636	.3937		10.000	84	49	64.00	61.22	58.43	55.65
19641	.3970	X	10.084	3-5/16"	1-15/16"	65.62	62.77	59.91	57.06
19646	.4040	Y	10.262	3-5/16"	1-15/16"	66.07	63.20	60.32	57.45
19651	.4062	13/32"	10.317	3-5/16"	1-15/16"	68.08	65.12	62.16	59.20
19656	.4130	Z	10.490	3-3/8"	2"	68.72	65.74	62.75	59.76
19661	.4134		10.500	86	51	68.72	65.74	62.75	59.76
19666	.4219	27/64"	10.716	3-3/8"	2"	69.37	66.35	63.34	60.32
19671	.4331		11.000	87	52	74.52	71.28	68.04	64.80
19676	.4375	7/16"	11.113	3-7/16"	2-1/16"	74.52	71.28	68.04	64.80
19681	.4528		11.500	91	54	80.02	76.54	73.06	69.58
19686	.4531	29/64"	11.509	3-9/16"	2-1/8"	80.02	76.54	73.06	69.58
19691	.4688	15/32"	11.908	3-5/8"	2-1/8"	84.08	80.42	76.77	73.11
19696	.4724		12.000	94	56	84.35	80.69	77.02	73.35
19701	.4844	31/64"	12.304	3-11/16"	2-3/16"	84.93	81.24	77.54	73.85
19706	.4921		12.500	95	56	85.79	82.06	78.33	74.60
19711	.5000	1/2"	12.700	3-3/4"	2-1/4"	86.34	82.59	78.83	75.08
19716	.5118		13.000	107	60	114.33	109.36	104.39	99.42
19721	.5156	33/64"	13.096	4-1/4"	2-3/8"	117.02	111.94	106.85	101.76
19726	.5312	17/32"	13.492	4-1/4"	2-3/8"	119.72	114.51	109.31	104.10
19731	.5315		13.500	107	60	122.41	117.08	111.76	106.44
19736	.5469	35/64"	13.891	4-1/4"	2-3/8"	125.09	119.65	114.21	108.77
19741	.5512		14.000	107	60	127.81	122.25	116.70	111.14
19746	.5625	9/16"	14.287	4-1/2"	2-1/2"	138.13	132.12	126.12	120.11
19751	.5709		14.500	115	65	140.71	134.60	128.48	122.36
19756	.5781	37/64"	14.683	4-1/2"	2-1/2"	143.30	137.07	130.84	124.61
19761	.5906		15.000	115	65	145.92	139.58	133.23	126.89
19766	.5938	19/32"	15.082	4-1/2"	2-1/2"	146.69	140.32	133.94	127.56
19771	.6094	39/64"	15.478	4-1/2"	2-1/2"	147.44	141.03	134.62	128.21
19776	.6102		15.500	115	65	148.20	141.76	135.31	128.87
19781	.6250	5/8"	15.875	4-1/2"	2-1/2"	148.96	142.48	136.01	129.53
19786	.6299		16.000	115	65	152.56	145.93	139.29	132.66

GARR TOOL Drilling Guide

Fractional

Type	Rc Hardness	RECOMMENDED SFM 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	80 - 120	100 - 150	100 - 150	-
	> 35	-	80 - 110	80 - 110	-
NICKEL BASE ALLOYS					
Invar, Kovar, Inconel-625/718, Waspaloy, Rene, Hastelloy, A286	< 35	100 - 125	100 - 150	125 - 175	-
	> 35	-	90 - 125	90 - 125	-
IRON BASE ALLOYS					
Incoloy 800-802, Multimet N-155, Timkin 16-25-6, Carpenter 22-b3	< 35	100 - 125	100 - 150	125 - 175	-
	> 35	-	90 - 125	90 - 150	-
MONEL					
Monel - 65% Nickel		-	100 - 150	100 - 150	-
TITANIUM ALLOYS					
Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si		125 - 175	150 - 200	150 - 200	-
STAINLESS STEELS					
(Precipitation) 13/8, 15/5, 17-4, pH Types	< 35	-	125 - 175	150 - 200	-
	> 35	-	80 - 125	100 - 150	-
(Austentic) Inox, 200 Series, 300 Series	< 35	-	100 - 175	150 - 200	-
	> 35	-	100 - 125	125 - 150	-
(Austentic) 304L, 316L, Nitronic 50, Inox	< 35	-	80 - 100	90 - 125	-
	> 35	-	60 - 90	80 - 100	-
(Martensitic) 400 Series	< 35	-	100 - 150	125 - 175	-
	> 35	-	80 - 125	100 - 140	-
HIGH STRENGTH TOOL STEELS					
4140, 4340, 6150, 5210, A2, D2, P20, H11, H13, S2, O1	< 35	-	100 - 175	125 - 175	-
	35 - 50	-	80 - 130	80 - 130	-
Thompson Shaft, Armor Plate (Class 1)	> 50	-	-	70 - 90	-
MEDIUM ALLOY TOOL STEELS					
200, 250, 300, 8620	< 35	-	125 - 175	125 - 175	-
	> 35	-	100 - 150	100 - 150	-
CARBON STEELS					
Platinum, A36, 12L14, 1000's, 1100's, 1300's	< 35	-	125 - 175	150 - 200	-
	> 35	-	100 - 125	100 - 175	-
CAST MATERIAL					
Steel		150 - 200	125 - 175	-	-
Ductile Iron		200 - 400	125 - 200	150 - 250	-
Gray Iron		175 - 300	100 - 200	150 - 250	-
Aluminum		200 - 400	150 - 250	-	250 - 400
ALUMINUM					
Aircraft Grade (6061, 7075)		-	250 - 350	-	250 - 400
MAGNESIUM					
		-	200 - 300	-	200 - 400
COPPER					
Copper Alloys		-	150 - 250	-	-
BRASS, BRONZE					
Brass, Aluminum/Bronze, Low Silicon Bronze		-	150 - 300	-	200 - 400
		-	125 - 200	-	200 - 400
COMPOSITE MATERIAL					
Glass Epoxy, Fiberglass, Plastics, Graphite, G10		200	150 - 300	150 - 300	-

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

Type	Rc Hardness	CHIPLOAD PER FLUTE (Fz)				
		1/16" - 1/8"	1/8" - 1/4"	1/4" - 3/8"	3/8" - 1/2"	1/2" - 5/8"
COBALT BASE ALLOYS						
Powdered Metal, Stellite, Hs-21, Haynes 25/188, X-40, L-605	< 35	.0004" - .0010"	.0008" - .0020"	.0015" - .0025"	.0020" - .0040"	.0025" - .0050"
	> 35	.0004" - .0010"	.0005" - .0010"	.0010" - .0015"	.0010" - .0020"	.0015" - .0030"
NICKEL BASE ALLOYS						
Invar, Kovar, Inconel-625/718, Waspaloy, Rene, Hastelloy, A286	< 35	.0005" - .0015"	.0010" - .0015"	.0015" - .0025"	.0020" - .0040"	.0025" - .0050"
	> 35	.0004" - .0010"	.0008" - .0015"	.0010" - .0015"	.0015" - .0030"	.0020" - .0040"
IRON BASE ALLOYS						
Incoloy 800-802, Multimet N-155, Timkin 16-25-6, Carpenter 22-b3	< 35	.0010" - .0015"	.0010" - .0020"	.0015" - .0035"	.0020" - .0050"	.0030" - .0060"
	> 35	.0008" - .0015"	.0010" - .0020"	.0015" - .0025"	.0020" - .0040"	.0025" - .0050"
MONEL						
Monel - 65% Nickel		.0004" - .0010"	.0008" - .0015"	.0010" - .0015"	.0015" - .0030"	.0020" - .0040"
TITANIUM ALLOYS						
Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si		.0008" - .0015"	.0010" - .0020"	.0015" - .0030"	.0020" - .0040"	.0025" - .0050"
STAINLESS STEELS						
(Precipitation) 13/8, 15/5, 17-4, pH Types	< 35	.0005" - .0015"	.0010" - .0020"	.0015" - .0035"	.0020" - .0040"	.0025" - .0050"
	> 35	.0004" - .0010"	.0008" - .0015"	.0010" - .0015"	.0015" - .0030"	.0020" - .0040"
(Austenitic) Inox, 200 Series, 300 Series	< 35	.0005" - .0015"	.0010" - .0020"	.0015" - .0035"	.0020" - .0040"	.0025" - .0050"
	> 35	.0004" - .0010"	.0008" - .0015"	.0010" - .0015"	.0015" - .0030"	.0020" - .0040"
(Austenitic) 304L, 316L, Nitronic 50, Inox	< 35	.0004" - .0010"	.0008" - .0015"	.0010" - .0015"	.0015" - .0030"	.0020" - .0040"
	> 35	.0003" - .0008"	.0005" - .0010"	.0010" - .0015"	.0010" - .0020"	.0015" - .0030"
(Martensitic) 400 Series	< 35	.0005" - .0015"	.0010" - .0020"	.0015" - .0035"	.0020" - .0040"	.0025" - .0050"
	> 35	.0004" - .0010"	.0008" - .0015"	.0010" - .0015"	.0015" - .0030"	.0020" - .0040"
HIGH STRENGTH TOOL STEELS						
4140, 4340, 6150, 5210, A2, D2, P20, H11, H13, S2, O1	< 35	.0005" - .0015"	.0010" - .0020"	.0015" - .0025"	.0015" - .0030"	.0020" - .0040"
	35 - 50	.0004" - .0010"	.0008" - .0020"	.0010" - .0020"	.0015" - .0030"	.0020" - .0040"
Thompson Shaft, Armor Plate (Class 1)	> 50	.0003" - .0006"	.0005" - .0010"	.0008" - .0015"	.0010" - .0020"	.0015" - .0030"
MEDIUM ALLOY TOOL STEELS						
200, 250, 300, 8620	< 35	.0010" - .0015"	.0015" - .0025"	.0020" - .0030"	.0020" - .0040"	.0025" - .0050"
	> 35	.0005" - .0010"	.0010" - .0020"	.0010" - .0025"	.0015" - .0030"	.0020" - .0040"
CARBON STEELS						
Platinum, A36, 12L14, 1000's, 1100's, 1300's	< 35	.0010" - .0015"	.0015" - .0025"	.0020" - .0030"	.0020" - .0040"	.0025" - .0050"
	> 35	.0005" - .0010"	.0010" - .0020"	.0010" - .0025"	.0015" - .0035"	.0020" - .0040"
CAST MATERIAL						
Steel		.0008" - .0015"	.0010" - .0020"	.0015" - .0030"	.0020" - .0040"	.0025" - .0050"
Ductile Iron		.0010" - .0020"	.0010" - .0030"	.0015" - .0035"	.0025" - .0040"	.0030" - .0050"
Gray Iron		.0010" - .0020"	.0010" - .0030"	.0015" - .0035"	.0025" - .0040"	.0030" - .0050"
Aluminum		.0010" - .0020"	.0015" - .0040"	.0020" - .0050"	.0030" - .0060"	.0035" - .0070"
ALUMINUM						
Aircraft Grade (6061, 7075)		.0010" - .0020"	.0015" - .0040"	.0020" - .0050"	.0030" - .0060"	.0035" - .0070"
MAGNESIUM						
		.0010" - .0020"	.0010" - .0030"	.0015" - .0035"	.0025" - .0040"	.0030" - .0050"
COPPER						
Copper Alloys		.0010" - .0020"	.0010" - .0030"	.0015" - .0035"	.0025" - .0040"	.0030" - .0050"
BRASS, BRONZE						
Brass, Aluminum/Bronze, Low Silicon Bronze		.0010" - .0020"	.0010" - .0030"	.0015" - .0035"	.0025" - .0040"	.0030" - .0050"
		.0008" - .0015"	.0010" - .0020"	.0015" - .0030"	.0020" - .0040"	.0025" - .0050"
COMPOSITE MATERIAL						
Glass Epoxy, Fiberglass, Plastics, Graphite, G10		.0006" - .0015"	.0008" - .0020"	.0010" - .0025"	.0015" - .0030"	.0020" - .0040"

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

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	25 - 40	30 - 45	30 - 45	-
	> 35	-	25 - 35	25 - 35	-
NICKEL BASE ALLOYS					
Invar, Kovar, Inconel-625/718, Waspaloy, Rene, Hastelloy, A286	< 35	30 - 40	30 - 45	40 - 50	-
	> 35	-	25 - 40	25 - 40	-
IRON BASE ALLOYS					
Incoloy 800-802, Multimet N-155, Timkin 16-25-6, Carpenter 22-b3	< 35	30 - 40	40 - 50	40 - 50	-
	> 35	-	30 - 40	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)	< 35	-	40 - 50	45 - 60	-
13/8, 15/5, 17-4, pH Types	> 35	-	25 - 40	30 - 45	-
(Austenitic)	< 35	-	30 - 50	45 - 60	-
Inox, 200 Series, 300 Series	> 35	-	30 - 40	40 - 45	-
(Austenitic)	< 35	-	25 - 30	30 - 40	-
304L, 316L, Nitronic 50, Inox	> 35	-	20 - 30	25 - 30	-
(Martensitic)	< 35	-	30 - 45	40 - 55	-
400 Series	> 35	-	25 - 40	30 - 45	-
HIGH STRENGTH TOOL STEELS					
4140, 4340, 6150, 5210, A2, D2, P20, H11, H13, S2, O1	< 35	-	30 - 55	40 - 55	-
	35 - 50	-	25 - 40	25 - 40	-
Thompson Shaft, Armor Plate (Class 1)	> 50	-	-	20 - 30	-
MEDIUM ALLOY TOOL STEELS					
200, 250, 300, 8620	< 35	-	40 - 55	40 - 55	-
	> 35	-	30 - 45	30 - 45	-
CARBON STEELS					
Platinum, A36, 12L14, 1000's, 1100's, 1300's	< 35	-	40 - 55	45 - 60	-
	> 35	-	30 - 40	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	-	60 - 120
		-	40 - 60	-	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
(Austenitic) 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
(Austenitic) 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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1550H, 1250H,
1850H

1580HD

1580H, 1280H

1580KD, 1280KD

1580KH, 1280KH,
1880KH

1520H, 1205H

1120H, 1100H

**Other recommended DRILLS for
Inconel and High Nickel Alloys**

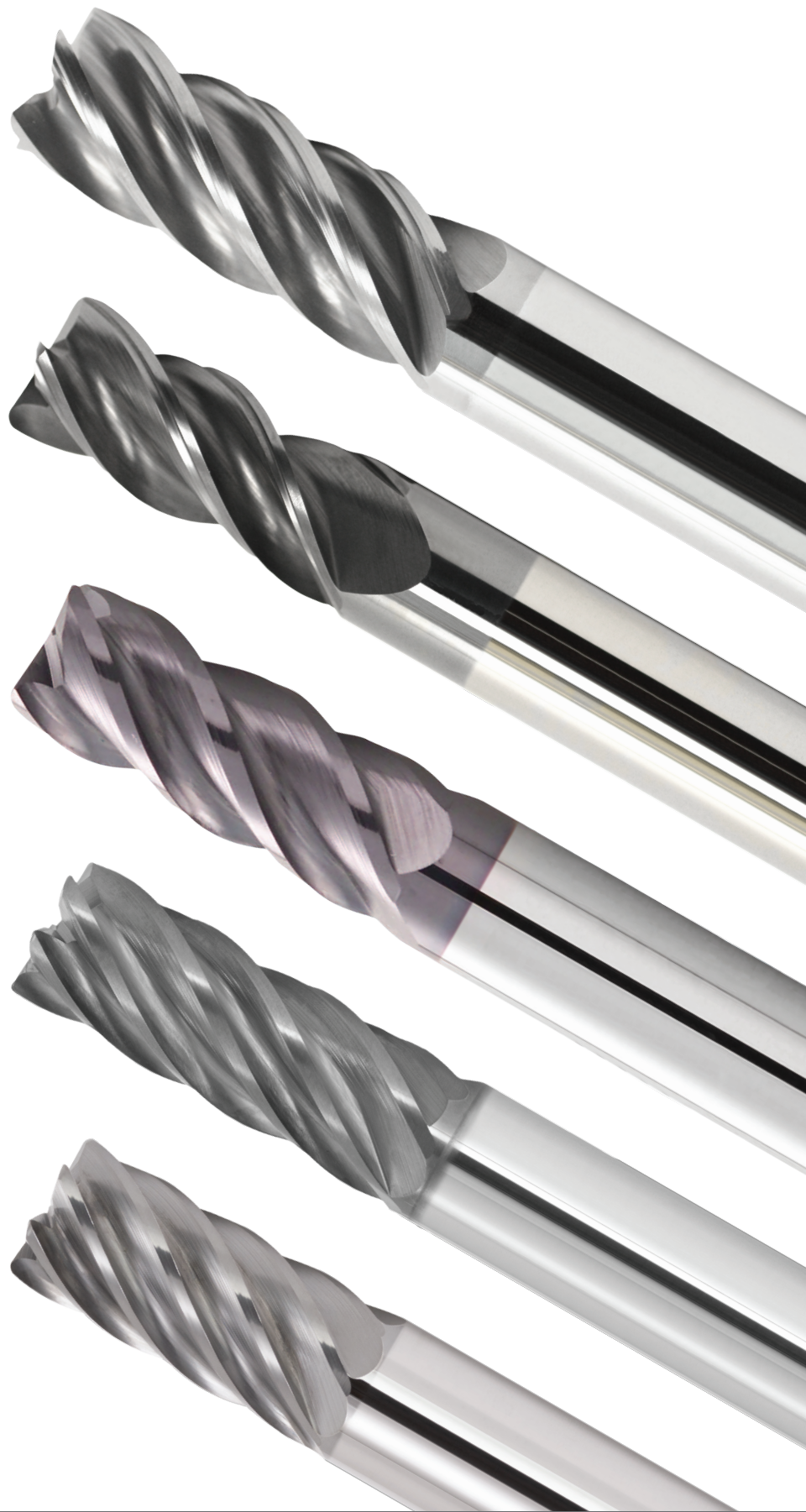
V5

V4

VRX

VRX-6

VX-7



**Recommended END MILLS for
Inconel and High Nickel Alloys**

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