GARR TOOL High Performance Drilling Guide

Fractional - Mini Drills

Type	Rc Hardness	Recommended SFM	CHIPLOAD PER FLUTE (Fz)		
		Series 1250H 1550H 1850H	1/32" - 0.99mm (.0312" - .0390")	1.00mm - 2.00mm (.0394" - .0787")	2.01mm - 1/8" (.0791" - .1250")
COBALT BASE ALLOYS					
Powdered Metal, Stellite, Hs-21, Haynes 25/188, X-40, L-605	< 35 > 35	100 - 150 80 - 110	.0002" - .0004" .0002" - .0004"	.0004" - .0008" .0003" - .0006"	.0006" - .0012" .0005" - .0010"
NICKEL BASE ALLOYS					
Invar, Kovar, Inconel-625/718, Waspalloy, Rene, Hastalloy, A286	< 35 > 35	125 - 150 100 - 125	.0003" - .0005" .0002" - .0004"	.0004" - .0008" .0003" - .0006"	.0006" - .0012" .0005" - .0010"
IRON BASE ALLOYS					
Incoloy 800-802, Multimet N-155, Timkin 16-25-6, Carpenter 22-b3	< 35 > 35	125 - 175 80 - 100	.0004" - .0008" .0003" - .0006"	.0006" - .0012" .0004" - .0008"	.0008" - .0015" .0006" - .0012"
MONEL					
Monel - 65% Nickel		75 - 125	.0002" - .0004"	.0003" - .0006"	.0005" - .0010"
TITANIUM ALLOYS					
Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si		150 - 200	.0003" - .0006"	.0004" - .0008"	.0006" - .0012"
STAINLESS STEELS					
(Precipitation) 13/8, 15/5, 17-4, pH Types	< 35 > 35	125 - 175 80 - 125	.0003" - .0005" .0002" - .0004"	.0004" - .0008" .0003" - .0006"	.0006" - .0012" .0005" - .0010"
(Austentic) Inox, 200 Series, 300 Series	< 35 > 35	100 - 175 80 - 125	.0003" - .0005" .0002" - .0004"	.0004" - .0008" .0003" - .0006"	.0006" - .0012" .0005" - .0010"
(Austentic) 304L, 316L, Nitronic 50, Inox	< 35 > 35	80 - 100 60 - 90	.0003" - .0005" .0002" - .0004"	.0004" - .0008" .0003" - .0006"	.0006" - .0012" .0005" - .0010"
(Martensitic) 400 Series	< 35 > 35	100 - 150 80 - 125	.0003" - .0005" .0002" - .0004"	.0004" - .0008" .0003" - .0006"	.0006" - .0012" .0005" - .0010"
HIGH STRENGTH TOOL STEELS					
4140, 4340, 6150, 5210, A2, D2, P20, H11, H13, S2, O1	< 35 35-48 > 48	100 - 175 80 - 130 60 - 80	.0003" - .0006" .0002" - .0005" .0002" - .0004"	.0004" - .0008" .0003" - .0008" .0003" - .0006"	.0006" - .0012" .0006" - .0012" .0005" - .0010"
MEDIUM ALLOY TOOL STEELS					
200, 250, 300, 8620	< 35 > 35	125 - 175 80 - 125	.0004" - .0008" .0003" - .0005"	.0006" - .0012" .0004" - .0008"	.0008" - .0015" .0006" - .0012"
CARBON STEELS					
Platinum, A36, 12L14, 1000's, 1100's, 1300's	< 35 > 35	125 - 175 80 - 125	.0004" - .0008" .0003" - .0005"	.0006" - .0012" .0004" - .0008"	.0008" - .0015" .0006" - .0012"
CAST MATERIAL					
Steel		100 - 175	.0003" - .0006"	.0004" - .0008"	.0006" - .0012"
Ductile Iron		100 - 200	.0004" - .0008"	.0006" - .0012"	.0008" - .0015"
Gray Iron		80 - 175	.0004" - .0008"	.0006" - .0012"	.0008" - .0015"
Aluminum		100 - 250	.0004" - .0008"	.0006" - .0012"	.0008" - .0015"
ALUMINUM					
2014, 2024, 6061-(T1-T6), 7075, Extruded		125 - 300	.0004" - .0008"	.0006" - .0012"	.0008" - .0015"
MAGNESIUM					
		125 - 250	.0004" - .0008"	.0006" - .0012"	.0008" - .0015"
COPPER					
Copper Alloys		125 - 250	.0004" - .0008"	.0006" - .0012"	.0008" - .0015"
BRASS					
Short Chips Long Chips		125 - 250 100 - 200	.0004" - .0008" .0003" - .0005"	.0006" - .0012" .0004" - .0008"	.0008" - .0015" .0006" - .0012"
BRONZE					
Short Chips Long Chips		100 - 250 80 - 175	.0004" - .0008" .0003" - .0006"	.0006" - .0012" .0004" - .0008"	.0008" - .0015" .0006" - .0012"

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

GARR TOOL High Performance Drilling Guide
Mini Drills - *Metric*

Type	Rc Hardness	Recommended M/Min. Series 1250H 1550H 1850H	CHIPLOAD PER FLUTE (Fz) 1/32" - 0.99mm (.0312" - .0390")	1.00mm - 2.00mm (.0394" - .0787")	2.01mm - 1/8" (.0791" - .1250")
COBALT BASE ALLOYS					
Powdered Metal, Stellite, Hs-21, Haynes 25/188, X-40, L-605	< 35 > 35	30 - 45 25 - 35	.005 - .010 .005 - .010	.010 - .020 .008 - .015	.015 - .030 .013 - .025
NICKEL BASE ALLOYS					
Invar, Kovar, Inconel-625/718, Waspalloy, Rene, Hastalloy, A286	< 35 > 35	40 - 45 30 - 40	.008 - .013 .005 - .010	.010 - .020 .008 - .015	.015 - .030 .013 - .025
IRON BASE ALLOYS					
Incoloy 800-802, Multimet N-155, Timkin 16-25-6, Carpenter 22-b3	< 35 > 35	40 - 50 25 - 30	.010 - .020 .008 - .015	.015 - .030 .010 - .020	.020 - .038 .015 - .030
MONEL					
Monel - 65% Nickel		20 - 40	.005 - .010	.008 - .015	.013 - .025
TITANIUM ALLOYS					
Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si		45 - 60	.008 - .015	.010 - .020	.015 - .030
STAINLESS STEELS					
(Precipitation) 13/8, 15/5, 17-4, pH Types	< 35 > 35	40 - 50 25 - 40	.008 - .013 .005 - .010	.010 - .020 .008 - .015	.015 - .030 .013 - .025
(Austentic) Inox, 200 Series, 300 Series	< 35 > 35	30 - 50 25 - 40	.008 - .013 .005 - .010	.010 - .020 .008 - .015	.015 - .030 .013 - .025
(Austentic) 304L, 316L, Nitronic 50, Inox	< 35 > 35	25 - 30 20 - 25	.008 - .013 .005 - .010	.010 - .020 .008 - .015	.015 - .030 .013 - .025
(Martensitic) 400 Series	< 35 > 35	30 - 45 25 - 40	.008 - .013 .005 - .010	.010 - .020 .008 - .015	.015 - .030 .013 - .025
HIGH STRENGTH TOOL STEELS					
4140, 4340, 6150, 5210, A2, D2, P20, H11, H13, S2, O1	< 35 35-48 > 48	30 - 50 25 - 40 20 - 25	.008 - .015 .005 - .013 .005 - .010	.010 - .020 .008 - .020 .008 - .015	.015 - .030 .015 - .030 .013 - .025
MEDIUM ALLOY TOOL STEELS					
200, 250, 300, 8620	< 35 > 35	40 - 50 25 - 40	.010 - .020 .008 - .013	.015 - .030 .010 - .020	.020 - .038 .015 - .030
CARBON STEELS					
Platinum, A36, 12L14, 1000's, 1100's, 1300's	< 35 > 35	40 - 50 25 - 40	.010 - .020 .008 - .013	.015 - .030 .010 - .020	.020 - .038 .015 - .030
CAST MATERIAL					
Steel		30 - 50	.008 - .015	.010 - .020	.015 - .030
Ductile Iron		30 - 60	.010 - .020	.015 - .030	.020 - .038
Gray Iron		25 - 50	.010 - .020	.015 - .030	.020 - .038
Aluminum		30 - 75	.010 - .020	.015 - .030	.020 - .038
ALUMINUM					
2014, 2024, 6061-(T1-T6), 7075, Extruded		40 - 90	.010 - .020	.015 - .030	.020 - .038
MAGNESIUM					
		40 - 75	.010 - .020	.015 - .030	.020 - .038
COPPER					
Copper Alloys		40 - 75	.010 - .020	.015 - .030	.020 - .038
BRASS					
Short Chips Long Chips		40 - 75 30 - 60	.010 - .020 .008 - .013	.015 - .030 .010 - .020	.020 - .038 .015 - .030
BRONZE					
Short Chips Long Chips		30 - 75 25 - 50	.010 - .020 .008 - .015	.015 - .030 .010 - .020	.020 - .038 .015 - .030

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GARR TOOL High Performance Drilling Guide

Fractional

Type	Rc Hardness	Recommended SFM		CHIPLOAD PER FLUTE (Fz)				
		NON-COOLANT	*COOLANT FED*					
		1580H 1280H 1580HD	1580KH 1280KH 1880KH 1580KD 1280KD	1/8" - 1/4"	1/4" - 3/8"	3/8" - 1/2"	1/2" - 5/8"	5/8" - 3/4"
COBALT BASE ALLOYS								
Powdered Metal, Stellite, Hs-21, Haynes 25/188, X-40, L-605	< 35	185	225	.0010" - .0020"	.0020" - .0030"	.0025" - .0035"	.0030" - .0040"	.0035" - .0055"
	> 35	125	180	.0005" - .0015"	.0015" - .0025"	.0020" - .0030"	.0025" - .0035"	.0030" - .0045"
NICKEL BASE ALLOYS								
Invar, Kovar, Inconel-625/718, Waspalloy, Rene, Hastalloy, A286	< 35	150	225	.0010" - .0020"	.0020" - .0030"	.0025" - .0035"	.0030" - .0040"	.0035" - .0055"
	> 35	125	180	.0005" - .0015"	.0015" - .0025"	.0020" - .0030"	.0025" - .0035"	.0030" - .0045"
IRON BASE ALLOYS								
Incoloy 800-802, Multimet N-155, Timkin 16-25-6, Carpenter 22-b3	< 35	200	300	.0015" - .0025"	.0025" - .0030"	.0025" - .0035"	.0035" - .0045"	.0035" - .0055"
	> 35	150	240	.0005" - .0015"	.0015" - .0025"	.0025" - .0030"	.0030" - .0035"	.0030" - .0045"
MONEL								
Monel - 65% Nickel		150	225	.0010" - .0020"	.0015" - .0025"	.0020" - .0030"	.0025" - .0035"	.0035" - .0055"
TITANIUM ALLOYS								
Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si		225	350	.0010" - .0020"	.0020" - .0030"	.0025" - .0035"	.0030" - .0040"	.0035" - .0055"
STAINLESS STEELS								
(Precipitation) 13/8, 15/5, 17-4, pH Types	< 35	225	300	.0015" - .0025"	.0025" - .0030"	.0030" - .0035"	.0035" - .0045"	.0040" - .0055"
	> 35	175	240	.0005" - .0015"	.0015" - .0025"	.0025" - .0030"	.0030" - .0035"	.0035" - .0045"
(Austentic) Inox, 200 Series, 300 Series	< 35	225	300	.0015" - .0025"	.0025" - .0030"	.0030" - .0035"	.0035" - .0045"	.0040" - .0055"
	> 35	175	225	.0010" - .0015"	.0015" - .0020"	.0020" - .0025"	.0025" - .0035"	.0035" - .0045"
(Austentic) 304L, 316L, Nitronic 50, Inox	< 35	125	175	.0010" - .0015"	.0015" - .0020"	.0020" - .0030"	.0030" - .0040"	.0025" - .0040"
	> 35	80	100	.0003" - .0010"	.0010" - .0015"	.0015" - .0025"	.0025" - .0035"	.0020" - .0040"
(Martensitic) 400 Series	< 35	225	300	.0015" - .0025"	.0025" - .0030"	.0030" - .0035"	.0035" - .0045"	.0040" - .0055"
	> 35	175	240	.0005" - .0015"	.0015" - .0025"	.0025" - .0030"	.0030" - .0035"	.0035" - .0045"
HIGH STRENGTH TOOL STEELS								
4140, 4340, 6150, 5210, A2, D2, P20, H11, H13, S2, O1	< 35	200	300	.0015" - .0025"	.0025" - .0030"	.0030" - .0035"	.0035" - .0045"	.0045" - .0055"
	> 35	175	240	.0005" - .0015"	.0015" - .0025"	.0025" - .0030"	.0030" - .0035"	.0035" - .0045"
MEDIUM ALLOY TOOL STEELS								
200, 250, 300, 8620	< 35	200	300	.0015" - .0025"	.0025" - .0030"	.0030" - .0035"	.0035" - .0045"	.0045" - .0065"
	> 35	175	240	.0005" - .0015"	.0015" - .0025"	.0025" - .0030"	.0030" - .0035"	.0035" - .0045"
CARBON STEELS								
Platinum, A36, 12L14, 1000's, 1100's, 1300's	< 35	200	300	.0015" - .0025"	.0025" - .0030"	.0030" - .0035"	.0035" - .0045"	.0045" - .0065"
	> 35	175	240	.0005" - .0015"	.0015" - .0025"	.0025" - .0030"	.0030" - .0035"	.0035" - .0045"
CAST MATERIAL								
Steel		200	300	.0025" - .0035"	.0035" - .0045"	.0035" - .0045"	.0045" - .0055"	.0065" - .0075"
Ductile Iron		250	350	.0025" - .0035"	.0035" - .0045"	.0035" - .0045"	.0045" - .0055"	.0065" - .0075"
Gray Iron		250	400	.0025" - .0035"	.0035" - .0045"	.0035" - .0045"	.0045" - .0055"	.0065" - .0075"
ALUMINUM								
2014, 2024, 6061-(T1-T6), 7075		300 - 400	300 - 500	.0035" - .0045"	.0045" - .0055"	.0065" - .0075"	.0085" - .0095"	.0085" - .0095"
Die Cast, Extruded		250 - 300	300 - 400	.0025" - .0035"	.0035" - .0045"	.0055" - .0065"	.0075" - .0085"	.0075" - .0085"
MAGNESIUM								
		300	400	.0035" - .0045"	.0045" - .0055"	.0065" - .0075"	.0085" - .0095"	.0085" - .0095"
COPPER								
Copper Alloys		300	400	.0025" - .0035"	.0035" - .0045"	.0035" - .0045"	.0045" - .0055"	.0065" - .0075"
BRASS								
Short Chips		300	400	.0035" - .0045"	.0045" - .0055"	.0065" - .0075"	.0085" - .0095"	.0085" - .0095"
Long Chips		200	300	.0025" - .0035"	.0035" - .0045"	.0055" - .0065"	.0075" - .0085"	.0075" - .0085"
BRONZE								
Short Chips		200	300	.0025" - .0035"	.0035" - .0045"	.0035" - .0045"	.0055" - .0065"	.0075" - .0085"
Long Chips		150	250	.0015" - .0025"	.0025" - .0035"	.0025" - .0035"	.0045" - .0055"	.0065" - .0075"

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

GARR TOOL High Performance Drilling Guide

Metric

Type	Rc Hardness	Recommended M/Min.		CHIPLOAD PER FLUTE (Fz)				
		NON-COOLANT	*COOLANT FED*					
		1580H 1280H 1580HD	1580KH 1280KH 1880KH 1580KD 1280KD	3.0 - 6.0	6.0 - 10.0	10.0 - 13.0	13.0 - 16.0	16.0 - 20.0
COBALT BASE ALLOYS								
Powdered Metal, Stellite, Hs-21, Haynes 25/188, X-40, L-605	< 35	60	70	.035 - .060	.060 - .085	.075 - .100	.085 - .110	.095 - .130
	> 35	40	55	.025 - .050	.050 - .075	.060 - .085	.075 - .100	.095 - .110
NICKEL BASE ALLOYS								
Invar, Kovar, Inconel-625/718, Waspalloy, Rene, Hastalloy, A286	< 35	60	70	.035 - .060	.060 - .085	.075 - .100	.085 - .125	.085 - .110
	> 35	40	55	.025 - .050	.050 - .075	.060 - .085	.075 - .100	.085 - .100
IRON BASE ALLOYS								
Incoloy 800-802, Multimet N-155, Timkin 16-25-6, Carpenter 22-b3	< 35	60	90	.050 - .075	.075 - .085	.085 - .100	.100 - .125	.110 - .140
	> 35	45	70	.025 - .050	.050 - .075	.075 - .085	.085 - .100	.095 - .110
MONEL								
Monel - 65% Nickel		45	70	.035 - .060	.050 - .075	.060 - .085	.075 - .100	.085 - .120
TITANIUM ALLOYS								
Commercially Pure, 6Al-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si		70	100	.035 - .060	.060 - .085	.075 - .100	.085 - .110	.095 - .130
STAINLESS STEELS								
(Precipitation) 13/8, 15/5, 17-4, pH Types	< 35	70	90	.050 - .075	.075 - .085	.085 - .100	.100 - .125	.100 - .140
	> 35	50	70	.025 - .050	.050 - .075	.075 - .085	.085 - .100	.085 - .110
(Austentic) Inox, 200 Series, 300 Series	< 35	70	90	.050 - .075	.075 - .085	.085 - .100	.100 - .125	.100 - .140
	> 35	50	70	.035 - .050	.050 - .060	.060 - .075	.075 - .100	.075 - .110
(Austentic) 304L, 316L, Nitronic 50, Inox	< 35	40	55	.035 - .050	.050 - .060	.060 - .085	.085 - .110	.075 - .110
	> 35	20	30	.025 - .035	.035 - .050	.050 - .075	.075 - .100	.075 - .110
(Martensitic) 400 Series	< 35	70	90	.050 - .075	.075 - .085	.085 - .100	.100 - .125	.100 - .130
	> 35	50	70	.025 - .050	.050 - .075	.075 - .085	.085 - .100	.085 - .110
HIGH STRENGTH TOOL STEELS								
4140, 4340, 6150, 5210, A2, D2, P20, H11, H13, S2, O1	< 35	60	90	.050 - .075	.075 - .085	.085 - .100	.100 - .125	.100 - .130
	> 35	50	70	.025 - .050	.050 - .075	.075 - .085	.085 - .100	.085 - .100
MEDIUM ALLOY TOOL STEELS								
200, 250, 300, 8620	< 35	60	90	.050 - .075	.075 - .085	.085 - .100	.100 - .125	.100 - .140
	> 35	50	70	.025 - .050	.050 - .075	.075 - .085	.085 - .100	.085 - .110
CARBON STEELS								
Platinum, A36, 12L14, 1000's, 1100's, 1300's	< 35	60	90	.050 - .075	.075 - .085	.085 - .100	.100 - .125	.100 - .140
	> 35	50	70	.025 - .050	.050 - .075	.075 - .085	.085 - .100	.085 - .120
CAST MATERIAL								
Steel		60	90	.060 - .090	.100 - .125	.100 - .125	.125 - .150	.175 - .200
Ductile Iron		75	100	.060 - .090	.100 - .125	.100 - .125	.125 - .150	.175 - .200
Gray Iron		75	120	.060 - .090	.100 - .125	.100 - .125	.125 - .150	.175 - .200
ALUMINUM								
2014, 2024, 6061-(T1-T6), 7075		90 - 120	90 - 150	.090 - .120	.125 - .150	.175 - .200	.225 - .250	.225 - .250
Die Cast, Extruded		75 - 90	90 - 120	.060 - .100	.100 - .120	.150 - .175	.200 - .225	.200 - .225
MAGNESIUM								
		90	120	.080 - .120	.125 - .150	.175 - .200	.225 - .250	.225 - .250
COPPER								
Copper Alloys		90	120	.060 - .100	.100 - .125	.100 - .125	.125 - .150	.175 - .200
BRASS								
Short Chips		90	120	.080 - .120	.125 - .150	.175 - .200	.225 - .250	.225 - .250
Long Chips		60	90	.060 - .090	.100 - .125	.150 - .175	.200 - .225	.200 - .225
BRONZE								
Short Chips		60	90	.060 - .100	.100 - .125	.100 - .125	.150 - .175	.200 - .225
Long Chips		45	70	.040 - .060	.060 - .085	.075 - .100	.125 - .150	.175 - .200

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