



HSS & Cobalt Drilling

Material Guide		HRc	GP	HD	Cobalt	Suggested Inch Per Revolution						
						UP TO 1/8	1/8- 1/4	1/4- 3/8	3/8- 1/2	1/2- 3/4	3/4- 1	1- 1-1/2
COBALT BASE ALLOYS	Stellite, HS-21, Haynes 25/188, X-40, L-605	under 32 over 32		5-20	5-20	.0004-.0013	.0013-.0020	.0020-.0030	.0030-.0035	.0030-.0040	.0035-.0045	.0040-.0050
NICKEL BASE ALLOYS	Inconel-625/718, Waspalloy, Rene, Hastelloy	under 32 over 32	10-20	20-23	20-23	.0004-.0013	.0013-.0020	.0020-.0030	.0030-.0035	.0030-.0040	.0035-.0045	.0040-.0050
IRON BASE ALLOYS	Incoloy 800-802, Multimet N-155, Timkin 16-25-6, Carpenter 22-b3	under 32 over 32		5-20	5-20	.0004-.0013	.0013-.0020	.0020-.0030	.0030-.0035	.0030-.0040	.0035-.0045	.0040-.0050
TITANIUM ALLOYS	Commercially Pure, 6AL-4V, Astm 1/2/3, 6Al-25N-4Zr-2Mo-Si		20-75	35-90	35-90	.0006-.0025	.0020-.0040	.0030-.0055	.0040-.0060	.0045-.0065	.0050-.0070	.0060-.0065
STAINLESS STEEL (PRECIPITATION)	13/8, 15/5, 17-4, AM-350/355	under 32 over 32	20	30	30	.0020-.0030	.0030-.0040	.0040-.0050	.0050-.0060	.0060-.0070	.0070-.0080	.0080-.0090
STAINLESS STEEL (AUSTENITIC)	301-304L, 310, 316L, 321, 347	under 32 over 32	26	36	36	.0010-.0030	.0035-.0050	.0050-.0075	.0080-.0090	.0090-.0100	.0100-.0110	.0110-.0120
STAINLESS STEEL (MARTENSITIC)	403, 410, 416, 440	under 32 over 32	50	70	72	.0010-.0024	.0025-.0037	.0040-.0055	.0050-.0060	.0060-.0070	.0070-.0080	.0080-.0090
HIGH STRENGTH TOOL STEELS	4140, 4340, 6150, 5210, A2, D2 P20, H11, H13, S2, 01	under 32 over 32	30-65	33-75	33-75	.0007-.0020	.0030-.0040	.0040-.0065	.0060-.0070	.0065-.0075	.0070-.0080	.0075-.0085
MEDIUM ALLOY STEELS	200,250,300	under 32 over 32	115	115	115	.0009-.0050	.0060-.0070	.0090-.0120	.0100-.0120	.0110-.0130	.0120-.0140	.0130-.0150
LOW CARBON STEELS	A36, 12L14, 12L15, 1005, 1018, 1020, 1108-1119, 1213-1215, 1513-1518, 4012, 5015, 9310	under 32 over 32	95	95	95	.0009-.0050	.0060-.0070	.0090-.0100	.0100-.0110	.0110-.0120	.0120-.0130	.0130-.0140
DUCTILE	Ductile Cast Irons		45	55	55	.0007-.0025	.0025-.0035	.0040-.0060	.0060-.0070	.0065-.0075	.0070-.0080	.0075-.0085
CAST IRONS	Gray Cast Irons		80-100	90-115	90-115	.0006-.0030	.0030-.0060	.0040-.0090	.0070-.0100	.0080-.0120	.0090-.0130	.0100-.0140
HIGH SILICON ALUMINUM	A380, A390		60-80	80-95	80-95	.0007-.0050	.0040-.0080	.0060-.0110	.0080-.0120	.0090-.0130	.0120-.0140	.0130-.0150
ALUMINUM ALLOYS	2014, 2024, 6061, 7075		90-98	95-100	95-100	.0007-.0050	.0040-.0080	.0060-.0110	.0080-.0120	.0090-.0130	.0120-.0140	.0130-.0150
MAGNESIUM			90-115	90-130	90-130	.0008-.0040	.0035-.0070	.0050-.0075	.0075-.0090	.0100-.0120	.0110-.0130	.0110-.0130
COPPER, COPPER ALLOYS			108	125	125	.0010-.0035	.0038-.0065	.0070-.0090	.0080-.0110	.0100-.0120	.0110-.0130	.0110-.0130
BRASS, BRONZE	Brass, Alum/Bronze, Low Silicon Bronze		90-115	90-130	90-130	.0008-.0040	.0035-.0070	.0050-.0075	.0075-.0090	.0080-.0100	.0090-.0110	.0100-.0120
COMPOSITES	G-10 Fiberglass, Graphite, Graphite/Epoxy, Plastics		100-125	125-175	125-175	.0040-.0060	.0030-.0050	.0040-.0060	.0050-.0070	.0060-.0080	.0070-.0090	.0080-.0100



DRILLS - HIGH SPEED STEEL & M42 COBALT

Technical Information

ELEMENT & DIMENSIONAL DRILL TOLERANCES

DIAMETER AT POINT

SIZE (INCLUSIVE)	TOLERANCE
OVER #81 TO 1/8	+0.000 TO -.0005
OVER 1/8 TO 1/4	+0.000 TO -.0007
OVER 1/4 TO 1/2	+0.000 TO -.0010
OVER 1/2 TO 1	+0.000 TO -.0012
OVER 1 TO 2	+0.000 TO -.0015
OVER 2 TO 3-1/2	+0.000 TO -.0020

SHANK DIAMETER

SIZE (INCLUSIVE)	TOLERANCE
OVER #81 TO 1/8	-.000 TO -.0025
OVER 1/8 TO 1/4	-.0005 TO -.0030
OVER 1/4 TO 1/2	-.0005 TO -.0045
OVER 1/2 TO 2	-.0005 TO -.0030

BACK TAPER

SIZE (INCLUSIVE)	TOLERANCE PER INCH
OVER #81 TO 1/8	.0000 TO .0008
OVER 1/8 TO 1/4	.0002 TO .0008
OVER 1/4 TO 1/2	.0002 TO .0009
OVER 1/2 TO 1	.0003 TO .0011
OVER 1 TO 3-1/2	.0004 TO .0015

FLUTE LENGTH

SIZE (INCLUSIVE)	TOLERANCE
OVER #81 TO 1/8	+1/8 TO -1/16
OVER 1/8 TO 1/2	+1/8 TO -1/8
OVER 1/2 TO 1	+1/4 TO -1/8
OVER 1 TO 2	+1/4 TO -1/4
OVER 2 TO 3-1/2	+3/8 TO -3/8

OVERALL LENGTH

SIZE (INCLUSIVE)	TOLERANCE
OVER #81 TO 1/8	+1/8 TO -1/16
OVER 1/8 TO 1/2	+1/8 TO -1/8
OVER 1/2 TO 1	+1/4 TO -1/8
OVER 1 TO 2	+1/4 TO -1/4
OVER 2 TO 3-1/2	+3/8 TO -3/8

INCLUDED POINT ANGLE

SIZE (INCLUSIVE)	INCLUDED ANGLE	TOLERANCE
1/16 TO 1/2	118°	±5°
OVER 1/2 TO 1-1/2	118°	±3°
OVER 1-1/2 TO 3-1/2	118°	±2°

LIP HEIGHT

SIZE (INCLUSIVE)	TIV (TOTAL INDICATOR VARIATION)
1/16 TO 1/8	.0020
OVER 1/8 TO 1/4	.0030
OVER 1/4 TO 1/2	.0040
OVER 1/2 TO 1	.0050
OVER 1 TO 3-1/2	.0060

NOTE: 95% of drills in any one lot to fall within tolerances above.

SUGGESTED METHOD OF MEASUREMENT:

1. Rotate the drill in a vee block against a back end stop.
2. Measure the cutting lip height variation on a comparator, or with an indicator set at allocation approximately 75% of the distance from the center to the periphery of the drill.

CENTRALITY OF WEB

SIZE (INCLUSIVE)	TIV (TOTAL INDICATOR VARIATION)
1/16 TO 1/8	.0030
OVER 1/8 TO 1/4	.0040
OVER 1/4 TO 1/2	.0050
OVER 1/2 TO 1	.0070
OVER 1 TO 2	.0100

NOTE: 95% of drills in any one lot to fall within tolerances above.

SUGGESTED METHOD OF MEASUREMENT:

1. Rotate the drill in a close fitting bushing.
2. Record the difference in indicator readings of the web at the point as the drill is indexed 180°.

FLUTE SPACING

SIZE (INCLUSIVE)	TOLERANCE (TIV)	ACTUAL DEVIATION
1/16 TO 1/8	.0030	.0015
OVER 1/8 TO 1/4	.0060	.0030
OVER 1/4 TO 1/2	.0100	.0050
OVER 1/2 TO 1	.0140	.0070
OVER 1 TO 2	.0260	.0130

NOTE: 95% of drills in any one lot to fall within tolerances above.

SUGGESTED METHOD OF MEASUREMENT:

1. Place the drill in a vee block against a back end stop, and rotate it against a radial finger stop.
2. Take an indicator reading at the leading edge of the margin on the opposite flute.
3. Repeat for the other flute and note the difference between the two readings.
4. The deviation in flute spacing is equal to one-half the difference between the two readings.