FEEDS & SPEEDS — DRILLING OR REAMING
GENERAL PURPOSE OR COOLANT FED




CHIP CLASS	MATERIAL BEING MACHINED	MATERIAL EXAMPLES	BRINELL HARDNESS	CHIP DESCRIPTION	TOOL. APPLIC.	CUTTING SPEED (SFM) STARTING RANGE*		FEED RATE (INCHES PER REVOLUTION) HOLE DIAMETER IN INCHES															
								⅛		¼		⅜		½		⅝		¾		1		1¼		1½	
						GENERAL PURPOSE	COOLANT FED	GEN. PURPOSE	COOLANT FED	GEN. PURPOSE	COOLANT FED	GEN. PURPOSE	COOLANT FED	GEN. PURPOSE	COOLANT FED	GEN. PURPOSE	COOLANT FED	GEN. PURPOSE	COOLANT FED	GEN. PURPOSE	COOLANT FED	GEN. PURPOSE	COOLANT FED	GEN. PURPOSE	COOLANT FED
20	**ALUMINUM ALLOY** CAST AND WROUGHT	308.0, 356.0, 360.0, 380.0, 383.0, 390.0, 2024, 3003, 4032, 5052, 6061, 7075	30-150 (500 kg)	DISCONTINUOUS FLAKY OR LONG STRINGY	DRILL REAM	250-350 150-250	375-550 200-300	.003 .004	– –	.005 .006	.004 .008	.007 .008	.005 .010	.008 .011	.006 .013	.010 .012	.006 .015	.011 .013	.007 .017	.014 .016	.009 .021	.017 .019	– .022	.019 .020	– .024
	COPPER ALLOY TOUGH	101, 110, 115, 120, 130, 142, 155, 170, 172, 175, 195, 425, 610, 630, 655, 725, 805, 826, 910	40-200 (500 kg)	LONG CONTINUOUS	DRILL REAM	125-190 50-90	225-300 70-105	.002 .005	– –	.005 .006	.004 .008	.007 .008	.005 .010	.008 .010	.006 .013	.009 .011	.007 .014	.010 .012	.008 .016	.012 .014	.010 .018	.014 .016	– .019	.016 .017	– .020
	LEAD ALLOY	Alloys 7, 8, 13, 15 1Sb, 4Sb, 6Sb, 8Sb, 9Sb	10-20 (500 kg)	DISCONTINUOUS TIGHTLY CURLED	DRILL REAM	350-450 150-250	400-500 200-300	.003 .002	– –	.005 .006	.004 .008	.006 .008	.006 .010	.007 .012	.007 016	.008 .014	.008 .017	.009 .015	.009 .018	.013 .018	.013 .022	.015 .021	– .024	.017 .022	– .026
	PLASTIC	ABS, Acrylic, Allyl, Bakelite, Epoxy, Furan, Nylon, Polyethylene, Polystyrene, PVC	–	CONTINUOUS	DRILL REAM	175-450 90-250	– 125-300	.002 .004	– –	.004 .005	– .006	.005 .007	– .008	.005 .008	– .009	.006 .009	– .010	.008 .012	– .014	.009 .014	– .016	.010 .016	– .018	.012 .018	– .020
	ZINC ALLOY	AC41A, AG40A, AMS4803, ILZRO 12, ZDC NO. 7, GRADES 903, 925	80-100	LONG TIGHTLY CURLED	DRILL REAM	300-400 140-210	400-500 170-240	.003 .005	– –	.005 .007	.004 .009	.007 .008	.005 .011	.009 .010	.006 .013	.011 .011	.008 .014	.012 .012	.009 .016	.014 .015	.010 .020	.016 .018	– .022	.018 .020	– .025
40	**ALUMINUM BRONZE**	614, 952-958	40-175	SHORT LOOSELY CURLED	DRILL REAM	125-190 50-90	200-300 70-105	.002 .004	– –	.005 .006	.004 .008	.007 .010	.005 .013	.008 .012	.006 .015	.009 .014	.007 .016	.010 .016	.008 .018	.012 .018	.010 .021	.014 .020	– .024	.016 .022	– .028
	COPPER ALLOY/BRASS/BRONZE FREE MACHINING	268, 270, 314, 332, 335, 340, 342, 353, 356, 360, 370, 464-467, 485, 838, 945	10-100 Rb	FLAT SMALL	DRILL REAM	225-400 100-250	300-450 125-300	.003 .005	– –	.005 .008	.004 .010	.007 .011	.005 .014	.008 .015	.006 .020	.009 .017	.007 .022	.010 .018	.008 .024	.012 .020	.010 .026	.014 .022	– .028	.016 .025	– .032
	MAGNESIUM ALLOY	AM60A, AZ21A, AZ91B-C, HM31A, K1A, ZE41A, ZK40A	50-90 (500 kg)	FLAT SMALL	DRILL REAM	300-400 130-190	450-550 150-250	.003 .005	– –	.005 .010	.005 .012	.006 .012	.006 .015	.007 .015	.007 .018	.008 .016	.008 .019	.009 .017	.009 .020	.013 .020	.013 .024	.015 .022	– .026	.016 .025	– .028
	NICKEL SILVER	745, 752, 754, 757, 700, 973-978	10-100 Rb	LOOSELY CURLED	DRILL REAM	125-190 50-90	225-300 70-190	.002 .004	– –	.005 .006	.004 .007	.007 .008	.005 .010	.008 .010	.006 .012	.009 .011	.007 .013	.010 .012	.008 .014	.012 .014	.010 .017	.014 .015	– .018	.016 .016	– .018
60	**CAST IRON-DUCTILE** AUSTENITIC (NI-RESIST)	TYPES D-2, D-2B, D-2C, D-2M, D-3, D-3A, D-4, D-5, D-5B	120-275	DISCONTINUOUS TIGHTLY CURLED	DRILL REAM	– 45-70	– 65-100	– .004	– –	– .006	– .008	– .007	– .009	– .008	– .011	– .010	– .014	– .013	– .016	– .015	– .018	– .018	– .020	– .020	– .025
	CAST IRON-DUCTILE FERRITIC & FERRITIC-PEARLITIC	GRADES 60-40-18, 65-45-12, 80-55-06, D4018, D4512, D5506	140-270	DISCONTINUOUS TIGHTLY CURLED	DRILL REAM	150-225 50-90	200-250 70-105	.002 .004	– –	.004 .005	.004 .007	.006 .008	.005 .010	.008 .010	.006 .012	.010 .012	.007 .015	.012 .014	.008 .017	.014 .017	.010 .022	.016 .020	– .024	.018 .023	– .027
	CAST IRON-DUCTILE MARTENSITIC & PEARLITIC-MARTENSITIC	GRADES 100-70-03, 120-90-02, D7003, DQ&T	270-400	DISCONTINUOUS TIGHTLY CURLED	DRILL REAM	– 35-60	200-250 50-85	– .004	– –	– .006	.004 .008	– .007	.005 .009	– .008	.006 .010	– .009	.007 .011	– .010	.008 .013	– .012	.010 .014	– .014	– .017	– .016	– .019
	CAST IRON-GRAY FERRITIC & FERRITIC-PEARLITIC	CLASSES 20, 25, 30, 35, 40 GRADES G1800, G2500, G3000	120-220	DISCONTINUOUS	DRILL REAM	175-300 65-135	250-400 95-190	.002 .005	– –	.005 .008	.004 .010	.007 .010	.006 .013	.009 .011	.008 .014	.011 .013	.010 .017	.014 .016	.012 .020	.017 .020	.015 .024	.018 .022	– .028	.019 .025	– .030
	CAST IRON-GRAY PEARLITIC	CLASSES 45, 50, 55, 60 GRADES G3500, G4000	220-320	DISCONTINUOUS	DRILL REAM	130-225 45-70	225-325 55-100	.002 .004	– –	.004 .006	.004 .008	.006 .008	.006 .010	.007 .009	.008 .012	.009 .010	.010 .014	.010 .012	.012 .015	.013 .014	.015 .018	.016 .018	– .020	.018 .020	– .026
	CAST IRON-MALLEABLE FERRITIC & PEARLITIC	CLASSES 32510, 35018, 40010, 45008 GRADES M3210, M4504, M5003	110-240	DISCONTINUOUS	DRILL REAM	125-190 60-120	200-250 70-105	.002 .004	– –	.005 .006	.004 .007	.008 .010	.006 .012	.009 .011	.008 .014	.010 .012	.008 .014	.011 .013	.008 .014	.012 .014	.010 .017	.014 .016	– .020	.016 .018	– .022
	CAST IRON-MALLEABLE TEMPERED MARTENSITE	GRADES 60004, 70003, 80002 GRADES M5003, M8501	200-320	DISCONTINUOUS	DRILL REAM	100-150 45-70	200-250 65-100	.002 .004	– –	.004 .006	.004 .008	.006 .008	.005 .010	.007 .010	.006 .012	.008 .012	.007 .014	.010 .013	.008 .015	.012 .015	.010 .020	.014 .018	– .023	.016 .025	– .030
80	**STEEL-LOW & MEDIUM STRENGTH** FREE MACHINING	1108-1119, 1132-1151, 10L17, 10L18, 10L50, 11L44, 12L13, 12L14, 12L15	100-250	DISCONTINUOUS LOOSELY CURLED	DRILL REAM	125-175 70-100	150-250 100-150	.003 .005	– –	.004 .008	.005 .012	.008 .010	.006 .014	.010 .012	.008 .016	.012 .014	.009 .018	.014 .015	.010 .020	.017 .020	.012 .025	.018 .025	– .030	.019 .030	– .035
	STEEL-LOW & MEDIUM STRENGTH WROUGHT	1005-1029, 1030-1050, 1513, 1518, 1524, 1552	100-375	CONTINUOUS STRINGY	DRILL REAM	– 30-85	– 40-110	– .004	– –	– .008	– .009	– .009	– .011	– .011	– .013	– .013	– .015	– .015	– .017	– .018	– .022	– .020	– .024	– .022	– .026
100	**ALLOY STEEL-LOW & MEDIUM STRENGTH** FREE MACHINING	41L30, 41L40. 41L50, 86L20, 4142Se, 4145Te	100-275	DISCONTINUOUS TIGHTLY CURLED	DRILL REAM	– 65-100	100-220 90-135	– .005	– –	– .008	.005 .010	– .010	.006 .012	– .015	.007 .018	– .017	.008 .020	– .018	.010 .022	– .022	.012 .025	– .025	– .027	– .027	– .030
	ALLOY STEEL-LOW & MEDIUM STRENGTH	1330, 1345, 1515, 4012, 4130, 4140, 4150, 4320, 4340, 4620, 5130, 8620, 8630, 8645, 9310	85-375	LOOSELY CURLED	DRILL REAM	– 40-85	100-150 65-100	– .005	– –	– .010	.005 .012	– .012	.006 .015	– .015	.007 .018	– .018	.008 .022	– .020	.010 .024	– .025	.012 .028	– .027	– .030	– .030	– .033
	STAINLESS STEEL 400 SERIES	409, 410, 414, 420, 430, 436, 442, 446	135-325	DISCONTINUOUS TIGHTLY CURLED	DRILL REAM	– 40-90	110-150 50-100	– .003	– –	– .005	.004 .007	– .006	.005 .007	– .007	.006 .008	– .008	.007 .009	– .008	.008 .009	– .010	.010 .012	– .011	– .014	– .012	– .015
	STAINLESS STEEL FREE MACHINING	203 EZ, 303, 303MA, 303Pb, 303 PLUS X, 303Se, 416, 416Se, 420F, 430F, 440F	135-275	SHORT TIGHTLY CURLED	DRILL REAM	100-150 65-100	125-190 90-135	.002 .004	– –	.004 .006	.004 .008	.005 .007	.005 .009	.006 .008	.006 .010	.007 .009	.007 .011	.008 .009	.007 .012	.010 .010	.008 .013	.012 .011	– .013	.014 .012	– .014
120	**ALLOY STEEL-HIGH STRENGTH, MARAGING STEEL, NITRIDING STEEL, TOOL STEEL**	50100, 51100, 52100, GRADES 200-350, Nitralloy, SERIES A2, D2, H13, M50, P20, S7, WI	175-400	CONTINUOUS WIRY	DRILL REAM	– 35-70	100-150 50-100	– .004	– –	– .006	.004 .007	– .007	.006 .008	– .008	.007 .009	– .009	.008 .011	– .010	.010 .012	– .011	.012 .014	– .012	– .015	– .013	– .016
140	**HIGH TEMP ALLOY** NICKEL & IRON	A-286; Hastelloy C; Inconel 600, 625, 718, 825; Monel 400; Nimonic 75, 80; Rene 41; Waspaloy	140-300	CONTINUOUS WIRY	DRILL REAM	– 15-85	– 20-115	– .003	– –	– .005	– .006	– .005	– .007	– .005	– .007	– .006	– .008	– .007	– .008	– .008	– .010	– .010	– .012	– .012	– .015
	STAINLESS STEEL 300 SERIES	301, 302, 304, 309, 314, 316, 321, 330, 347, 385, Nitronic 32, 33, 40, 50, 60	135-375	WIRY LOOSELY CURLED	DRILL REAM	– 40-75	– 60-90	– .003	– –	– .004	– .006	– .005	– .007	– .006	– .008	– .006	– .008	– .007	– .009	– .008	– .010	– .009	– .011	– .010	– .012
	STAINLESS STEEL PH SERIES	13-8 Mo, 15-5PH, 16-6PH, 17-4PH, 17-7PH, AM-350, AM-355	150-440	WIRY LOOSELY CURLED	DRILL REAM	– 35-70	– 50-90	– .003	– –	– .004	– .006	– .004	– .006	– .005	– .007	– .006	– .008	– .007	– .009	– .008	– .010	– .009	– .012	– .010	– .014
	TITANIUM ALLOY	98.9, 99.0, 99.2, 99.5, Ti-6Al-4V, Ti-6Al-6V2Sn, Ti-8Mn, Ti-10v-2Fe-3Al	110-380	CONTINUOUS WIRY	DRILL REAM	– 30-45	– 40-60	– .004	– –	– .006	– .008	– .008	– .010	– .010	– .013	– .011	– .014	– .011	– .014	– .012	– .016	– .013	– .016	– .014	– .018

*Use low end of speed range for high end of hardness range.