Cutting Groups	Material Group	Composition/Structure		Tensile Strength RM (MPa)	Hardness HB	Starting Speed (m/min) (sfm)	Starting Recommendation for Feed (mm/r and ipr) by Insert Blade Seat Size							
							Y & Z	0	1	2	3	4	5	6-7-8
							9,5 - 12,7	13,0 - 17,5	17,8 - 24,0	24,6 - 35,0	35,7 - 47,6	48,0 - 65,1	63,5 - 76,2	77,0 -114,3
							.3740-.5000	.5118 - .6890	.7031-.9449	.9688 - 1.3780	1.4063 - 1.8750	1.8898 - 2.5625	2.5000 - 3.000	3.0313 - 4.5000
1	Unalloyed steel, cast steel, machining steel	C= 0,10-0,25	Annealed, long-chipping	420	125	55 180	0,178 .007	0,254 .010	0,330 .013	0,406 .016	0,508 .020	0,610 .024	0,635 .025	0,686 .027
2		C= 0,25-0,55	Annealed, long-chipping	640	190	52 170	0,152 .006	0,229 .009	0,305 .012	0,381 .015	0,508 .020	0,584 .023	0,610 .024	0,660 .026
3		C= 0,25-0,55	Tempered	850	250	47 155	0,127 .005	0,203 .008	0,254 .010	0,356 .014	0,457 .018	0,533 .021	0,584 .023	0,635 .025
4		C= 0,25-0,80	Annealed	915	270	49 160	0,152 .006	0,254 .010	0,330 .013	0,406 .016	0,508 .020	0,584 .023	0,610 .024	0,660 .026
5		C= 0,25-0,80	Tempered	1020	300	44 145	0,127 .005	0,203 .008	0,254 .010	0,356 .014	0,457 .018	0,533 .021	0,584 .023	0,635 .025
6	Low-alloy steel, cast steel, machining steel		Annealed	610	180	46 150	0,152 .006	0,203 .008	0,254 .010	0,356 .014	0,432 .017	0,483 .019	0,533 .021	0,584 .023
7			Tempered	930	275	41 135	0,127 .005	0,178 .007	0,254 .010	0,330 .013	0,432 .017	0,508 .020	0,533 .021	0,584 .023
8			Tempered	1020	300	38 125	0,102 .004	0,152 .006	0,229 .009	0,305 .012	0,381 .015	0,457 .018	0,483 .019	0,533 .021
9			Tempered	1190	350	33 110	0,076 .003	0,152 .006	0,229 .009	0,305 .012	0,381 .015	0,432 .017	0,457 .018	0,483 .019
10	High-alloy steel, cast steel, high-alloy tool steel		Annealed	680	200	38 125	0,127 .005	0,229 .009	0,279 .011	0,330 .013	0,432 .017	0,508 .020	0,533 .021	0,584 .023
11			Hardened and Tempered	1100	325	20 65	0,076 .003	0,127 .005	0,178 .007	0,203 .008	0,254 .010	0,330 .013	0,381 .015	0,406 .016
12	Stainless steel, cast steel	Ferritic / Martensitic	Annealed	680	200	20 65	0,102 .004	0,127 .005	0,178 .007	0,229 .009	0,279 .011	0,356 .014	0,381 .015	0,406 .016
13		Martensitic	Tempered	810	240	30 100	0,127 .005	0,178 .007	0,203 .008	0,254 .010	0,305 .012	0,356 .014	0,406 .016	0,457 .018
14.1	Stainless steel	Austenitic		610		27 90	0,152 .006	0,203 .008	0,229 .009	0,279 .011	0,279 .011	0,406 .016	0,279 .011	0,508 .020
14.2		Austenitic / Ferritic (duplex)		880		23 75	0,127 .005	0,178 .007	0,203 .008	0,254 .010	0,305 .012	0,356 .014	0,406 .016	0,457 .018
15	Gray cast iron	Pearlitic / Ferritic			180	53 175	0,152 .006	0,229 .009	0,305 .012	0,406 .016	0,457 .018	0,533 .021	0,584 .023	0,635 .025
16		Pearlitic (martensitic)			260	38 125	0,102 .004	0,152 .006	0,178 .007	0,229 .009	0,305 .012	0,356 .014	0,406 .016	0,457 .018
17		Ferritic			160	61 200	0,178 .007	0,279 .011	0,356 .014	0,457 .018	0,559 .022	0,635 .025	0,686 .027	0,737 .029
18		Pearlitic			250	38 125	0,102 .004	0,152 .006	0,178 .007	0,229 .009	0,305 .012	0,356 .014	0,406 .016	0,457 .018
19		Ferritic			130	68 225	0,203 .008	0,305 .012	0,406 .016	0,508 .020	0,610 .024	0,686 .027	0,737 .029	0,787 .031
20		Pearlitic			230	46 150	0,127 .005	0,178 .007	0,229 .009	0,305 .012	0,356 .014	0,432 .017	0,483 .019	0,533 .021
21	Aluminum forging alloys		Not heat treatable		60	182 600	0,178 .007	0,305 .012	0,381 .015	0,483 .019	0,533 .021	0,610 .024	0,635 .025	0,660 .026
22			Heat treatable / heat-treated		100	75 600	0,178 .007	0,305 .012	0,381 .015	0,483 .019	0,533 .021	0,610 .024	0,635 .025	0,660 .026
23	Aluminum casting alloys	<12% SI	Not heat treatable		75	91 300	0,203 .008	0,330 .013	0,406 .016	0,508 .020	0,559 .022	0,635 .025	0,660 .026	0,686 .027
24		<12% SI	Heat treatable/heat-treated		90	91 300	0,203 .008	0,330 .013	0,406 .016	0,508 .020	0,559 .022	0,635 .025	0,660 .026	0,686 .027
25		>12% SI	Not heat treatable		130	91 300	0,203 .008	0,330 .013	0,406 .016	0,508 .020	0,559 .022	0,635 .025	0,660 .026	0,686 .027
31	Heat resistant alloys	Fe-Based	Annealed		200	14 45	0,127 .005	0,178 .007	0,203 .008	0,254 .010	0,305 .012	0,381 .015	0,406 .016	0,432 .017
32			Heat treated		230	12 40	0,102 .004	0,152 .006	0,178 .007	0,229 .009	0,279 .011	0,305 .012	0,330 .013	0,356 .014
33		Ni or Co-based	Annealed		250	12 40	0,102 .004	0,152 .006	0,178 .007	0,229 .009	0,279 .011	0,305 .012	0,330 .013	0,356 .014
34			Heat treated		350	11 35	0,102 .004	0,127 .005	0,152 .006	0,178 .007	0,229 .009	0,279 .011	0,305 .012	0,330 .013
35			Cast		320	11 35	0,102 .004	0,127 .005	0,152 .006	0,178 .007	0,229 .009	0,279 .011	0,305 .012	0,330 .013

Notes: These are starting condition guidelines only. The machine tool, fixturing, toolholding, part configuration, and coolant capability may significantly influence specific applications. Use proper and safe machining practices. Make the set-up as rigid as possible. Decrease speed as material hardness increases.

Kennametal QPV Drills Technical Information

Minimum Recommended Coolant Volume Flow Rate (GPM/LPM) and Coolant Pressure

Cutting Groups	Material Group		Series/Diameters							
			Y & Z	0	1	2	3	4	5	6-7-8
			9,5 - 12,7	13,0 - 17,5	17,8 - 24,0	24,6 - 35,0	35,7 - 47,6	48,0 - 65,1	63,5 - 76,2	77,0 - 114,3
			.3740-.5000	.5118 - .6890	.7031-.9449	.9688 - 1.3780	1.4063 - 1.8750	1.8898 - 2.5625	2.5000 - 3.000	3.0313 - 4.5000
1-5	Unalloyed steel, cast steel, machining steel	flow - GPM	2.4 - 2.6	2.4 - 2.6	3.7 - 4.2	6 - 7	11 - 12	26 - 30	26 - 30	36 - 40
		flow - LPM	9,0 - 9,8	9,0 - 9,8	14,0 - 15,9	22,7 - 26,5	41,6 - 45,4	98,4 - 113,6	98,4 - 113,6	136,3 - 151,4
		pressure - PSI	160 - 170	75 - 90	75 - 95	60 - 80	55 - 75	30 - 40	30 - 40	>50
		pressure - BAR	11 - 11,7	5,1 - 6,2	5,1 - 6,5	4,1 - 5,5	3,8 - 5,1	2,0 - 2,7	2,0 - 2,7	>3,4
6 - 9	Low-alloy steel, cast steel, machining steel	flow - GPM	2.5 - 2.7	2.8 - 3.0	4.4 - 5.2	7 - 8	12 - 14	30 - 33	30 - 33	37 - 41
		flow - LPM	9,5 - 10,2	10,6 - 11,4	16,7 - 19,7	26,5 - 30,3	45,4 - 53,0	113,6 - 124,9	113,6 - 124,9	140,0 - 155,2
		pressure - PSI	175 - 185	100 - 120	105 - 140	80 - 115	75 - 100	40 - 50	40 - 50	>60
		pressure - BAR	12,0 - 12,8	6,9 - 8,3	7,2 - 9,7	5,5 - 7,9	5,1 - 6,9	2,7 - 3,4	2,7 - 3,4	>4,1
10 - 11	High-alloy steel, cast steel, high-alloy tool steel	flow - GPM	2.3 - 2.5	2.3 - 2.6	3.6 - 4.1	5 - 6	10 - 12	26 - 30	26 - 30	36 - 40
		flow - LPM	8,7 - 9,5	8,7 - 9,8	13,6 - 15,5	18,9 - 22,7	37,9 - 45,4	98,4 - 113,6	98,4 - 113,6	136,3 - 151,4
		pressure - PSI	155 - 165	70 - 85	70 - 90	55 - 75	50 - 70	30 - 40	30 - 40	>50
		pressure - BAR	10,7 - 11,4	4,8 - 5,8	4,8 - 6,2	3,8 - 5,2	3,4 - 4,8	2,0 - 2,7	2,0 - 2,7	>3,4
12 - 13	Stainless steel, cast steel	flow - GPM	2.3 - 2.5	2.3 - 2.5	2.9 - 3.1	4 - 5	7 - 8	21 - 23	21 - 23	27 - 30
		flow - LPM	8,7 - 9,5	8,7 - 9,5	11,0 - 11,7	15,1 - 18,9	26,5 - 30,3	79,5 - 87,1	79,5 - 87,1	102,2 - 113,6
		pressure - PSI	145 - 155	55 - 60	45 - 50	25 - 30	25 - 30	20 - 25	20 - 25	>30
		pressure - BAR	10,0 - 10,7	3,8 - 4,1	3,1 - 3,4	1,7 - 2,1	1,7 - 2,1	1,4 - 1,7	1,4 - 1,7	>2,1
14.1-14.2	Stainless steel	flow - GPM	2.3 - 2.5	2.3 - 2.6	3.5 - 3.7	5 - 6	9 - 10	23 - 26	23 - 26	33 - 37
		flow - LPM	8,7 - 9,5	8,7 - 9,8	13,2 - 14,0	18,9 - 22,7	34,0 - 37,9	87,1 - 98,4	87,1 - 98,4	124,9 - 140,0
		pressure - PSI	160 - 170	70 - 85	65 - 75	40 - 55	40 - 50	25 - 30	25 - 30	>35
		pressure - BAR	11 - 11,7	4,8 - 5,8	4,5 - 5,2	2,8 - 3,8	2,8 - 3,5	1,7 - 2,1	1,7 - 2,1	>2,4
15 - 20	Cast iron gray, nodular, malleable	flow - GPM	2.3 - 2.5	2.2 - 2.4	3.1 - 3.3	4 - 5	8 - 9	23 - 26	23 - 26	27 - 30
		flow - LPM	8,7 - 9,5	8,3 - 9,1	11,7 - 12,5	15,1 - 18,9	30,3 - 34,1	87,1 - 98,4	87,1 - 98,4	102,2 - 113,6
		pressure - PSI	155 - 165	60 - 65	50 - 60	30 - 40	30 - 35	25 - 30	25 - 30	>30
		pressure - BAR	10,7 - 11,4	4,1 - 4,6	3,4 - 4,1	2,0 - 2,7	2,0 - 2,4	1,7 - 2,1	1,7 - 2,1	>2,1
21 - 25	Aluminum	flow - GPM	2.6 - 2.8	3.3 - 3.7	5.3 - 6.1	8 - 9	14 - 16	30 - 33	30 - 33	37 - 41
		flow - LPM	9,8 - 10,6	12,5 - 14,0	20,1 - 23,1	30,3 - 34,1	53,0 - 60,6	113,6 - 124,9	113,6 - 124,9	140,0 - 155,2
		pressure - PSI	185 - 200	140 - 180	150 - 200	115 - 160	90 - 125	40 - 50	40 - 50	>60
		pressure - BAR	12,8 - 13,8	9,7 - 12,4	10,3 - 13,8	7,9 - 11,0	6,2 - 8,6	2,8 - 3,5	2,8 - 3,5	>4,1
31 - 35	Heat-resistant alloys	flow - GPM	2.2 - 2.4	2.2 - 2.4	3.1 - 3.2	4 - 5	7 - 8	23 - 26	23 - 26	27 - 30
		flow - LPM	8,3 - 9,1	8,3 - 9,1	11,7 - 12,1	15,1 - 18,9	26,5 - 30,3	87,1 - 98,4	87,1 - 98,4	102,2 - 113,6
		pressure - PSI	150 - 160	60 - 65	50 - 55	30 - 35	25 - 30	25 - 30	25 - 30	>30
		pressure - BAR	10,3 - 11,0	4,1 - 4,6	3,4 - 3,8	2,0 - 2,4	1,7 - 2,1	1,7 - 2,1	1,7 - 2,1	>2,1

Useful Formulas:

kW	=	hp	÷ 1.341022
kN	=	lbs.	÷ 225
Nm	=	ft.-lbs.	÷ .7375621

GPM = gallons per minute
LPM = liters per minute

NOTE: Coolant should be filtered prior to use to approximately 30-50 microns.
Chipping of the insert might occur in applications such as machines with fixed speed lower than recommended, old machines with loose spindles, or interrupted cuts. For these applications, grade KC100 is the recommended choice.

To place an order, contact your authorized Kennametal distributor or visit www.kennametal.com.