List 215, 220D, 200 & 233*

General Drilling Operations

Work Material		Mild Steels, Carbon Steels		Alloy Tool Steels, Tool Steels		Cast Iron		Aluminum	
Hardness				Up to 30 HRC					
Drilling Speed		280-320 SFM		250-270 SFM		250-350 SFM		550-650 SFM	
Drill Dia.		Speed RPM	Feed IPR	Speed RPM	Feed IPR	Speed RPM	Feed IPR	Speed RPM	Feed IPR
mm	Inch								
1	-	25,000	0.0010 - 0.0012	25,000	0.0003 - 0.0005	25,000	0.0007 - 0.0009	25,000	0.0006 - 0.0008
-	1/16	18,300	0.0016 - 0.0018	15,900	0.0004 - 0.0006	18,300	0.0011 - 0.0013	25,000	0.0010 - 0.0012
2	-	14,600	0.0020 - 0.0022	12,600	0.0006 - 0.0008	14,600	0.0014 - 0.0016	25,000	0.0013 - 0.0015
-	3/32	12,200	0.0024 - 0.0026	10,600	0.0007 - 0.0009	12,200	0.0017 - 0.0019	24,400	0.0015 - 0.0017
3	-	9,700	0.0027 - 0.0029	8,400	0.0012 - 0.0014	9,700	0.0021 - 0.0023	19,400	0.0020 - 0.0022
-	1/8	9,200	0.0028 - 0.0030	7,950	0.0012 - 0.0015	9,200	0.0022 - 0.0024	18,300	0.0022 - 0.0024
4	-	7,300	0.0030 - 0.0032	6,300	0.0013 - 0.0015	7,300	0.0023 - 0.0025	14,500	0.0029 - 0.0031
-	3/16	6,100	0.0035 - 0.0037	5,300	0.0015 - 0.0017	6,100	0.0027 - 0.0029	12,200	0.0034 - 0.0036
6	-	4,850	0.0040 - 0.0042	4,200	0.0020 - 0.0022	4,850	0.0037 - 0.0039	9,700	0.0045 - 0.0047
-	1/4	4,600	0.0042 - 0.0044	3,950	0.0021 - 0.0023	4,600	0.0039 - 0.0041	9,150	0.0047 - 0.0049
8	-	3,650	0.0048 - 0.0050	3,150	0.0024 - 0.0026	3,650	0.0044 - 0.0046	7,250	0.0054 - 0.0056
-	3/8	3,050	0.0065 - 0.0067	2,650	0.0033 - 0.0035	3,050	0.0047 - 0.0049	6,100	0.0066 - 0.0068
10	-	2,900	0.0067 - 0.0069	2,500	0.0033 - 0.0036	2,900	0.0048 - 0.0050	5,800	0.0068 - 0.0070
-	7/16	2,600	0.0068 - 0.0070	2,250	0.0034 - 0.0036	2,600	0.0049 - 0.0051	5,200	0.0072 - 0.0074
12	-	2,400	0.0074 - 0.0076	2,100	0.0034 - 0.0036	2,400	0.0054 - 0.0056	4,800	0.0078 - 0.0080
-	1/2	2,250	0.0078 - 0.0080	1,950	0.0035 - 0.0036	2,250	0.0057 - 0.0059	4,550	0.0082 - 0.0084

General Drilling Operations

Work Material		Titanium Alloys (Annealed)		Inconel, Titanium Alloys (Solution Treated and Aged)		Hardened Steels, Prehardened Steels			
Hardness						30-38 HRC		38-45 HRC	
Drilling Speed		120-140 SFM		50-70 SFM		210-230 SFM		160-180 SFM	
Drill Dia.		Speed RPM	Feed IPR	Speed RPM	Feed IPR	Speed RPM	Feed IPR	Speed RPM	Feed IPR
mm	Inch								
1	-	12,600	0.0003 - 0.0005	5,800	0.0002 - 0.0004	20,850	0.0002 - 0.0004	16,500	0.0002 - 0.0004
-	1/16	8,000	0.0004 - 0.0006	3,700	0.0003 - 0.0005	13,150	0.0004 - 0.0006	10,400	0.0004 - 0.0006
2	-	6,300	0.0006 - 0.0008	2,900	0.0004 - 0.0006	10,400	0.0005 - 0.0007	8,250	0.0005 - 0.0007
-	3/32	5,300	0.0007 - 0.0009	2,400	0.0005 - 0.0007	8,750	0.0007 - 0.0009	6,950	0.0007 - 0.0009
3	-	4,200	0.0010 - 0.0012	1,900	0.0008 - 0.0010	6,950	0.0011 - 0.0013	5,500	0.0011 - 0.0013
-	1/8	4,000	0.0011 - 0.0012	1,850	0.0008 - 0.0010	6,600	0.0012 - 0.0014	5,200	0.0012 - 0.0014
4	-	3,150	0.0011 - 0.0013	1,450	0.0009 - 0.0010	5,200	0.0013 - 0.0015	4,100	0.0013 - 0.0015
-	3/16	2,650	0.0013 - 0.0015	1,200	0.0010 - 0.0012	4,400	0.0015 - 0.0017	3,450	0.0015 - 0.0017
6	-	2,100	0.0015 - 0.0017	950	0.0013 - 0.0015	3,500	0.0023 - 0.0025	2,750	0.0023 - 0.0025
-	1/4	2,000	0.0016 - 0.0018	900	0.0014 - 0.0015	3,300	0.0024 - 0.0026	2,600	0.0024 - 0.0026
8	-	1,550	0.0018 - 0.0020	730	0.0015 - 0.0017	2,600	0.0028 - 0.0030	2,050	0.0028 - 0.0030
-	3/8	1,300	0.0023 - 0.0025	600	0.0018 - 0.0020	2,200	0.0039 - 0.0041	1,700	0.0039 - 0.0041
10	-	1,250	0.0024 - 0.0026	580	0.0019 - 0.0021	2,130	0.0040 - 0.0042	1,650	0.0040 - 0.0042
-	7/16	1,140	0.0025 - 0.0026	520	0.0019 - 0.0021	1,920	0.0041 - 0.0043	1,450	0.0041 - 0.0043
12	-	1,050	0.0025 - 0.0027	490	0.0020 - 0.0022	1,780	0.0041 - 0.0043	1,350	0.0041 - 0.0043
-	1/2	990	0.0026 - 0.0027	460	0.0020 - 0.0022	1,680	0.0042 - 0.0043	1,300	0.0042 - 0.0043

*When using our List 233 three flute drills, we recommend the same RPM but feed rates should be increased by 25-35%.

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List 215, 220D, 200 & 233* (Continued)

Aerospace Operations

Work Material		Graphite Composite		Epoxy Fiber		Acrylic Plastics		Graphite Composite Titanium Stack	
Drilling Speed		200-220 SFM		200-220 SFM		150-170 SFM		12-20 SFM	
Drill Dia.		Speed RPM	Feed IPR	Speed RPM	Feed IPR	Speed RPM	Feed IPR	Speed RPM	Feed IPR
mm	Inch								
3	–	6,800	0.0017-0.0022	6,800	0.0017-0.0022	5,200	0.0017-0.0022	520	0.0008-0.0013
–	1/8	6,400	0.0015-0.0025	6,400	0.0015-0.0025	4,900	0.0015-0.0025	490	0.0010-0.0015
4	–	5,100	0.0020-0.0030	5,100	0.0020-0.0030	3,900	0.0020-0.0030	390	0.0010-0.0020
–	3/16	4,250	0.0025-0.0035	4,250	0.0025-0.0035	3,250	0.0025-0.0035	325	0.0015-0.0025
6	–	3,400	0.0035-0.0045	3,400	0.0035-0.0045	2,580	0.0035-0.0045	260	0.0015-0.0025
–	1/4	3,200	0.0035-0.0045	3,200	0.0035-0.0045	2,450	0.0035-0.0045	245	0.0020 -0.0030
8	–	2,550	0.0045-0.0055	2,550	0.0045-0.0055	1,950	0.0045-0.0055	195	0.0025-0.0035
–	3/8	2,140	0.0055-0.0065	2,140	0.0055-0.0065	1,630	0.0055-0.0065	165	0.0030-0.0040
10	–	2,030	0.0055-0.0065	2,030	0.0055-0.0065	1,550	0.0055-0.0065	155	0.0035-0.0045
–	7/16	1,830	0.0060-0.0070	1,830	0.0060-0.0070	1,400	0.0060-0.0070	140	0.0035-0.0045
12	–	1,700	0.0065-0.0075	1,700	0.0065-0.0075	1,280	0.0065-0.0075	130	0.0040-0.0050
–	1/2	1,600	0.0065-0.0075	1,600	0.0065-0.0075	1,200	0.0065-0.0075	120	0.0040-0.0050

The chart above is for materials typically used in aircraft structures. Speeds may be less than optimal because of limitations in the portable machine tools utilized.
*When using our List 233 three flute drills we recommend the same RPM but feed rates should be increased by 25-35%.

Hole Depth Diameters	Reduce Spindle Speed	Reduce Feed Rate
3 x Dia.	10%	10%
4 x Dia.	20%	10%
5 x Dia.	30%	20%
6 x Dia.	35%	20%
8 x Dia.	40%	20%

When drilling deep holes, the recommended speeds and feeds should be reduced proportionately based on the hole depth. To the left are guidelines for reducing the speeds and feeds.