

高多層基板 / 10層以上 (φ0.05mm - φ1.6mm)
High Multilayer PWB / 10-layer and above



穴明け機主軸回転数 (Max 値) 160 krpm

Maximum spindle speed 160 krpm

1/2

直径 Diameter		回転数 Spindle speed	(周速)*2 (Velocity)*2	送り速度 Infeed rate		(チップロード)*2 (Chipload)*2	上昇速度 Retract rate		捨て板切り込み深さ Depth into back-up board		ヒット数*3 Hits*3	再研磨回数*3 Number of reprints*3	基板重ね枚数 Stack height*3,*4	基板厚 Board thickness [mm]
[mm]	[inch]	[rpm]	[m/min]	[m/min]	[IPM]	[μm/rev]	[m/min]	[IPM]	[mm]	[inch]	-	-	t1.6	t1.7 ~
0.05	0.0020	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
0.075	0.0030	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
0.09	0.0035	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
0.1	0.0039	160,000	(50)	0.80	31	(5)	10	394	0.1	0.0039	500 - 1,000	1	1	1
0.12	0.0047	160,000	(60)	0.80	31	(5)	10	394	0.15	0.0059	500 - 1,000	1	1	1
0.15	0.0059	160,000	(75)	1.20	47	(8)	15	591	0.15	0.0059	500 - 1,000	1	1	1
0.2	0.0079	150,000	(94)	1.50	59	(10)	25.4	1000	0.2	0.0079	1,000 - 1,500	1	1	1
0.25	0.0098	120,000	(94)	1.44	57	(12)	25.4	1000	0.25	0.0098	1,000 - 1,500	1	1	1
0.275	0.0108	110,000	(95)	1.65	65	(15)	25.4	1000	0.3	0.0118	1,000 - 1,500	1	1	1
0.3	0.0118	100,000	(94)	2.00	79	(20)	25.4	1000	0.3	0.0118	1,500 - 2,000	1	1-2	1
0.35	0.0138	90,000	(99)	1.80	71	(20)	25.4	1000	0.35	0.0138	1,500 - 2,000	1	1-2	1
0.4	0.0157	85,000	(107)	1.96	77	(23)	25.4	1000	0.4	0.0157	1,500 - 2,000	1	1-2	1
0.45	0.0177	80,000	(113)	1.84	72	(23)	25.4	1000	0.45	0.0177	1,500 - 2,000	1	1-2	1
0.5	0.0197	75,000	(118)	1.95	77	(26)	25.4	1000	0.5	0.0197	1,500 - 2,000	1	1-2	1
0.55	0.0217	70,000	(121)	1.82	72	(26)	25.4	1000	0.55	0.0217	1,500 - 2,000	1	1-2	1
0.6	0.0236	65,000	(123)	1.82	72	(28)	25.4	1000	0.6	0.0236	1,500 - 2,000	2	1-2	1
0.65	0.0256	60,000	(123)	1.68	66	(28)	25.4	1000	0.65	0.0256	1,500 - 2,000	2	1-2	1
0.7	0.0276	58,000	(128)	1.62	64	(28)	25.4	1000	0.7	0.0276	1,500 - 2,000	2	1-2	1
0.75	0.0295	58,000	(137)	1.62	64	(28)	25.4	1000	0.7	0.0276	1,500 - 2,000	2	1-2	1
0.8	0.0315	55,000	(138)	1.54	61	(28)	25.4	1000	0.7	0.0276	1,500 - 2,000	2	1-2	1
0.85	0.0335	55,000	(147)	1.54	61	(28)	25.4	1000	0.7	0.0276	1,500 - 2,000	2	1-2	1
0.9	0.0354	53,000	(150)	1.48	58	(28)	25.4	1000	0.7	0.0276	1,500 - 2,000	2	1-2	1
0.95	0.0374	50,000	(149)	1.40	55	(28)	25.4	1000	0.7	0.0276	1,500 - 2,000	2	1-2	1
1	0.0394	46,000	(145)	1.29	51	(28)	25.4	1000	0.7	0.0276	1,500 - 2,000	2	1-2	1
1.05	0.0413	45,000	(148)	1.35	53	(30)	25.4	1000	0.7	0.0276	1,500 - 2,000	3	1-2	1
1.1	0.0433	43,000	(149)	1.29	51	(30)	25.4	1000	0.7	0.0276	1,500 - 2,000	3	1-2	1
1.15	0.0453	41,000	(148)	1.23	48	(30)	25.4	1000	0.7	0.0276	1,500 - 2,000	3	1-2	1
1.2	0.0472	39,000	(147)	1.56	61	(40)	25.4	1000	0.7	0.0276	1,500 - 2,000	3	1-2	1
1.25	0.0492	37,000	(145)	1.48	58	(40)	25.4	1000	0.7	0.0276	1,500 - 2,000	3	1-2	1
1.3	0.0512	36,000	(147)	1.44	57	(40)	25.4	1000	0.7	0.0276	1,500 - 2,000	3	1-2	1
1.35	0.0531	34,000	(144)	1.36	54	(40)	25.4	1000	0.7	0.0276	1,500 - 2,000	3	1-2	1
1.4	0.0551	32,000	(141)	1.28	50	(40)	25.4	1000	0.7	0.0276	1,500 - 2,000	3	1-2	1
1.45	0.0571	30,000	(137)	1.20	47	(40)	25.4	1000	0.7	0.0276	1,500 - 2,000	3	1-2	1
1.5	0.0591	28,000	(132)	1.12	44	(40)	25.4	1000	0.7	0.0276	1,500 - 2,000	3	1-2	1
1.55	0.0610	28,000	(136)	1.12	44	(40)	25.4	1000	0.7	0.0276	1,500 - 2,000	3	1-2	1
1.6	0.0630	28,000	(141)	1.12	44	(40)	25.4	1000	0.7	0.0276	1,500 - 2,000	3	1-2	1

*1 赤字のドリル径は160krpm以上の高速回転加工で穴品質ならびにドリル折損率が改善されます。
 *2 周速ならびにチップロードはメートル表記です。
 *3 ヒット数、再研磨回数、重ね枚数は目安です。穴品質をご確認の上設定願います。
 *4 上記数に適合しない基板厚や重ね枚数で加工される場合については、別途お問い合わせ願います。
 *5 穴明け加工機のスピンドル性能等によっては条件設定を改善する必要があります。
 *6 穴明け加工機のプレッシャーフット、及びバキューム性能は、穴品質に影響を及ぼすことがありますので定期的な点検をお願いします。
 *7 当板、捨て板の材料、厚さは穴品質に影響を及ぼすことがありますので、選定にあたっては十分ご注意ください。
 *8 加工品質改善、工具折損を防ぐためステップドリリングならびにダブルドリリング等を推奨します。

*1 Diameters written in RED will gain improved hole quality when drilling with over 160krpm spindle speed.
 *2 Velocity and chipload are shown in metric units.
 *3 Hits, number of reprints and stack heights are for general information. They should be determined by hole quality.
 *4 Where the board thickness and/or stack height are not shown in the table, please contact Union Tool's Technical support team.
 *5 These parameters can be affected by the condition and performance of both the spindle and drilling machine.
 *6 The pressure foot and vacuum performance of the drilling machine can affect hole quality. Periodic inspection, maintenance and measurement is strongly recommended.
 *7 The thickness of the entry and back-up board, together with the material type can affect the drilling conditions and care should be taken to choose an appropriate product for the application being drilled.
 *8 To improve hole quality and drill bit breakage, peck drilling and double drilling are recommended.

高多層基板 / 10 層以上 (φ1.65mm - φ6.5mm)
High Multilayer PWB / 10-layer and above



穴明け機主軸回転数 (Max 値) 160 krpm

Maximum spindle speed 160 krpm

2/2

直径 Diameter		回転数 Spindle speed	(周速) *2 (Velocity) *2	送り速度 Infeed rate		(チップロード) *2 (Chipload) *2	上昇速度 Retract rate		捨て板切り込み深さ Depth into back-up board		ヒット数 *3 Hits *3	再研磨回数 *3 Number of repoints *3	基板重ね枚数 Stack height *3, *4 基板厚 Board thickness [mm]	
[mm]	[inch]	[rpm]	[m/min]	[m/min]	[IPM]	[μm/rev]	[m/min]	[IPM]	[mm]	[inch]	-	-	t1.6 t1.7 ~	
1.65	0.0650	28,000	(145)	1.68	66	(60)	25.4	1000	0.7	0.0276	1,500 - 2,000	3	1-2	1
1.7	0.0669	25,000	(134)	1.50	59	(60)	25.4	1000	0.7	0.0276	1,500 - 2,000	3	1-2	1
1.75	0.0689	25,000	(137)	1.50	59	(60)	25.4	1000	0.7	0.0276	1,500 - 2,000	3	1-2	1
1.8	0.0709	23,000	(130)	1.38	54	(60)	25.4	1000	0.7	0.0276	1,500 - 2,000	3	1-2	1
1.85	0.0728	23,000	(134)	1.38	54	(60)	25.4	1000	0.7	0.0276	1,500 - 2,000	3	1-2	1
1.9	0.0748	20,000	(119)	1.20	47	(60)	25.4	1000	0.7	0.0276	1,500 - 2,000	3	1-2	1
1.95	0.0768	20,000	(123)	1.20	47	(60)	25.4	1000	0.7	0.0276	1,500 - 2,000	3	1-2	1
2	0.0787	18,000	(113)	1.08	43	(60)	25.4	1000	0.7	0.0276	1,500 - 2,000	3	1-2	1
2.05	0.0807	18,000	(116)	1.08	43	(60)	25.4	1000	0.7	0.0276	1,500 - 2,000	3	1-2	1
2.1	0.0827	16,000	(106)	0.96	38	(60)	25.4	1000	0.7	0.0276	1,500 - 2,000	3	1-2	1
2.15	0.0846	16,000	(108)	0.96	38	(60)	25.4	1000	0.7	0.0276	1,500 - 2,000	3	1-2	1
2.2	0.0866	15,000	(104)	0.90	35	(60)	25.4	1000	0.7	0.0276	1,500 - 2,000	3	1-2	1
2.25	0.0886	15,000	(106)	0.90	35	(60)	25.4	1000	0.7	0.0276	1,500 - 2,000	3	1-2	1
2.3	0.0906	15,000	(108)	0.90	35	(60)	25.4	1000	0.7	0.0276	1,500 - 2,000	3	1-2	1
2.35	0.0925	15,000	(111)	0.90	35	(60)	25.4	1000	0.7	0.0276	1,500 - 2,000	3	1-2	1
2.4	0.0945	15,000	(113)	0.90	35	(60)	25.4	1000	0.7	0.0276	1,500 - 2,000	3	1-2	1
2.45	0.0965	15,000	(115)	0.90	35	(60)	25.4	1000	0.7	0.0276	1,500 - 2,000	3	1-2	1
2.5	0.0984	15,000	(118)	0.90	35	(60)	25.4	1000	0.7	0.0276	1,500 - 2,000	3	1-2	1
2.55	0.1004	15,000	(120)	0.90	35	(60)	25.4	1000	0.7	0.0276	1,500 - 2,000	3	1-2	1
2.6	0.1024	15,000	(123)	0.90	35	(60)	25.4	1000	0.7	0.0276	1,500 - 2,000	3	1-2	1
2.65	0.1043	15,000	(125)	0.90	35	(60)	25.4	1000	0.7	0.0276	1,500 - 2,000	3	1-2	1
2.7	0.1063	15,000	(127)	0.90	35	(60)	25.4	1000	0.7	0.0276	1,500 - 2,000	3	1-2	1
2.75	0.1083	15,000	(130)	0.90	35	(60)	25.4	1000	0.7	0.0276	1,500 - 2,000	3	1-2	1
2.8	0.1102	15,000	(132)	0.90	35	(60)	25.4	1000	0.7	0.0276	1,500 - 2,000	3	1-2	1
2.85	0.1122	15,000	(134)	0.90	35	(60)	25.4	1000	0.7	0.0276	1,500 - 2,000	3	1-2	1
2.9	0.1142	15,000	(137)	0.90	35	(60)	25.4	1000	0.7	0.0276	1,500 - 2,000	3	1-2	1
2.95	0.1161	15,000	(139)	0.90	35	(60)	25.4	1000	0.7	0.0276	1,500 - 2,000	3	1-2	1
3	0.1181	15,000	(141)	0.90	35	(60)	25.4	1000	0.7	0.0276	1,500 - 2,000	3	1-2	1
3.05	0.1201	15,000	(144)	0.90	35	(60)	25.4	1000	0.7	0.0276	1,500 - 2,000	3	1-2	1
3.1	0.1220	15,000	(146)	0.90	35	(60)	25.4	1000	0.7	0.0276	1,500 - 2,000	3	1-2	1
3.15	0.1240	15,000	(148)	0.90	35	(60)	25.4	1000	0.7	0.0276	1,500 - 2,000	3	1-2	1
3.175	0.1250	15,000	(150)	0.90	35	(60)	25.4	1000	0.7	0.0276	1,500 - 2,000	3	1-2	1
3.2 - 3.95	0.126 - 0.156	25,000	-	0.75	30	(30)	25.4	1000	0.7	0.0276	500-1000	4	1-2	1
4.0 - 4.95	0.157 - 0.195	20,000	-	0.60	24	(30)	25.4	1000	0.7	0.0276	500-1000	4	1-2	1
5.0 - 5.95	0.197 - 0.234	16,000	-	0.64	25	(40)	25.4	1000	0.7	0.0276	500-1000	4	1-2	1
6.0 - 6.5	0.236 - 0.256	15,000	-	0.53	21	(35)	25.4	1000	0.7	0.0276	500-1000	4	1-2	1

*1 穴周囲バリならびに内壁荒れが見られる場合はチップロードを下げて下さい。

*2 周速ならびにチップロードはメートル表記です。

*3 ヒット数、再研磨回数、重ね枚数は目安です。穴品質をご確認の上設定願います。

*4 上記表に適合しない基板厚や重ね枚数で加工される場合については、別途お問い合わせ願います。

*5 穴明け加工機のスピンドル性能等によっては条件設定を改善する必要があります。

*6 穴明け加工機のプレッシャーフット、及びバキューム性能は、穴品質に影響を及ぼすことがありますので定期的な点検をお奨めします。

*7 当板、捨て板の材料、厚さは穴品質に影響を及ぼすことがありますので、選定にあたっては十分ご注意ください。

*8 加工品質改善、工具折損を防ぐためステップドリリングならびにダブルドリリング等を推奨します。

*1 In the case of burring and hole wall roughness problems, please decrease the chipload.

*2 Velocity and chipload are shown in metric units.

*3 Hits, number of reprints and stack heights are for general information. They should be determined by hole quality.

*4 Where the board thickness and/or stack height are not shown in the table, please contact Union Tool's Technical support team.

*5 These parameters can be affected by the condition and performance of both the spindle and drilling machine.

*6 The pressure foot and vacuum performance of the drilling machine can affect hole quality. Periodic inspection, maintenance and measurement is strongly recommended.

*7 The thickness of the entry and back-up board, together with the material type can affect the drilling conditions and care should be taken to choose an appropriate product for the application being drilled.

*8 To improve hole quality and drill bit breakage, peck drilling and double drilling are recommended.