

フレキシブル基板 / 両面 (φ0.05mm - φ1.6mm)
Flexible PWB / Double sided



穴明け機主軸回転数 (Max 値) 200 krpm

Maximum spindle speed 200 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 *4 | 基板厚 Board thickness [mm] |
|----------------|--------|----------------------|--------------------------|---------------------|-------|------------------------------|----------------------|-------|---------------------------------------|--------|--------------------|-----------------------------------|---------------------------|-----------------------------|
| [mm] | [inch] | [rpm] | [m/min] | [m/min] | [IPM] | [μm/rev] | [m/min] | [IPM] | [mm] | [inch] | - | - | t 0.06 | t 0.08 |
| 0.05 | 0.0020 | 200,000 | (31) | 1.00 | 39 | (5) | 10 | 394 | 0.1 | 0.0039 | 1,000 - 2,000 | 1 | 1 | 1 |
| 0.075 | 0.0030 | 200,000 | (47) | 1.00 | 39 | (5) | 10 | 394 | 0.1 | 0.0039 | 1,000 - 2,000 | 1 | 1 - 3 | 1 |
| 0.09 | 0.0035 | 200,000 | (57) | 1.00 | 39 | (5) | 10 | 394 | 0.1 | 0.0039 | 1,000 - 2,000 | 1 | 1 - 3 | 1 - 3 |
| 0.1 | 0.0039 | 200,000 | (63) | 1.00 | 39 | (5) | 10 | 394 | 0.1 | 0.0039 | 2,000 - 6,000 | 1 | 5 - 8 | 3 - 6 |
| 0.12 | 0.0047 | 200,000 | (75) | 1.00 | 39 | (5) | 10 | 394 | 0.15 | 0.0059 | 2,000 - 6,000 | 1 | 6 - 10 | 5 - 8 |
| 0.15 | 0.0059 | 200,000 | (94) | 2.00 | 79 | (10) | 15 | 591 | 0.15 | 0.0059 | 2,000 - 6,000 | 2 | 7 - 12 | 6 - 10 |
| 0.2 | 0.0079 | 180,000 | (113) | 1.80 | 71 | (10) | 25.4 | 1000 | 0.2 | 0.0079 | 2,500 - 7,000 | 2 | 7 - 12 | 6 - 10 |
| 0.25 | 0.0098 | 140,000 | (110) | 2.10 | 83 | (15) | 25.4 | 1000 | 0.25 | 0.0098 | 2,500 - 7,000 | 2 | 7 - 12 | 6 - 10 |
| 0.275 | 0.0108 | 130,000 | (112) | 2.34 | 92 | (18) | 25.4 | 1000 | 0.3 | 0.0118 | 2,500 - 7,000 | 2 | 7 - 12 | 6 - 10 |
| 0.3 | 0.0118 | 120,000 | (113) | 2.16 | 85 | (18) | 25.4 | 1000 | 0.3 | 0.0118 | 3,000 - 8,000 | 2 | 8 - 15 | 6 - 10 |
| 0.35 | 0.0138 | 100,000 | (110) | 2.10 | 83 | (21) | 25.4 | 1000 | 0.35 | 0.0138 | 3,000 - 8,000 | 2 | 8 - 15 | 6 - 10 |
| 0.4 | 0.0157 | 95,000 | (119) | 2.19 | 86 | (23) | 25.4 | 1000 | 0.4 | 0.0157 | 3,000 - 8,000 | 3 | 8 - 15 | 6 - 10 |
| 0.45 | 0.0177 | 85,000 | (120) | 1.96 | 77 | (23) | 25.4 | 1000 | 0.45 | 0.0177 | 3,000 - 8,000 | 3 | 8 - 15 | 6 - 10 |
| 0.5 | 0.0197 | 75,000 | (118) | 1.95 | 77 | (26) | 25.4 | 1000 | 0.5 | 0.0197 | 3,000 - 8,000 | 3 | 8 - 15 | 6 - 10 |
| 0.55 | 0.0217 | 70,000 | (121) | 1.82 | 72 | (26) | 25.4 | 1000 | 0.55 | 0.0217 | 3,000 - 8,000 | 3 | 8 - 15 | 6 - 10 |
| 0.6 | 0.0236 | 65,000 | (123) | 1.82 | 72 | (28) | 25.4 | 1000 | 0.6 | 0.0236 | 3,000 - 8,000 | 3 | 8 - 15 | 6 - 10 |
| 0.65 | 0.0256 | 65,000 | (133) | 1.82 | 72 | (28) | 25.4 | 1000 | 0.65 | 0.0256 | 3,000 - 8,000 | 3 | 8 - 15 | 6 - 10 |
| 0.7 | 0.0276 | 60,000 | (132) | 1.68 | 66 | (28) | 25.4 | 1000 | 0.7 | 0.0276 | 3,000 - 8,000 | 3 | 8 - 15 | 6 - 10 |
| 0.75 | 0.0295 | 60,000 | (141) | 1.68 | 66 | (28) | 25.4 | 1000 | 0.7 | 0.0276 | 3,000 - 8,000 | 3 | 8 - 15 | 6 - 10 |
| 0.8 | 0.0315 | 57,000 | (143) | 1.60 | 63 | (28) | 25.4 | 1000 | 0.7 | 0.0276 | 3,000 - 8,000 | 3 | 8 - 15 | 6 - 10 |
| 0.85 | 0.0335 | 57,000 | (152) | 1.60 | 63 | (28) | 25.4 | 1000 | 0.7 | 0.0276 | 3,000 - 8,000 | 3 | 8 - 15 | 6 - 10 |
| 0.9 | 0.0354 | 55,000 | (156) | 1.54 | 61 | (28) | 25.4 | 1000 | 0.7 | 0.0276 | 3,000 - 8,000 | 3 | 8 - 15 | 6 - 10 |
| 0.95 | 0.0374 | 52,000 | (155) | 1.46 | 57 | (28) | 25.4 | 1000 | 0.7 | 0.0276 | 3,000 - 8,000 | 3 | 8 - 15 | 6 - 10 |
| 1 | 0.0394 | 48,000 | (151) | 1.34 | 53 | (28) | 25.4 | 1000 | 0.7 | 0.0276 | 3,000 - 8,000 | 3 | 8 - 15 | 6 - 10 |
| 1.05 | 0.0413 | 47,000 | (155) | 1.32 | 52 | (28) | 25.4 | 1000 | 0.7 | 0.0276 | 3,000 - 8,000 | 3 | 8 - 15 | 6 - 10 |
| 1.1 | 0.0433 | 45,000 | (156) | 1.26 | 50 | (28) | 25.4 | 1000 | 0.7 | 0.0276 | 3,000 - 8,000 | 3 | 8 - 15 | 6 - 10 |
| 1.15 | 0.0453 | 43,000 | (155) | 1.20 | 47 | (28) | 25.4 | 1000 | 0.7 | 0.0276 | 3,000 - 8,000 | 3 | 8 - 15 | 6 - 10 |
| 1.2 | 0.0472 | 41,000 | (155) | 1.56 | 61 | (38) | 25.4 | 1000 | 0.7 | 0.0276 | 3,000 - 8,000 | 3 | 8 - 15 | 6 - 10 |
| 1.25 | 0.0492 | 39,000 | (153) | 1.48 | 58 | (38) | 25.4 | 1000 | 0.7 | 0.0276 | 2,000 - 6,000 | 3 | 8 - 15 | 6 - 10 |
| 1.3 | 0.0512 | 38,000 | (155) | 1.44 | 57 | (38) | 25.4 | 1000 | 0.7 | 0.0276 | 2,000 - 6,000 | 3 | 8 - 15 | 6 - 10 |
| 1.35 | 0.0531 | 36,000 | (153) | 1.37 | 54 | (38) | 25.4 | 1000 | 0.7 | 0.0276 | 2,000 - 6,000 | 3 | 8 - 15 | 6 - 10 |
| 1.4 | 0.0551 | 34,000 | (150) | 1.29 | 51 | (38) | 25.4 | 1000 | 0.7 | 0.0276 | 2,000 - 6,000 | 3 | 8 - 15 | 6 - 10 |
| 1.45 | 0.0571 | 32,000 | (146) | 1.22 | 48 | (38) | 25.4 | 1000 | 0.7 | 0.0276 | 2,000 - 6,000 | 3 | 8 - 15 | 6 - 10 |
| 1.5 | 0.0591 | 30,000 | (141) | 1.14 | 45 | (38) | 25.4 | 1000 | 0.7 | 0.0276 | 2,000 - 6,000 | 3 | 8 - 15 | 6 - 10 |
| 1.55 | 0.0610 | 30,000 | (146) | 1.14 | 45 | (38) | 25.4 | 1000 | 0.7 | 0.0276 | 2,000 - 6,000 | 3 | 8 - 15 | 6 - 10 |
| 1.6 | 0.0630 | 30,000 | (151) | 1.14 | 45 | (38) | 25.4 | 1000 | 0.7 | 0.0276 | 2,000 - 6,000 | 3 | 8 - 15 | 6 - 10 |

*1 赤字のドリル径は200krpm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 接着材の有無ならびに材質で加工特性が大きく異なります。目標品質をクリアできるヒット数ならびに重ね枚数をご検討願います。

*9 当社フレキシブル基板用ドリル"FXシリーズ"を推奨します。

*1 Diameters written in RED will gain improved hole quality when drilling with over 200krpm 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.

Special attention should be given to the spindle run out and the accuracy of the 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 With or without adhesive layers and the material property changes drilling performance significantly.

Hit counts and PWB stack height should be determined by hole quality target.

*9 Union Tool's "FX series" for flexible PWB is recommended.

フレキシブル基板 / 両面 (φ1.65mm - φ6.5mm)
Flexible PWB / Double sided



穴明け機主軸回転数 (Max 値) 200 krpm Maximum spindle speed 200 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 reprints*3 | 基板重ね枚数 Stack height*4 | 基板厚 Board thickness [mm] |
|----------------|---------------|----------------------|------------------------|---------------------|-------|----------------------------|----------------------|-------|---------------------------------------|--------|------------------|---------------------------------|--------------------------|-----------------------------|
| [mm] | [inch] | [rpm] | [m/min] | [m/min] | [IPM] | [μm/rev] | [m/min] | [IPM] | [mm] | [inch] | - | - | t 0.06 | t 0.08 |
| 1.65 | 0.0650 | 30,000 | (156) | 1.59 | 63 | (53) | 25.4 | 1000 | 0.7 | 0.0276 | 1,500 - 2,500 | 4 | 8 - 15 | 6 - 10 |
| 1.7 | 0.0669 | 27,000 | (144) | 1.43 | 56 | (53) | 25.4 | 1000 | 0.7 | 0.0276 | 1,500 - 2,500 | 4 | 8 - 15 | 6 - 10 |
| 1.75 | 0.0689 | 27,000 | (148) | 1.43 | 56 | (53) | 25.4 | 1000 | 0.7 | 0.0276 | 1,500 - 2,500 | 4 | 8 - 15 | 6 - 10 |
| 1.8 | 0.0709 | 25,000 | (141) | 1.33 | 52 | (53) | 25.4 | 1000 | 0.7 | 0.0276 | 1,500 - 2,500 | 4 | 8 - 15 | 6 - 10 |
| 1.85 | 0.0728 | 25,000 | (145) | 1.33 | 52 | (53) | 25.4 | 1000 | 0.7 | 0.0276 | 1,500 - 2,500 | 4 | 8 - 15 | 6 - 10 |
| 1.9 | 0.0748 | 22,000 | (131) | 1.17 | 46 | (53) | 25.4 | 1000 | 0.7 | 0.0276 | 1,500 - 2,500 | 4 | 8 - 15 | 6 - 10 |
| 1.95 | 0.0768 | 22,000 | (135) | 1.17 | 46 | (53) | 25.4 | 1000 | 0.7 | 0.0276 | 1,500 - 2,500 | 4 | 8 - 15 | 6 - 10 |
| 2 | 0.0787 | 20,000 | (126) | 1.06 | 42 | (53) | 25.4 | 1000 | 0.7 | 0.0276 | 1,500 - 2,500 | 4 | 8 - 15 | 6 - 10 |
| 2.05 | 0.0807 | 20,000 | (129) | 1.06 | 42 | (53) | 25.4 | 1000 | 0.7 | 0.0276 | 1,500 - 2,500 | 4 | 8 - 15 | 6 - 10 |
| 2.1 | 0.0827 | 18,000 | (119) | 0.95 | 38 | (53) | 25.4 | 1000 | 0.7 | 0.0276 | 1,500 - 2,500 | 4 | 8 - 15 | 6 - 10 |
| 2.15 | 0.0846 | 18,000 | (122) | 0.95 | 38 | (53) | 25.4 | 1000 | 0.7 | 0.0276 | 1,500 - 2,500 | 4 | 8 - 15 | 6 - 10 |
| 2.2 | 0.0866 | 16,000 | (111) | 0.85 | 33 | (53) | 25.4 | 1000 | 0.7 | 0.0276 | 1,500 - 2,500 | 4 | 8 - 15 | 6 - 10 |
| 2.25 | 0.0886 | 16,000 | (113) | 0.85 | 33 | (53) | 25.4 | 1000 | 0.7 | 0.0276 | 1,500 - 2,500 | 4 | 8 - 15 | 6 - 10 |
| 2.3 | 0.0906 | 15,000 | (108) | 0.80 | 31 | (53) | 25.4 | 1000 | 0.7 | 0.0276 | 1,500 - 2,500 | 4 | 8 - 15 | 6 - 10 |
| 2.35 | 0.0925 | 15,000 | (111) | 0.80 | 31 | (53) | 25.4 | 1000 | 0.7 | 0.0276 | 1,500 - 2,500 | 4 | 8 - 15 | 6 - 10 |
| 2.4 | 0.0945 | 15,000 | (113) | 0.80 | 31 | (53) | 25.4 | 1000 | 0.7 | 0.0276 | 1,500 - 2,500 | 4 | 8 - 15 | 6 - 10 |
| 2.45 | 0.0965 | 15,000 | (115) | 0.80 | 31 | (53) | 25.4 | 1000 | 0.7 | 0.0276 | 1,500 - 2,500 | 4 | 8 - 15 | 6 - 10 |
| 2.5 | 0.0984 | 15,000 | (118) | 0.80 | 31 | (53) | 25.4 | 1000 | 0.7 | 0.0276 | 1,500 - 2,500 | 4 | 8 - 15 | 6 - 10 |
| 2.55 | 0.1004 | 15,000 | (120) | 0.80 | 31 | (53) | 25.4 | 1000 | 0.7 | 0.0276 | 1,500 - 2,500 | 4 | 8 - 15 | 6 - 10 |
| 2.6 | 0.1024 | 15,000 | (123) | 0.80 | 31 | (53) | 25.4 | 1000 | 0.7 | 0.0276 | 1,500 - 2,500 | 4 | 8 - 15 | 6 - 10 |
| 2.65 | 0.1043 | 15,000 | (125) | 0.80 | 31 | (53) | 25.4 | 1000 | 0.7 | 0.0276 | 1,500 - 2,500 | 4 | 8 - 15 | 6 - 10 |
| 2.7 | 0.1063 | 15,000 | (127) | 0.80 | 31 | (53) | 25.4 | 1000 | 0.7 | 0.0276 | 1,500 - 2,500 | 4 | 8 - 15 | 6 - 10 |
| 2.75 | 0.1083 | 15,000 | (130) | 0.80 | 31 | (53) | 25.4 | 1000 | 0.7 | 0.0276 | 1,500 - 2,500 | 4 | 8 - 15 | 6 - 10 |
| 2.8 | 0.1102 | 15,000 | (132) | 0.80 | 31 | (53) | 25.4 | 1000 | 0.7 | 0.0276 | 1,500 - 2,500 | 4 | 8 - 15 | 6 - 10 |
| 2.85 | 0.1122 | 15,000 | (134) | 0.80 | 31 | (53) | 25.4 | 1000 | 0.7 | 0.0276 | 1,500 - 2,500 | 4 | 8 - 15 | 6 - 10 |
| 2.9 | 0.1142 | 15,000 | (137) | 0.80 | 31 | (53) | 25.4 | 1000 | 0.7 | 0.0276 | 1,500 - 2,500 | 4 | 8 - 15 | 6 - 10 |
| 2.95 | 0.1161 | 15,000 | (139) | 0.80 | 31 | (53) | 25.4 | 1000 | 0.7 | 0.0276 | 1,500 - 2,500 | 4 | 8 - 15 | 6 - 10 |
| 3 | 0.1181 | 15,000 | (141) | 0.80 | 31 | (53) | 25.4 | 1000 | 0.7 | 0.0276 | 1,500 - 2,500 | 4 | 8 - 15 | 6 - 10 |
| 3.05 | 0.1201 | 15,000 | (144) | 0.80 | 31 | (53) | 25.4 | 1000 | 0.7 | 0.0276 | 1,500 - 2,500 | 4 | 8 - 15 | 6 - 10 |
| 3.1 | 0.1220 | 15,000 | (146) | 0.80 | 31 | (53) | 25.4 | 1000 | 0.7 | 0.0276 | 1,500 - 2,500 | 4 | 8 - 15 | 6 - 10 |
| 3.15 | 0.1240 | 15,000 | (148) | 0.80 | 31 | (53) | 25.4 | 1000 | 0.7 | 0.0276 | 1,500 - 2,500 | 4 | 8 - 15 | 6 - 10 |
| 3.175 | 0.1250 | 15,000 | (150) | 0.80 | 31 | (53) | 25.4 | 1000 | 0.7 | 0.0276 | 1,500 - 2,500 | 4 | 8 - 15 | 6 - 10 |
| 3.2 - 3.95 | 0.126 - 0.156 | 25,000 | - | 0.75 | 30 | (30) | 25.4 | 1000 | 0.7 | 0.0276 | 500-1000 | 4 | 8 - 15 | 6 - 10 |
| 4.0 - 4.95 | 0.157 - 0.195 | 20,000 | - | 0.60 | 24 | (30) | 25.4 | 1000 | 0.7 | 0.0276 | 500-1000 | 4 | 8 - 15 | 6 - 10 |
| 5.0 - 5.95 | 0.197 - 0.234 | 16,000 | - | 0.64 | 25 | (40) | 25.4 | 1000 | 0.7 | 0.0276 | 500-1000 | 4 | 8 - 15 | 6 - 10 |
| 6.0 - 6.5 | 0.236 - 0.256 | 15,000 | - | 0.53 | 21 | (35) | 25.4 | 1000 | 0.7 | 0.0276 | 500-1000 | 4 | 8 - 15 | 6 - 10 |

*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 穴明け加工機の材料、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 接着材の有無ならびに材質で加工特性が大きく異なります。目標品質をクリアできるヒット数ならびに基板重ね枚数をご検討願います。

*9 当社フレキシブル基板用ドリル"FXシリーズ"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 Special attention should be given to the spindle run out and the accuracy of the drilling machine.

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

*8 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.

*9 With or without adhesive layers and the material property changes drilling performance significantly.

Hit counts and PWB stack height should be determined by hole quality target.

*9 Union Tool's "FX series" for flexible PWB is recommended.