Twister® GP

302 / 306 Series Recommended Cutting Data - **Inch**

Workpiece Material Group	ISO	Hardness	TYPE	vc - SFM	Drill Diameter (Inch)				
					1/64	1/32	1/16	3/32	1/8
					f - IPR				
Free Machining & Low Carbon Steels 1006, 1008, 1015, 1018, 1020, 1022, 1025, 1117, 1140, 1141, 11L08, 11L14, 1213, 12L13, 12L14, 1215, 1330	P	up to 28 Rc		300	.0003	.0006	.0012	.0018	.0023
Medium Carbon & High Carbon Steels, Alloy Steels & Easy to Machine Tool Steels 1030, 1035, 1040, 1045, 1050, 1052, 1055, 1060, 1085, 1095, 1541, 1551, 9255, 2515, 3135, 3415, 4130, 4137, 4140, 4150, 4320, 4340, 4520, 5015, 5115, 5120, 5132, 5140, 5155, 6150, 8620, 9262, 9840, 52100, O1, O2, O6, S2, W1 to W310	P	28 to 38 Rc	●	225	.0003	.0006	.0012	.0018	.0023
Tool Steels & Die Steels O7, M1, M2, M3, M4, M7, T1, T2, T4, T5, T8, T15, A2, A3, A6, A7, H10, H11, H12, H13, H19, H21, L3, L6, L7, P2, P20, S1, S5, S7, 52100, A 128, D2, D3, D4, D5, D7	P	28 to 44 Rc		200	.0003	.0006	.0012	.0018	.0023
Hardened Steels A2 / 52100	H	35-45 Rc	●	50	.0001	.0003	.0005	.0008	.0010
Free Machining Stainless	M	up to 28 Rc		175	.0003	.0006	.0012	.0018	.0023
Stainless Steel - Austenitic 304 / 316	M	up to 28 Rc		200	.0003	.0006	.0012	.0018	.0023
Stainless Steel - Ferritic / Martensitic	M	up to 28 Rc	●	100	.0003	.0006	.0012	.0018	.0023
Stainless Steel - Moderately Difficult 301, 302, 303 High Tensile, 304, 304L, 305, 420, 15-5PH, 17-4PH, 17-7PH	M	over 28 Rc		75	.0003	.0006	.0012	.0018	.0023
Aluminum (<10% Si)	N			450	.0006	.0012	.0020	.0030	.0040
Aluminum (>10% Si)	N			325	.0006	.0012	.0020	.0030	.0040
Plastics	N		●	550	.0006	.0012	.0020	.0030	.0040
Composities / Fiber Reinforced Materials / Circuit Boards	N			650	.001-.0015	.0020	.0030	.0040	.0050
Cast Iron - Gray CG, ASTM A48, CLASS 20, 25, 30, 35, SAE J431C, GRADES G1800, G3000, G3500, GG 10, 15, 20, 25, 30, 35, 40	K	up to 240 HB		400	.0003	.0006	.0012	.0018	.0023
Cast Iron - Ductile & Malleable CGI 60-40-18, 65-45-12, D4018, D4512, D5506, 32510, 35108, M3210, M4504, M5503, 250, 300, 350, 400, 450	K	over 240 HB	●	350	.0003	.0006	.0012	.0018	.0023
Titanium 6Al-4V	S	up to 42 Rc		60	.0003	.0006	.0012	.0018	.0023
High Temp Alloys Inconel / Hastelloy / Waspeloy / Nickel Based Alloys-Monel	S	up to 42 Rc	●	50	.0001	.0003	.0005	.0008	.0010

Chiploads above .006 are not recommended since location problems become more evident.

In typical circuit board materials, Micro Drills operate efficiently in the 600-700 SFM (180-215 m/min) ranges. Higher speed rates tend to produce excessive drill wear and early failure. In general, smaller diameter drills are limited to slower speeds, because of machine limitations.

Feed rates can be set extremely high in most applications, because of the quality and design features of the M.A. Ford® Micro Drill. However, certain precautions should be taken for proper performance and safety. When determining optimum feed rates, consider the following factors:

- Spindle motors must be rated at least one hp (1 horsepower).
- To prevent delamination, entry materials must be used.
- Pressure foot clamping must be appropriate.

When drilling harder materials, the Micro Drill life may be variable. Drilling set ups must be precise. The drill TIR must be less than .0001" (.0025 mm). The feed axis motion must be smooth without any play. Machining practices are very important.

Note: Micro drills should be kept in their original packaging, or equivalent when not in use. Mechanical micrometers are not recommended for checking size.

Twister® GP

302 / 306 Series Recommended Cutting Data - **Metric**

Workpiece Material Group	ISO	Hardness	TYPE	vc - m/min	Drill Diameter (mm)				
					0.5	1	2	2.5	3
					f - mm/Rev				
Free Machining & Low Carbon Steels 1006, 1008, 1015, 1018, 1020, 1022, 1025, 1117, 1140, 1141, 11L08, 11L14, 1213, 12L13, 12L14, 1215, 1330	P	up to 28 Rc		90	.0075	.0150	.0300	.0450	.0560
Medium Carbon & High Carbon Steels, Alloy Steels & Easy to Machine Tool Steels 1030, 1035, 1040, 1045, 1050, 1052, 1055, 1060, 1085, 1095, 1541, 1551, 9255, 2515, 3135, 3415, 4130, 4137, 4140, 4150, 4320, 4340, 4520, 5015, 5115, 5120, 5132, 5140, 5155, 6150, 8620, 9262, 9840, 52100, O1, O2, O6, S2, W1 to W310	P	28 to 38 Rc	●	70	.0075	.0150	.0300	.0450	.0560
Tool Steels & Die Steels O7, M1, M2, M3, M4, M7, T1, T2, T4, T5, T8, T15, A2, A3, A6, A7, H10, H11, H12, H13, H19, H21, L3, L6, L7, P2, P20, S1, S5, S7, 52100, A 128, D2, D3, D4, D5, D7	P	28 to 44 Rc		60	.0075	.0150	.0300	.0450	.0560
Hardened Steels A2 / 52100	H	35-45 Rc	●	15	.0035	.0075	.0150	.0190	.0260
Free Machining Stainless	M	up to 28 Rc		55	.0075	.0150	.0300	.0450	.0560
Stainless Steel - Austenitic 304 / 316	M	up to 28 Rc		60	.0075	.0150	.0300	.0450	.0560
Stainless Steel - Ferritic / Martensitic	M	up to 28 Rc	●	30	.0075	.0150	.0300	.0450	.0560
Stainless Steel - Moderately Difficult 301, 302, 303 High Tensile, 304, 304L, 305, 420, 15-5PH, 17-4PH, 17-7PH	M	over 28 Rc		25	.0075	.0150	.0300	.0450	.0560
Aluminum (<10% Si)	N			140	.0150	.0300	.0600	.0800	.1000
Aluminum (>10% Si)	N			100	.0150	.0300	.0600	.0800	.1000
Plastics	N		●	170	.0150	.0300	.0600	.0800	.1000
Composities / Fiber Reinforced Materials / Circuit Boards	N			200	.025-.038	.0510	.0760	.1020	.1270
Cast Iron - Gray CG, ASTM A48, CLASS 20, 25, 30, 35, SAE J431C, GRADES G1800, G3000, G3500, GG 10, 15, 20, 25, 30, 35, 40	K	up to 240 HB		120	.0075	.0150	.0300	.0450	.0560
Cast Iron - Ductile & Malleable CGI 60-40-18, 65-45-12, D4018, D4512, D5506, 32510, 35108, M3210, M4504, M5503, 250, 300, 350, 400, 450	K	over 240 HB	●	110	.0075	.0150	.0300	.0450	.0560
Titanium 6Al-4V	S	up to 42 Rc		20	.0075	.0150	.0300	.0450	.0560
High Temp Alloys Inconel / Hastelloy / Waspeloy / Nickel Based Alloys-Monel	S	up to 42 Rc	●	15	.0025	.0075	.0120	.0200	.0250

Chiploads above .140 are not recommended since location problems become more evident.

In typical circuit board materials, Micro Drills operate efficiently in the 600-700 SFM (180-215 m/min) ranges. Higher speed rates tend to produce excessive drill wear and early failure. In general, smaller diameter drills are limited to slower speeds, because of machine limitations.

Feed rates can be set extremely high in most applications, because of the quality and design features of the M.A. Ford® Micro Drill. However, certain precautions should be taken for proper performance and safety. When determining optimum feed rates, consider the following factors:

- Spindle motors must be rated at least one hp (1 horsepower).
- To prevent delamination, entry materials must be used.
- Pressure foot clamping must be appropriate.

When drilling harder materials, the Micro Drill life may be variable. Drilling set ups must be precise. The drill TIR must be less than .0001" (.0025 mm). The feed axis motion must be smooth without any play. Machining practices are very important.

Note: Micro drills should be kept in their original packaging, or equivalent when not in use. Mechanical micrometers are not recommended for checking size.

Technical data provided should be considered advisory only as variations may be necessary depending on the particular application.