

MM-4M-EX and MM-4M-R

50 Position Encoder Resolution Data Sheet

Linear Motion: MM-4M-EX, 80 TPI Lead Screw, 13mm mtr, 50 enc. *lines/mtr rev

Drive Combination	Actual Gear Ratio	Calculated Resolution ¹		Max Travel Rate ²	
		Inch/count	mm/count	Inch/sec	mm/sec
14:1 / 80 TPI	13.795918367:1	4.5303 x 10 ⁻⁶	0.1151 x 10 ⁻³	0.302	7.67
43:1 / 80 TPI	42.920634921:1	1.4562 x 10 ⁻⁶	0.0370 x 10 ⁻³	0.097	2.4
66:1 / 80 TPI	66.220408163:1	0.9438 x 10 ⁻⁶	0.0240 x 10 ⁻³	0.062	1.5
134:1 / 80 TPI	133.530864198:1	0.4681 x 10 ⁻⁶	0.0119 x 10 ⁻³	0.030	0.78
159:1 / 80 TPI	159.419501134:1	0.3920 x 10 ⁻⁶	0.0096 x 10 ⁻³	0.025	0.64
246:1 / 80 TPI	245.961516035:1	0.2541 x 10 ⁻⁶	0.0065 x 10 ⁻³	0.016	0.41
415:1 / 80 TPI	415.429355281:1	0.1504 x 10 ⁻⁶	0.0038 x 10 ⁻³	0.010	0.25
592:1 / 80 TPI	592.129575640:1	0.1056 x 10 ⁻⁶	0.0027 x 10 ⁻³	0.006	0.16
989:1 / 80 TPI	988.891428571:1	0.0632 x 10 ⁻⁶	0.0016 x 10 ⁻³	0.0036	0.092
1,526:1 / 80 TPI	1,525.718204082:1	0.0410 x 10 ⁻⁶	0.0010 x 10 ⁻³	0.0027	0.069
2,608:1 / 80 TPI	2,625.740771277:1	0.0238 x 10 ⁻⁶	0.0006 x 10 ⁻³	0.0015	0.039
4,365:1 / 80 TPI	4,385.142457309:1	0.0143 x 10 ⁻⁶	0.0004 x 10 ⁻³	0.0009	0.023
5,647:1 / 80 TPI	5,666.953329446:1	0.0110 x 10 ⁻⁶	0.0003 x 10 ⁻³	0.0007	0.018

Rotary Motion: MM-4M-R, 90:1 Worm Drive Ratio 13mm mtr, 50 encoder* lines/motor revolution

Drive Combination	Actual Gear Ratio	Calculated Resolution ¹		Max Travel Rate ²
		Degree/count	arc-sec/count	Degree/sec
14:1 / 90:1	13.795918367:1	1.44970 x 10 ⁻³	5.2189	96.63
43:1 / 90:1	42.920634921:1	0.46598 x 10 ⁻³	1.6775	31.00
66:1 / 90:1	66.220408163:1	0.30202 x 10 ⁻³	1.0873	20.09
134:1 / 90:1	133.530864198:1	0.14978 x 10 ⁻³	0.5392	9.90
159:1 / 90:1	159.419501134:1	0.12546 x 10 ⁻³	0.4516	8.36
246:1 / 90:1	245.961516035:1	0.08131 x 10 ⁻³	0.2927	5.36
415:1 / 90:1	415.429355281:1	0.04814 x 10 ⁻³	0.1733	3.18
592:1 / 90:1	592.129575640:1	0.03378 x 10 ⁻³	0.1216	2.18
989:1 / 90:1	988.891428571:1	0.02022 x 10 ⁻³	0.0728	1.361
1,526:1 / 90:1	1,525.718204082:1	0.01311 x 10 ⁻³	0.0472	0.90
2,608:1 / 90:1	2,625.740771277:1	0.00762 x 10 ⁻³	0.0274	0.54
4,365:1 / 90:1	4,385.142457309:1	0.00456 x 10 ⁻³	0.0164	0.27
5,647:1 / 90:1	5,666.953329446:1	0.00353 x 10 ⁻³	0.0127	0.23

Notes:

1) The lead values shown above in both travel rate and resolution calculations, are for 80 (1/80) thread per Inch (TPI) lead-screws. For a 40 TPI leadscrew, substitute 0.025 inch lead.

2) Max travel rate calculated with motor armature running at a maximum speed of 20,000 RPM

*The resultant quadrature output is equal to 64 encoder counts per motor armature revolution. (mtr rev)

Travel rate calculations:

Output Shaft RPM	= RPM of motor / Gearhead Ratio
Distance per minute	= Output shaft RPM x Lead (0.0125 inch, 0.03175mm)
Distance per second	= Distance per minute/60
Distance in millimeter	= inch/39.37 X 10 ⁻³
Distance in micrometer	= inch/39.37 x 10 ⁻⁶

Conversion:

1 inch (in.)	= 25.4 mm
1 inch (in.)	= 25,400µm
1 millimeter (mm)	= 39.37 x 10 ⁻³ inch
1 micrometer (µm)	= 39.37 x 10 ⁻⁶ inch
1 degree	= 3,600 arc-s
1 arc-s	= 0.277 x 10 ⁻³ degree

The information contained in this data sheet is subject to change without notice. Critical dimensions or specifications should be verified with our technical support staff.

MTR-13-50E-HT MicroMini™ Motor

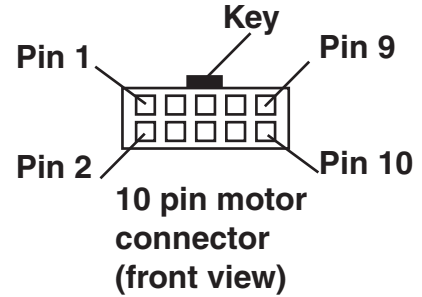
Connection Specifications

Motor Connector Pin Assignments:

Motor Type: MTR-13-E-HT
Connector Type: Dual Row IDC

Note: Mating connectors may be purchased from National Aperture, Inc.

Pin #	Name	Pin #	Name
1	Motor+	6	Motor -
2	Encoder+V	7	Limit ground
3	Encoder Ch A	8	No connection*
4	Encoder Ch B	9	Reverse limit
5	Ground (case)	10	Forward limit



***Optional: +5V with Optical Limit Switches**

Electrical Specifications:

Supply Voltage Nom. (Volts)	6
Armature Resistance (Ohm) $\pm 12\%$	2.83
Max Power Output (Watts) ¹	3.11
Max Efficiency (%) ¹	81
No-Load Speed (rpm) $\pm 12\%$ ¹	10,600
Friction Torque (at no-load speed)(oz-in)	0.017
No-Load Current (mA) $\pm 50\%$ ²	22
Stall Torque (oz-in.) ¹	1.59
Velocity Constant (rpm/Volt)	1,790
Back EMF Constant (mV/rpm)	0.560
Torque Constant (oz-in./Amp)	0.758
Armature Inductance (mH)	0.07

Encoder Specifications:

Supply Voltage	5 VDC Nom.
Max Supply Voltage	5.5 VDC
Operating Current	6 mA Nom. @ 5 VDC
Signal Phase Shift	90°
Max Signal Frequency	20 KHz
Operating Temp. Range	-25°C to +85°C (-13°F to +185°F)
Signal Rise Time	0.1µs max.
Phase Relationship	Ch. A leads Ch. B when motor rotation is clockwise as viewed from shaft end.
Pulses Per Revolution	50 (2 channels)
Quadrature	200 encoder counts

Mechanical Specifications (Motor):

Mechanical Time Constant (ms) ¹	7
Armature Inertia	0.71g-cm ²
Angular Acceleration (x 10 ³ rad/sec ²) ¹	160
Thermal Resistances (°C/W)	
Rotor to Case	6
Case to Ambient	25
Max Shaft Load	
Radial at 3,000 rpm (3mm from bearing)	1.2 N
Axial (Static)	20 N
Weight	0.71 oz (19 gram)
Max Operating Temp. Range	-30°C to +85°C (-22°F to +185°F)
Max Rotor Temp.	125°C (257°F)

(1) Specified at nominal supply voltage.

(2) Specified with shaft diameter = 1.5mm at no-load speed.

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