

# MM-3M-F/MM-4M-F

## 10 Position Encoder Resolution Data Sheet

### Linear Motion: 10mm Motor w/80 TPI Lead Screw

Gearhead Ratio	Max Travel Rate <sup>2</sup>		Resolution <sup>1</sup>	
	Inch per second	mm per second	µinch per count	µm per count
16:1	0.260	6.60	19.5313	0.4960
64:1	0.064	1.65	4.8828	0.1240
256:1	0.016	0.41	1.2207	0.0310
1024:1	0.004	0.10	0.3052	0.0077

### Travel rate calculations:

- Output Shaft RPM = RPM of motor/Gearhead Ratio  
Distance per minute = Output shaft RPM x Lead (0.0125 in., 0.3175 mm)  
Distance per second = Distance per minute/60  
Distance in millimeter = inch/39.37 x 10<sup>-3</sup>  
Distance in micrometer = inch/39.37 x 10<sup>-6</sup>

### Encoder resolution calculations:

- Encoder counts per shaft revolution = 40 encoder counts x Gearhead ratio  
Minimum encoder count (inch) = Lead (0.0125 in.) / Encoder counts per output shaft revolution  
Minimum encoder count (millimeter) = Minimum encoder count (inch)/39.37 x 10<sup>-3</sup> in.  
Minimum encoder count (micrometer) = Minimum encoder count (inch)/39.37 x 10<sup>-6</sup>

### Conversion:

- 1 inch (in) = 25.4mm  
1 inch (in) = 25,400µm  
1 millimeter (mm) = 39.37 x 10<sup>-3</sup> inch  
1 micrometer (µm) = 39.37 x 10<sup>-6</sup> inch  
1 deg (deg) = 3,600 arc-sec  
1 arc-sec = 0.277 x 10<sup>-3</sup> degree

### Notes:

- 1) The lead values shown above in both travel rate and resolution calculations, are for 80 (1/80) Threads per Inch (TPI) leadscrews. 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.
- 3) The 10 mm motors used with both the rotary and linear stages incorporate dual channel, 10 position, magnetic encoders. The resultant quadrature output is equal to 40 encoder counts per motor armature revolution.

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.

National Aperture, Inc. - 16 Northwestern Dr. - Salem, N.H. 03079-4810 - Tel. (800) 360-4598 - (603) 893-7393 - FAX (603) 893-7857 - [www.nationalaperture.com/www.naimotion.com](http://www.nationalaperture.com/www.naimotion.com)

# MTR-10-10E MicroMini™ Motor

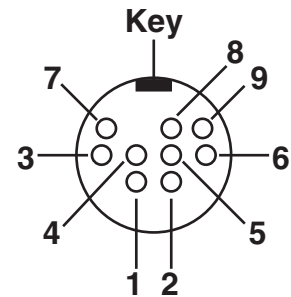
## Linear 80 TPI Connection Specifications

**Motor Type: MTR-10-10E**

**Connector type: 9 pin Mini-DIN**

**\*Mate Part #(female socket):**

**CUI Part #MD-90J**



**9 pin Mini-Din  
male motor connector  
(front view)**

Pin #	Name	Pin #	Name
1	Motor+	6	Motor (-)
2	Encoder Vcc	7	Limit Ground Switch
3	Encoder Ch A	8	Forward limit
4	Encoder Ch B	9	Reverse limit
5	Encoder Ground		

### Electrical Specifications:

Supply Voltage Nom. (Volts)	6
Armature Resistance (Ohm)±12%	20.1
Max power output (Watts) <sup>(2)</sup>	0.42
Max. Efficiency (%) <sup>(2)</sup>	67
No Load Speed (RPM) ±12% <sup>(2)</sup>	18,400
Friction Torque (@ no load speed) (mNm)	0.03
No Load Current (mA)±50% <sup>(3)</sup>	10
Stall Torque (mNm) <sup>(2)</sup>	0.87
Velocity Constant (RPM/Volt)	3,173
Back EMF Constant (mV/RPM)	0.315
Torque Constant (mNm/A)	3.01
Armature Inductance (mH)	0.060
Speed/Torque Gradient(RPM/mNm)	21,185
Recommended Values	
Speed (RPM)	up to 13,000
Torque (mNm)	up to 0.48
Current (mA)	up to 170

### Encoder Specifications:

Supply Voltage	5 VDC Nom.
Max Voltage Supply	15 VDC
Operating Current	5mA Nom. @5VDC
Signal Phase Shift	90°
Max. Signal Freq.	7.2 KHz
Temperature Range	-40°C to +85° C
Output Signal Type	Square wave
Signal Rise Time	Less than 5µs
Phase Relationship	Ch A leads CH B when motor rotation is clockwise as seen from shaft end.
Pulses per Revolution	10 (2 channels)
Quadrature	40 encoder counts
Output signal CMOS and TTL compatible	

### Mechanical Specifications:

Mechanical Time Constant (ms) <sup>(2)</sup>	13
Armature Inertia (g cm <sup>2</sup> ) <sup>(2)</sup>	0.06
Angular Acceleration (x 10 <sup>3</sup> Rad/second <sup>2</sup> ) <sup>(2)</sup>	145
Rotor Temperature Range	-30°C to +85°C
Bearing Play (measured @ bearing)	
Radial	Less than 0.02mm
Axial	Less than 0.2mm
Thermal Resistance (C°/W)	
Rotor to Case	26
Case to Ambient	56
Maximum Shaft Load	
Radial (@3,000 RPM) 3 mm from bearing	5 N
Axial @ standstill	5 N
Weight	6.5 g
Planetary Gearhead recommended	
max continuous input speed	5,000 RPM

(1) Ratings are presented independent of each other

(2) Specified at nominal supply voltage

(3) Specified with shaft diameter = 0.8mm at no load

\*Mating connectors available through National Aperture, Inc.

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