

# MM-3M-ST, -F, -EX, -R/MM-4M-F

## 12 Position Encoder Resolution Data Sheet

### Linear Motion: 10 mm HT 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	0.2604	6.6146	16.276	0.41341

### Rotary Motion: 10 mm HT Motor w/80:1 Worm Drive Ratio

Gearhead Ratio	Final Output	Max Travel Rate <sup>2</sup>		Resolution <sup>1</sup>	
		degree per second	degree per count	arc-second per count	
16:1	1,280:1	93.75	$5.859375 \times 10^{-3}$	21.1530	

*note: for 16:1 gearhead there are 61,440 counts for 360° rotation.*

#### Travel rate calculations:

Output Shaft RPM	=RPM of motor/Gearhead Ratio
Distance per minute	= Output shaft RPM x Lead (0.0125 inch, 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	= 48 encoder counts x Gearhead ratio
Minimum encoder count (inch)	= Lead (0.0125 inch)/ Encoder counts per output shaft revolution
Minimum encoder count (millimeter)	= Minimum encoder count (inch)/39.37 x 10 <sup>-3</sup> inch
Minimum encoder count (micrometer)	= Minimum encoder count (inch)/39.37 x 10 <sup>-6</sup>

#### Conversion:

1 inch (in.)	= 25.4 mm
1 inch (in.)	= 25,400 µm
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-second
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 rotary stages incorporate dual channel, 12 position, magnetic encoders. The resultant quadrature output is equal to 48 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.*

# MTR-10-12E-HT MicroMini™ Motor

## Linear 80 TPI/Rotary 80:1 Connection Specifications

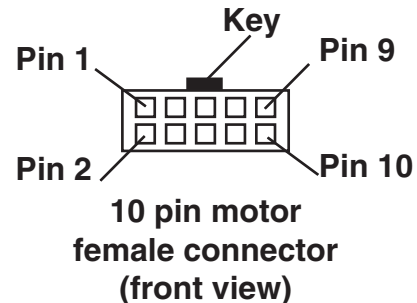
**Motor Type: MTR-10-12E-HT with 16:1 planetary gearhead and magnetic encoder**

**Connector type: Dual row IDC**

**\*Mate Part# (male pin):**

**Pancon part #057-010-115**

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



### Electrical Specifications:

Supply Voltage Nom. (Volts)	6
Armature Resistance (Ohm)±12%	10.8
Max. power output (Watts) <sup>(2)</sup>	0.81
Max. Efficiency (%) <sup>(2)</sup>	78
No Load Speed (RPM) ±12% <sup>(2)</sup>	13,200
Friction Torque (@ no load speed) (mNm)	0.03
No Load Current (mA) ±50% <sup>(3)</sup>	8
Stall Torque (oz-in) <sup>(2)</sup> mN	2.34
Velocity Constant (RPM/Volt)	2,231
Back EMF Constant (mV/RPM)	0.448
Torque Constant (mN/A)	4.28
Armature Inductance (mH)	0.100
Speed/torque gradient (RPM/mN)	5,630
Maximum permissible speed (RPM)	12,000
Maximum continuous current (mA)	291
Maximum continuous torque (mNm)	1.21
Maximum power output at nominal voltage (mW)	810
Thermal time constant (s)	5/289

### Encoder Specifications:

Supply Voltage	5 VDC Nom.
Max Voltage Supply	15 VDC
Operating Current	5 mA Nom. @5 VDC
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	12 (2 channels)
Quadrature	48 encoder counts
Output signal CMOS and TTL compatible	

### Mechanical Specifications:

Mechanical Time Constant (ms) <sup>(2)</sup>	7
Armature Inertia (g - cm <sup>2</sup> )	0.12
Angular Acceleration (x 10 <sup>3</sup> Rad/sec <sup>2</sup> ) <sup>(2)</sup>	195
Maximum rotor temperature	+85°C
Axial Play	0.2mm
Thermal Resistance (C°/W)	
Rotor to Case	14
Case to Ambient	41
Maximum Shaft Load (N)	
Radial 1.5mm from flange	0.5 N
Axial @ Standstill	20 N
Weight	8.8 g
Planetary Gearhead recommended max continuous input speed	5000 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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