

MM-4M-G-87/120(R)

50 Position Encoder Resolution Data Sheet

Rotary Motion: 6mm Motor w/80 TPI Leadscrew

Stage	Radius of Rotation	Gearhead Ratio	Max Travel Rate ²	Resolution ¹	
			deg/sec	deg/count	arc-sec/count
-87	87mm	64:1	1.1839	1.63356770785E-5	5.88084374826E-2
-120	120mm	64:1	0.8584	1.18433658821E-5	4.26361171756E-2

Travel rate calculations:

Given:

Motor voltage = 4.6vdc;
Gearhead = 64:1;
GH = Gearhead;
RPM/volt = 4727;
80 pitch leadscrew (1/80=0.0125 inch or 0.3175 mm)

Calculation:

$(4727 \text{ RPM/volt})(4.6\text{v})(1 \text{ RPS}/60 \text{ RPM})(1 \text{ GH rev}/64 \text{ mtr rev})(0.3175 \text{ mm}/\text{GH rev}) = 1.79786\text{mm/sec}$
and
for 87 mm radius stage: $\theta = \tan^{-1}(1.79786/87) = 1.1839 \text{ deg/sec}$
and
for 120 mm radius stage: $\theta = \tan^{-1}(1.79786/120) = 0.8584 \text{ deg/sec}$

Encoder resolution calculations:

Given:

1 motor rev = 200 quadrature counts (50 counts/mtr rev x 4 = 200)

Calculation:

$(1 \text{ mtr rev}/200 \text{ counts})(1\text{GH rev}/64 \text{ mtr revs})(317.5 \mu\text{m}/\text{GH rev}) = 0.0248046875 \mu\text{m/count}$
and
for 87 mm stage and 1 μm resolution: $\theta = \tan^{-1}(1\text{E}-6/87\text{E}-3) = 6.58572178284\text{E}-4 \text{ deg}/\mu\text{m}$
and
 $(0.0248046875 \mu\text{m/count})(6.58572178284\text{E}-4 \text{ deg}/\mu\text{m}) = 1.63356770785\text{E}-5 \text{ deg/count}$
or
 $(1.63356770785\text{E}-5 \text{ deg/count})(3600 \text{ arc-sec}/1\text{deg}) = 5.88084374826\text{E}-2 \text{ arc-sec/count}$
and
for 120 mm stage and 1 μm resolution: $\theta = \tan^{-1}(1\text{E}-6/120\text{E}-3) = 4.77464829264\text{E}-4 \text{ deg}/\mu\text{m}$
and
 $(0.0248046875 \mu\text{m/count})(4.77464829264\text{E}-4 \text{ deg}/\mu\text{m}) = 1.18433658821\text{E}-5 \text{ deg/count}$
or
 $(1.18433658821\text{E}-5 \text{ deg/count})(3600 \text{ arc-sec}/1 \text{ deg}) = 4.26361171756\text{E}-2 \text{ arc-sec/count}$

Conversion:

1 inch = 25.4 mm
1 inch = 25,400 μm
1mm = 39.37E-3 inch
1 μm = 39.37E-6 inch
1deg = 3600 arc-sec
1arc-sec = 2.77777E-4 deg

Notes:

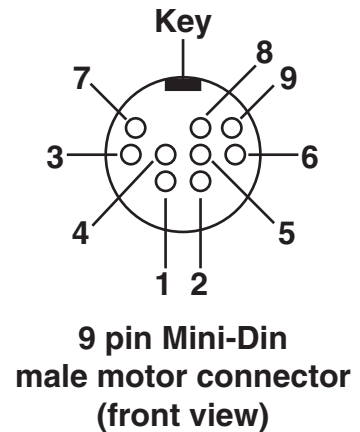
- 1) Max travel rate calculated with motor armature running at a maximum speed of 20,000 RPM.
- 2) The 6mm motors used with linear stages incorporate dual channel 50 position, optical encoders. The resultant quadrature output is equal to 200 encoder counts per motor armature revolution. speeds measured at 4.5 VDC with 64:1 gearhead.

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-6-50E-4.5v MicroMini™ Motor

80 TPI Connection Specifications

Motor Type: MTR-6-E with 64:1 planetary gearhead and optical encoder
Connector Type: 9 Pin Mini-DIN



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

Electrical Specifications:

Supply voltage Nom(volts)	4.5
Armature Resistance (Ω) \pm 12%	37.7
Max Power Output (watts)	0.11
Max Efficiency (%)	50
No Load Speed (RPM) \pm 12%	19,500
Friction Torque@no load speed(mNm)	0.02
No Load Current (mA) \pm 50%	10
Stall Torque (mNm)	0.22
Velocity Constant (RPM/Volt)	4727
Back EMF Constant (mV/RPM)	0.212
Torque Constant (mNm/A)	2.02
Armature Inductance (H)	95

Encoder Specifications:

Supply voltage	2.7 to 3.3vdc
Max Supply Voltage	7 vdc
Operating Current	85mA Nom@3 vdc
Signal Phase Shift	90°
Max Signal Frequency	up to 35 kHz
Temperature Range	-30 to +85 °C
Output Signal Type	square wave
Signal Rise/Fall Time	0.3/0.1 μ s
Phase Relationship	Ch B leads Ch A when motor rotation is CW as seen from shaft end
Pulses per revolution	50 (2 channels)
Quadrature	200 encoder counts

Mechanical Specifications:

Mechanical Time Constant (ms)	9
Armature Inertia (g-cm ²)	0.01
Angular Acceleration ($\times 10^3$ Rad/s ²)	221
Rotor Temperature Range (°C)	-30 to +85
Bearing Play (measured at bearing)	
Axial (mm)	\leq 0.15
Radial (mm)	\leq 0.03
Thermal Resistance (C°/W)	
Rotor to Case	35
Case to Ambient	76
Max Shaft Load	
Radial(@3000RPM)3mm from bearing (N)	0.5
Axial (@ standstill) (N)	20
Weight (g)	2

Planetary gearhead recommended input speed <8000 RPM

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