

16 Position Encoder Resolution Data Sheet

MTR-13-16E-HT

MM-4M-EX

80 TPI Lead Screw (0.3175 mm/turn)			16 position encoder ¹
GH ² Ratio	Actual Gear Ratio	Max Travel Rate ³ (mm/sec)	Resolution (µm/count)
14:1	13.795918367:1	7.671	0.3596
43:1	42.920634921:1	2.466	0.1156
66:1	66.220408163:1	1.598	0.0749
134:1	133.530864198:1	0.792	0.0372
159:1	159.419501134:1	0.664	0.0311
246:1	245.961516035:1	0.430	0.0202
415:1	415.429355281:1	0.255	0.0119
592:1	592.129575640:1	0.178	0.0084
989:1	988.891428571:1	0.107	0.0050
1526:1	1,525.718204082:1	0.069	0.0033
2608:1	2,625.740771277:1	0.040	0.0019
4365:1	4,385.142457309:1	0.024	0.0011
5647:1	5,666.953329446:1	0.018	0.0009
40 TPI Lead Screw (0.635 mm/turn)			16 position encoder ¹
GH ² Ratio	Actual Gear Ratio	Max Travel Rate ³ (mm/sec)	Resolution (µm/count)
14:1	13.795918367:1	15.342	0.7192
43:1	42.920634921:1	4.931	0.2312
66:1	66.220408163:1	3.196	0.1498
134:1	133.530864198:1	1.585	0.0743
159:1	159.419501134:1	1.327	0.0622
246:1	245.961516035:1	0.860	0.0403
415:1	415.429355281:1	0.509	0.0239
592:1	592.129575640:1	0.357	0.0168
989:1	988.891428571:1	0.214	0.0100
1526:1	1,525.718204082:1	0.138	0.0065
2608:1	2,625.740771277:1	0.080	0.0038
4365:1	4,385.142457309:1	0.048	0.0023
5647:1	5,666.953329446:1	0.037	0.0018

Notes:

- The 13 mm motors used with both linear and rotary stages incorporate dual channel, 16 position, optical encoders. The quadrature output is equivalent to 64 encoder counts per motor armature revolution.
- Gearhead ratio is denoted by GH.
- Maximum travel rate is calculated with the motor armature turning at a maximum rate of 20,000 RPM.

Linear Travel

Travel rate calculations

Lead screw RPM = (motor RPM)/(gearhead ratio)
 Distance per minute = (lead screw RPM) x lead; (lead = 0.3175 mm for 80 TPI screw and 0.635 mm for 40 TPI screw)
 Distance per second = (distance per minute)/60
 Distance in inches = (distance (mm))/(25.4)
Example calculation: with motor RPM = 20,000; GH ratio = 13.795918367:1; lead = 0.3175 mm
 Distance per second = [(20000 RPM)/13.795918367] x (0.3175 mm) x (min/60 sec)] = 7.6714 mm/sec

Encoder resolution calculations

Encoder counts per lead screw revolution = (encoder counts per motor revolution) x (gearhead ratio)
 Distance per encoder count = lead/(encoder counts per lead screw revolution)
Example calculation: with motor GH ratio = 13.795918367:1; lead = 0.3175 mm; 64 encoder counts per motor revolution
 Distance per encoder count = (0.3175 mm)/(64 x 13.795918367) = 0.3595945821096348 µm/count

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.

16 Position Encoder Resolution Data Sheet (cont.)

MTR-13-16E-HT

MM-4M-R

90:1 Worm Drive Ratio			16 position encoder ¹
GH ² Ratio	Actual Gear Ratio	Max Travel Rate ³ (rad/sec)	Resolution (μrad/count)
14:1	13.795918367:1	1.687	79.0691
43:1	42.920634921:1	0.542	25.4151
66:1	66.220408163:1	0.351	16.4727
134:1	133.530864198:1	0.174	8.1691
159:1	159.419501134:1	0.146	6.8425
246:1	245.961516035:1	0.094	4.4350
415:1	415.429355281:1	0.056	2.6258
592:1	592.129575640:1	0.039	1.8422
989:1	988.891428571:1	0.023	1.1031
1526:1	1,525.718204082:1	0.015	0.7150
2608:1	2,625.740771277:1	0.009	0.4154
4365:1	4,385.142457309:1	0.005	0.2488
5647:1	5,666.953329446:1	0.004	0.1925

Notes:

1. The 13 mm motors used with both linear and rotary stages incorporate dual channel, 16 position, optical encoders. The quadrature output is equivalent to 64 encoder counts per motor armature revolution.
2. Gearhead ratio is denoted by GH.
3. Maximum travel rate is calculated with the motor armature turning at a maximum rate of 20,000 RPM.

Rotary Travel

Travel rate calculations

Rotor travel rate (RPM) = (motor RPM)/[gearhead ratio] x (worm drive ratio)
 Rotor travel rate (rad/sec) = [rotor travel rate (RPM)] x (min/60 sec) x (6.283185 rad/revolution)
Example calculation: with motor RPM = 20,000; GH ratio = 13.795918367:1; lead = 0.3175 mm
 Rotor travel rate (rad/sec) = (20000 RPM)/(13.795918367 x 90) x (min/60 sec) x (6.283185 rad/revolution) = 1.68680728 rad/sec

Encoder resolution calculations

Encoder counts per rotor revolution = [(encoder counts per motor revolution)] x (gearhead ratio) x (worm drive ratio)
 Angular resolution = (6.283185 rad/revolution)/ (encoder counts per rotor revolution)
Example calculation: with motor GH ratio = 13.795918367:1; worm drive ratio = 90:1; lead = 0.3175 mm; 64 encoder counts per motor revolution
 Angular resolution = (6.283185 rad per rotor revolution)/[(64 counts per motor revolution) x (13.795918367 motor revolutions per gearhead revolution) x (90 gearhead revolutions per rotor revolution)]
 = 79.069 μrad/count

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