

BULLETIN LCG
Series GM8000,
GM9000, GM14900

LO-COG® DC Gearmotors



Pittman brand LO-COG® brush-commutated DC gearmotors offer smooth, quiet operation and long life. LO-COG gearmotors feature sintered steel spur gears and are available with several reduction ratios and torque ratings to provide an economical solution for a wide range of applications. Armatures are skewed to minimize magnetic cogging, even at low speeds, and windings are resin impregnated for greater reliability in incremental motion applications. An innovative cartridge brush assembly reduces audible and electrical noise and significantly improves brush life by maintaining optimum brush force throughout the life of the motor. For precision motor control, Hewlett-Packard® optical encoders are available in 2 or 3 channel versions with several CPR ranges to meet your position, velocity and direction feedback needs.

Construction

- 2 pole permanent magnet stators are constructed of ceramic magnets enclosed in heavy-gauge steel return rings
- Diamond turned commutators ensure maximum brush life
- Standard copper graphite brushes (Other brush materials available)
- Precision ground hardened stainless steel shafts
- Silicon-steel laminations
- Self-aligning, sintered bronze bearings

Options

- High-torque gears or high-torque wide-face gears
- Low noise, primary cluster gears
- Custom cables
- Multiple shaft configurations
- Shaft-mounted pulleys and gears
- Ball bearings
- Multiple windings
- Electromechanical brakes
- Integrated Hewlett-Packard® optical encoders
- Adaptors available for other encoders
- RFI suppression
- Dynamic armature balancing

Series GM8000

- 11 ratios from 6.3:1 to 1803:6:1
- Peak Torques to 100 oz-in standard
- 160 and 175 oz-in gearheads optional
- Available in 3 motor lengths
- Encoder resolutions from 96 to 1024

Series GM9000

- 12 ratios from 5.9:1 to 4732:5:1
- Peak Torques to 175 oz-in standard
- 300 and 500 oz-in gearheads optional
- Available in 6 motor lengths
- Encoder resolutions from 96 to 2048

Series GM14000

- 4 ratios from 5.9:1 to 218:4:1
- Peak Torques to 175 oz-in standard
- 300 and 500 oz-in gearheads optional
- Available in 7 motor lengths
- Encoder resolutions from 96 to 2048

PITTMAN®
Power Your Ideas™



Get same day shipment of sample motors for models listed in the Pittman Express Catalog (Bulletin PE).

Every Pittman motor is subjected to automated performance testing prior to shipment.

SERIES GM8000

Gearmotor Data

Line No.	Parameter	Symbol	Units	Reduction Ratios										
				6.3:1	9.9:1	19.5:1	30.9:1	60.5:1	95.9:1	187.7:1	297.5:1	581.8:1	922.3:1	1803.6:1
MECHANICAL SPECIFICATIONS														
1	Max. Load Standard Gears ¹	T _L	oz-in (N-m)	100 (0.71)	100 (0.71)	100 (0.71)	100 (0.71)	100 (0.71)	100 (0.71)	100 (0.71)	100 (0.71)	100 (0.71)	100 (0.71)	100 (0.71)
2	Max. Load Cut Steel Gears ¹	T _L	oz-in (N-m)	N/A (N/A)	160 (1.13)	160 (1.13)	160 (1.13)	160 (1.13)	160 (1.13)	160 (1.13)	160 (1.13)	160 (1.13)	160 (1.13)	160 (1.13)
3	Max. Load Wide Face Gears ¹	T _L	oz-in (N-m)	N/A (N/A)	175 (1.24)	175 (1.24)	175 (1.24)	175 (1.24)	175 (1.24)	175 (1.24)	175 (1.24)	175 (1.24)	175 (1.24)	175 (1.24)
4	Gearbox Shaft Rotation ²	—	—	CW	CCW	CCW	CW	CW	CCW	CCW	CW	CW	CCW	CCW
5	Gearbox Efficiency	—	%	81	73	73	66	66	59	59	53	53	48	48
6	Gearbox Weight	W _G	oz (gm)	2.35 (66.6)	2.49 (70.6)	2.49 (70.6)	2.62 (74.3)	2.62 (74.3)	2.76 (78.2)	2.76 (78.2)	3.11 (88.2)	3.11 (88.2)	3.25 (92.1)	3.25 (92.1)
7	Gearbox Length	L ₂	in max (mm max)	0.968 (24.6)	0.968 (24.6)	0.968 (24.6)	0.968 (24.6)	0.968 (24.6)	0.968 (24.6)	0.968 (24.6)	1.164 (29.6)	1.164 (29.6)	1.164 (29.6)	1.164 (29.6)
8	Length, GM82X2	L ₃	in max (mm max)	2.977 (75.6)	2.977 (75.6)	2.977 (75.6)	2.977 (75.6)	2.977 (75.6)	2.977 (75.6)	2.977 (75.6)	3.173 (80.6)	3.173 (80.6)	3.173 (80.6)	3.173 (80.6)
9	Length, GM82X3	L ₃	in max (mm max)	3.102 (78.8)	3.102 (78.8)	3.102 (78.8)	3.102 (78.8)	3.102 (78.8)	3.102 (78.8)	3.102 (78.8)	3.298 (83.8)	3.298 (83.8)	3.298 (83.8)	3.298 (83.8)
10	Length, GM82X4	L ₃	in max (mm max)	3.352 (85.1)	3.352 (85.1)	3.352 (85.1)	3.352 (85.1)	3.352 (85.1)	3.352 (85.1)	3.352 (85.1)	3.548 (90.1)	3.548 (90.1)	3.548 (90.1)	3.548 (90.1)
11	Length, GM87X2	L ₃	in max (mm max)	2.91 (73.9)	2.91 (73.9)	2.91 (73.9)	2.91 (73.9)	2.91 (73.9)	2.91 (73.9)	2.91 (73.9)	3.106 (78.9)	3.106 (78.9)	3.106 (78.9)	3.106 (78.9)
12	Length, GM87X3	L ₃	in max (mm max)	3.035 (77.1)	3.035 (77.1)	3.035 (77.1)	3.035 (77.1)	3.035 (77.1)	3.035 (77.1)	3.035 (77.1)	3.231 (82.1)	3.231 (82.1)	3.231 (82.1)	3.231 (82.1)
13	Length, GM87X4	L ₃	in max (mm max)	3.285 (83.4)	3.285 (83.4)	3.285 (83.4)	3.285 (83.4)	3.285 (83.4)	3.285 (83.4)	3.285 (83.4)	3.481 (88.4)	3.481 (88.4)	3.481 (88.4)	3.481 (88.4)
NO-LOAD SPEED														
14	GM8X12	S _{NL}	rpm (rad/s)	1227 (128)	774 (81.1)	396 (41.5)	250 (26.2)	128 (13.4)	80.5 (8.43)	41.2 (4.31)	26.0 (2.72)	13.3 (1.39)	8.38 (.877)	4.29 (.449)
15	GM8X22	S _{NL}	rpm (rad/s)	1246 (130)	786 (82.3)	402 (42.1)	253 (26.5)	130 (13.6)	81.8 (8.57)	41.8 (4.38)	26.4 (2.76)	13.5 (1.41)	8.51 (.891)	4.35 (.456)
16	GM8X13	S _{NL}	rpm (rad/s)	1308 (137)	825 (86.4)	422 (44.2)	266 (27.9)	136 (14.2)	85.8 (8.98)	43.9 (4.60)	27.7 (2.90)	14.2 (1.49)	8.93 (.935)	4.57 (.479)
17	GM8X23	S _{NL}	rpm (rad/s)	1317 (138)	831 (87.0)	425 (44.5)	268 (28.1)	137 (14.3)	86.5 (9.06)	44.2 (4.63)	27.9 (2.92)	14.3 (1.50)	9.00 (.942)	4.60 (.482)
18	GM8X14	S _{NL}	rpm (rad/s)	1690 (177)	1066 (112)	545 (57.1)	344 (36.0)	176 (18.4)	111 (11.6)	56.7 (5.94)	35.8 (3.75)	18.3 (1.92)	11.5 (1.20)	5.90 (.618)
19	GM8X24	S _{NL}	rpm (rad/s)	1612 (169)	1017 (107)	520 (54.5)	328 (34.3)	168 (17.6)	106 (11.1)	54.1 (5.67)	34.1 (3.57)	17.5 (1.83)	11.0 (1.15)	5.63 (.590)

¹Represents gearbox capability only. Continuous load torque capability will vary with gear ratio, motor selection, and operating conditions.

²Shaft rotation is designated while looking at output shaft with motor operating in a clockwise direction.

Motor Data

Line No.	Parameter	Symbol	Units	8X12	8X22	8X13	8X23	8X14	8X24
20	Continuous Torque (Max.) ³	T _C	oz-in (N-m)	1.3 (8.90 X 10 ⁻³)	1.6 (11.2 X 10 ⁻³)	1.5 (10.7 X 10 ⁻³)	2.0 (14.1 X 10 ⁻³)	2.1 (14.5 X 10 ⁻³)	2.6 (18.5 X 10 ⁻³)
21	Peak Torque (Stall)	T _{PK}	oz-in (N-m)	5.1 (35.7 X 10 ⁻³)	7.4 (52.0 X 10 ⁻³)	6.8 (47.7 X 10 ⁻³)	10.5 (74.2 X 10 ⁻³)	11.9 (84.0 X 10 ⁻³)	16.8 (118.6 X 10 ⁻³)
22	Motor Constant	K _M	oz-in/√W (N-m/√W)	0.93 (6.6 X 10 ⁻³)	1.12 (7.9 X 10 ⁻³)	1.05 (7.4 X 10 ⁻³)	1.30 (9.2 X 10 ⁻³)	1.22 (8.6 X 10 ⁻³)	1.49 (710.5 X 10 ⁻³)
23	No-Load Speed	S ₀	rpm (rad/s)	7729 (809)	7847 (822)	8238 (863)	8298 (869)	10648 (1115)	10158 (1064)
24	Friction Torque	T _F	oz-in (N-m)	0.35 (2.5 X 10 ⁻³)	0.35 (2.5 X 10 ⁻³)	0.35 (2.5 X 10 ⁻³)	0.35 (2.5 X 10 ⁻³)	0.35 (2.5 X 10 ⁻³)	0.35 (2.5 X 10 ⁻³)
25	Rotor Inertia	J _M	oz-in-s ² (kg-m ²)	1.3 X 10 ⁻⁴ (9.18 X 10 ⁻⁷)	1.4 X 10 ⁻⁴ (9.89 X 10 ⁻⁷)	1.6 X 10 ⁻⁴ (1.13 X 10 ⁻⁶)	1.7 X 10 ⁻⁴ (1.20 X 10 ⁻⁶)	2.2 X 10 ⁻⁴ (1.55 X 10 ⁻⁶)	2.3 X 10 ⁻⁴ (1.62 X 10 ⁻⁶)

³Continuous torque specified at 25°C ambient temperature and without additional heat sink.



Motor Data, continued

Line No.	Parameter	Symbol	Units	8X12	8X22	8X13	8X23	8X14	8X24
26	Electrical Time Constant	τ_E	ms	0.50	0.52	0.48	0.55	0.54	0.54
27	Mechanical Time Constant	τ_M	ms	21.5	15.6	21.0	14.1	21.0	14.7
28	Viscous Damping— Infinite Source Impedance	D	oz-in/krpm (N-m/(rad/s))	0.0087 (129.02)	0.0153 (226.89)	0.0104 (154.23)	0.0176 (261.01)	0.0147 (218.00)	0.0202 (299.57)
29	Viscous Damping— Zero Source Impedance	K_D	oz-in/krpm (N-m/(rad/s))	0.64 (4.31×10^{-5})	0.92 (6.20×10^{-5})	0.81 (5.46×10^{-5})	1.25 (8.43×10^{-5})	1.10 (7.42×10^{-5})	1.63 (1.10×10^{-4})
30	Maximum Winding Temperature	θ_{MAX}	°F (°C)	311 (155)	311 (155)	311 (155)	311 (155)	311 (155)	311 (155)
31	Thermal Impedance	R_{TH}	°F/watt °C/watt	75.9 (24.4)	75.9 (24.4)	72.9 (22.7)	72.9 (22.7)	70.5 (21.4)	70.5 (21.4)
32	Thermal Time Constant	τ_{TH}	min	7.75	7.75	9.00	9.00	10.70	10.70
33	Motor Weight	W_M	oz (gm)	4.49 (127.3)	4.69 (133.0)	4.86 (137.8)	5.05 (143.2)	5.62 (159.3)	5.81 (164.7)

Model GM8XX2 Winding Data (Other windings available upon request)

Line No.	Parameter	Symbol	Units	GM8X12				GM8X22			
34	Reference Voltage	E	V	12.0	19.1	24.0	30.3	12.0	19.1	24.0	30.3
35	Torque Constant	K_T	oz-in/A (N-m/A)	1.94 (13.7×10^{-3})	3.06 (21.7×10^{-3})	3.87 (27.3×10^{-3})	4.89 (34.6×10^{-3})	1.94 (13.7×10^{-3})	3.07 (21.7×10^{-3})	3.88 (27.4×10^{-3})	4.88 (34.5×10^{-3})
36	Back-EMF Constant	K_E	V/krpm (V/rad/s)	1.43 (13.7×10^{-3})	2.27 (21.7×10^{-3})	2.86 (27.3×10^{-3})	3.62 (34.6×10^{-3})	1.43 (13.7×10^{-3})	2.27 (21.7×10^{-3})	2.87 (27.4×10^{-3})	3.61 (34.5×10^{-3})
37	Resistance	R_T	Ω	4.38	10.80	17.20	27.3	3.10	7.61	12.1	19.1
38	Inductance	L	mH	2.15	5.40	8.62	13.8	1.57	3.93	6.27	9.92
39	No-Load Current	I_{NL}	A	0.22	0.14	0.11	0.09	0.25	0.16	0.12	0.10
40	Peak Current (Stall) ⁴	I_p	A	2.74	1.76	1.40	1.11	3.88	2.51	1.99	1.59

Model GM8XX3 Winding Data (Other windings available upon request)

Line No.	Parameter	Symbol	Units	GM8X13				GM8X23			
41	Reference Voltage	E	V	12.0	19.1	24.0	30.3	12.0	19.1	24.0	30.3
42	Torque Constant	K_T	oz-in/A (N-m/A)	1.85 (13.1×10^{-3})	2.95 (20.8×10^{-3})	3.70 (26.1×10^{-3})	4.67 (33.0×10^{-3})	1.88 (13.3×10^{-3})	2.94 (20.8×10^{-3})	3.73 (26.4×10^{-3})	4.71 (33.3×10^{-3})
43	Back-EMF Constant	K_E	V/krpm (V/rad/s)	1.37 (13.1×10^{-3})	2.18 (20.8×10^{-3})	2.73 (26.1×10^{-3})	3.45 (33.0×10^{-3})	1.39 (13.3×10^{-3})	2.18 (20.8×10^{-3})	2.76 (26.4×10^{-3})	3.48 (33.3×10^{-3})
44	Resistance	R_T	Ω	3.20	7.94	12.5	19.8	2.17	5.20	8.24	13.1
45	Inductance	L	mH	1.48	3.78	5.93	9.46	1.17	2.85	4.57	7.29
46	No-Load Current	I_{NL}	A	0.24	0.15	0.12	0.09	0.27	0.17	0.13	0.11
47	Peak Current (Stall) ⁴	I_p	A	3.75	2.40	1.92	1.53	5.54	3.67	2.91	2.32

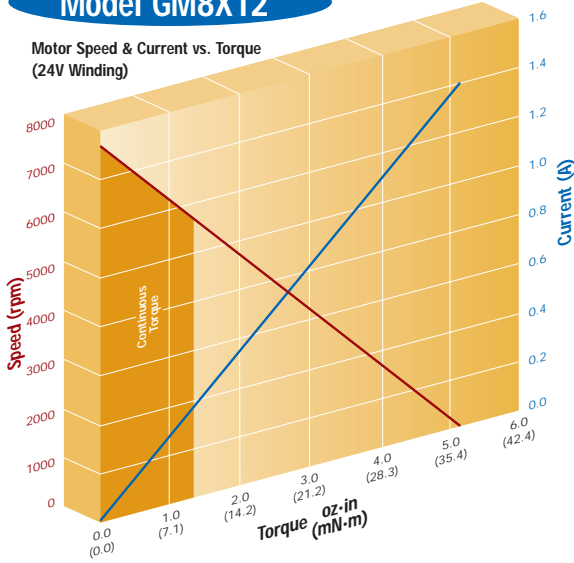
Model GM8XX4 Winding Data (Other windings available upon request)

Line No.	Parameter	Symbol	Units	GM8X14				GM8X24			
48	Reference Voltage	E	V	12.0	19.1	24.0	30.3	12.0	19.1	24.0	30.3
49	Torque Constant	K_T	oz-in/A (N-m/A)	1.46 (10.3×10^{-3})	2.31 (16.3×10^{-3})	2.92 (20.6×10^{-3})	3.69 (26.1×10^{-3})	1.54 (10.9×10^{-3})	2.47 (17.5×10^{-3})	3.09 (21.9×10^{-3})	3.86 (27.3×10^{-3})
50	Back-EMF Constant	K_E	V/krpm (V/rad/s)	1.08 (10.3×10^{-3})	1.71 (16.3×10^{-3})	2.16 (20.6×10^{-3})	2.73 (26.1×10^{-3})	1.14 (10.9×10^{-3})	1.83 (17.5×10^{-3})	2.29 (21.9×10^{-3})	2.86 (27.3×10^{-3})
51	Resistance	R_T	Ω	1.52	3.64	5.73	9.06	1.17	2.79	4.33	6.75
52	Inductance	L	mH	0.77	1.94	3.10	4.95	0.58	1.50	2.34	3.65
53	No-Load Current	I_{NL}	A	0.35	0.22	0.18	0.14	0.36	0.23	0.18	0.15
54	Peak Current (Stall) ⁴	I_p	A	7.90	5.24	4.19	3.34	10.3	6.85	5.54	4.49

⁴Theoretical values supplied for reference only.

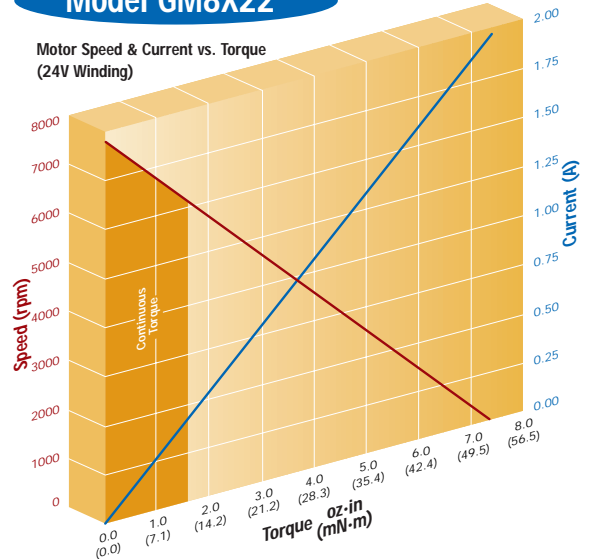
Model GM8X12

Motor Speed & Current vs. Torque
(24V Winding)



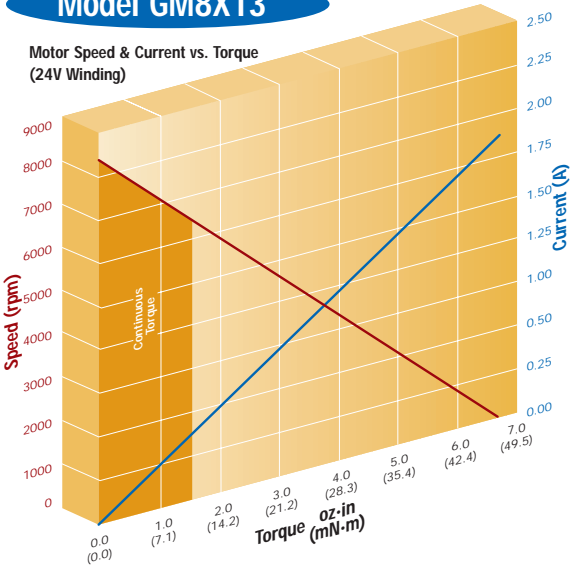
Model GM8X22

Motor Speed & Current vs. Torque
(24V Winding)



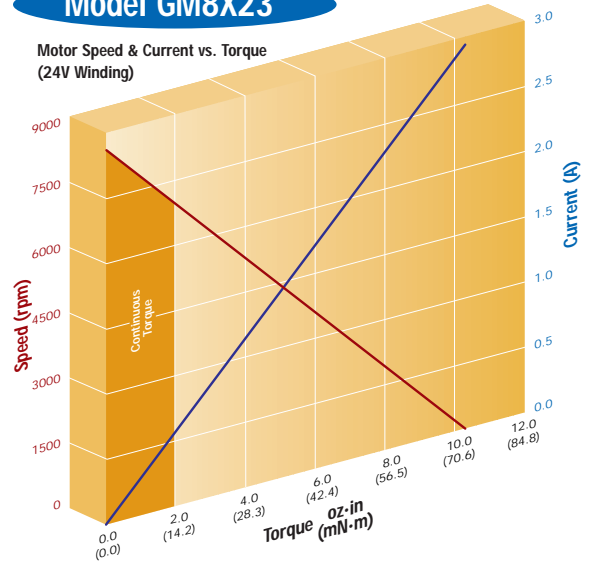
Model GM8X13

Motor Speed & Current vs. Torque
(24V Winding)



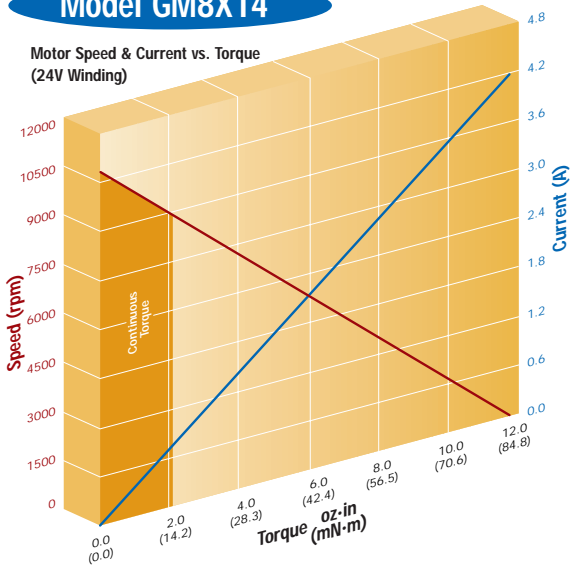
Model GM8X23

Motor Speed & Current vs. Torque
(24V Winding)



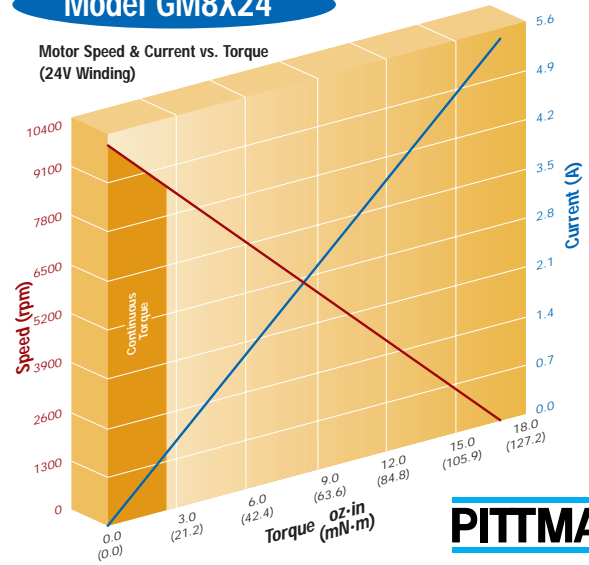
Model GM8X14

Motor Speed & Current vs. Torque
(24V Winding)

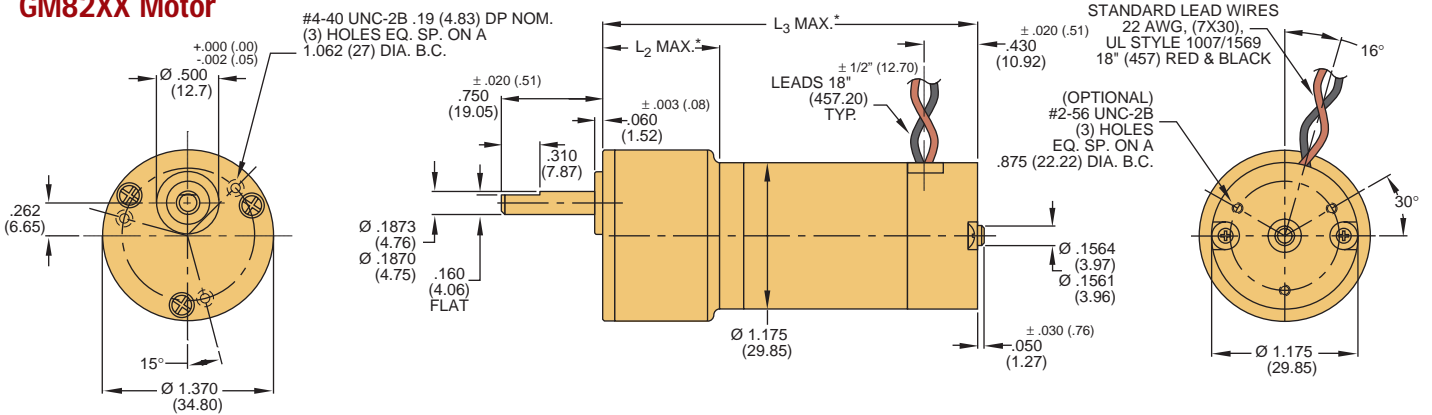


Model GM8X24

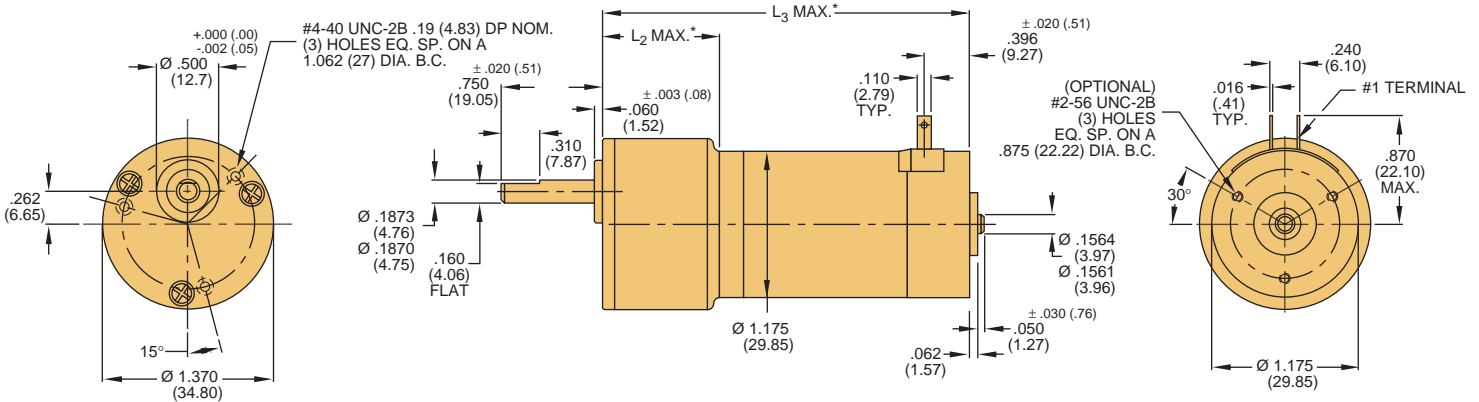
Motor Speed & Current vs. Torque
(24V Winding)



GM82XX Motor



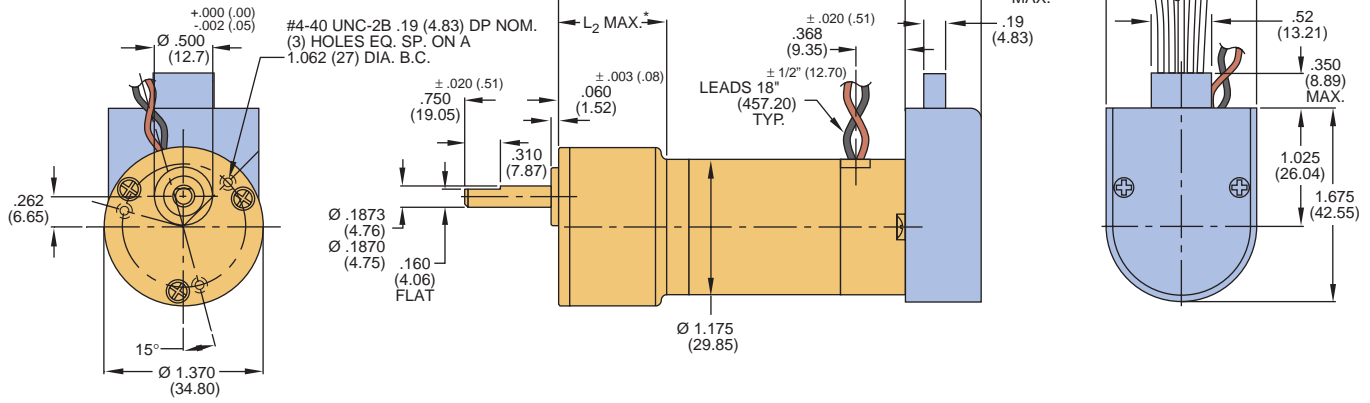
GM87XX Motor



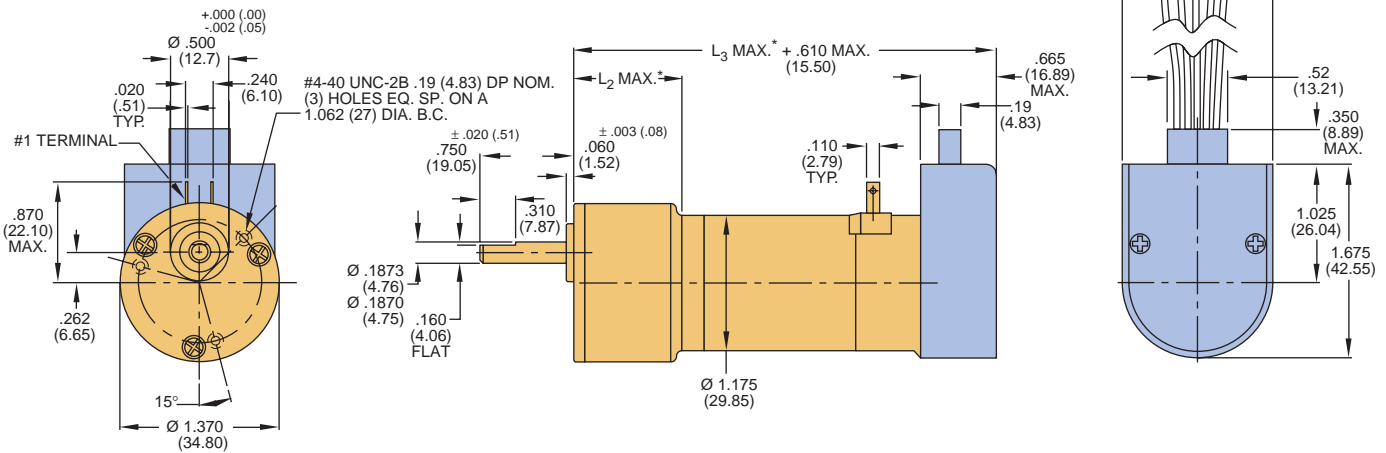
Notes:

- Unless otherwise specified, all tolerances are to be ±.005 (.01)
- All measurements are in inches (mm)
- *See line numbers 7 through 13 in gearmotor data chart

GM82XX Motor with 91X0 Encoder



GM87XX Motor with 91X0 Encoder



Encoder Connection Chart

Pin No.	Color	Connection
1	Black	Ground
2	Green	Index/NC
3	Yellow	Channel A
4	Red	Vcc
5	Blue	Channel B

Notes:

- Unless otherwise specified, all tolerances are to be ±.005 (.01)
- All measurements are in inches (mm)
- *See line numbers 7 through 13 in gearmotor data chart

SERIES GM9000

Gearmotor Data

Line No.	Parameter	Symbol	Units	Reduction Ratios											
				5.9:1	11.5:1	19.7:1	38.3:1	65.5:1	127.8:1	218.4:1	425.9:1	728.1:1	1419.8:1	2426.9:1	4732.5:1
MECHANICAL SPECIFICATIONS (Standard and High-Torque Gears)															
1	Max. Load Standard Gears ¹	T _L	oz-in (N-m)	175 (1.24)	175 (1.24)	175 (1.24)	175 (1.24)	175 (1.24)	175 (1.24)	175 (1.24)	175 (1.24)	175 (1.24)	175 (1.24)	175 (1.24)	175 (1.24)
2	Max. Load High-Torque Gears ¹	T _L	oz-in (N-m)	300 (2.12)	300 (2.12)	300 (2.12)	300 (2.12)	300 (2.12)	300 (2.12)	300 (2.12)	300 (2.12)	300 (2.12)	300 (2.12)	300 (2.12)	300 (2.12)
3	Gearbox Shaft Rotation ²	—	—	CW	CW	CCW	CCW	CW	CW	CCW	CCW	CW	CW	CCW	CCW
4	Gearbox Efficiency	—	%	81	81	73	73	66	66	59	59	53	53	48	48
5	Gearbox Weight	W _G	oz (gm)	5.90 (167.3)	5.90 (167.3)	6.26 (177.5)	6.26 (177.5)	6.62 (187.7)	6.62 (187.7)	6.98 (197.9)	6.98 (197.9)	7.34 (208.1)	7.34 (208.1)	8.18 (231.9)	8.18 (231.9)
6	Gearbox Length	L ₂	in max (mm max)	1.373 (34.9)	1.373 (34.9)	1.373 (34.9)	1.373 (34.9)	1.373 (34.9)	1.373 (34.9)	1.373 (34.9)	1.373 (34.9)	1.373 (34.9)	1.373 (34.9)	1.528 (38.8)	1.528 (38.8)
7	Length, GM92X2/GM94X2	L ₃	in max (mm max)	3.101 (78.8)	3.101 (78.8)	3.101 (78.8)	3.101 (78.8)	3.101 (78.8)	3.101 (78.8)	3.101 (78.8)	3.101 (78.8)	3.101 (78.8)	3.101 (78.8)	3.256 (82.7)	3.256 (82.7)
8	Length, GM92X3/GM94X3	L ₃	in max (mm max)	3.476 (88.3)	3.476 (88.3)	3.476 (88.3)	3.476 (88.3)	3.476 (88.3)	3.476 (88.3)	3.476 (88.3)	3.476 (88.3)	3.476 (88.3)	3.476 (88.3)	3.631 (92.2)	3.63 (92.2)
9	Length, GM92X4/GM94X4	L ₃	in max (mm max)	3.676 (93.4)	3.676 (93.4)	3.676 (93.4)	3.676 (93.4)	3.676 (93.4)	3.676 (93.4)	3.676 (93.4)	3.676 (93.4)	3.676 (93.4)	3.676 (93.4)	3.831 (97.3)	3.831 (97.3)
10	Length, GM9235/GM9435	L ₃	in max (mm max)	3.976 (101.0)	3.976 (101.0)	3.976 (101.0)	3.976 (101.0)	3.976 (101.0)	3.976 (101.0)	3.976 (101.0)	3.976 (101.0)	3.976 (101.0)	3.976 (101.0)	4.131 (104.9)	4.131 (104.9)
11	Length, GM9236/GM9436	L ₃	in max (mm max)	4.326 (109.9)	4.326 (109.9)	4.326 (109.9)	4.326 (109.9)	4.326 (109.9)	4.326 (109.9)	4.326 (109.9)	4.326 (109.9)	4.326 (109.9)	4.326 (109.9)	4.481 (113.8)	4.481 (113.8)
MECHANICAL SPECIFICATIONS (High-Torque Wide Face Gears)															
12	Max. Load ¹	T _L	oz-in (N-m)	NOT AVAILABLE		500 (3.53)	500 (3.53)	500 (3.53)	500 (3.53)	500 (3.53)	500 (3.53)	500 (3.53)	500 (3.53)	NOT AVAILABLE	
13	Gearbox Shaft Rotation ²	—	—	NOT AVAILABLE		CCW	CCW	CW	CW	CCW	CCW	CW	CW	NOT AVAILABLE	
14	Gearbox Efficiency	—	%	NOT AVAILABLE		73	73	66	66	59	59	53	53	NOT AVAILABLE	
15	Gearbox Weight	W _G	oz (gm)	NOT AVAILABLE		6.52 (184.8)	6.52 (184.8)	6.88 (195.0)	6.88 (195.0)	7.24 (205.3)	7.24 (205.3)	8.08 (229.1)	8.08 (229.1)	NOT AVAILABLE	
16	Gearbox Length	L ₂	in max (mm max)	NOT AVAILABLE		1.373 (34.9)	1.373 (34.9)	1.373 (34.9)	1.373 (34.9)	1.373 (34.9)	1.373 (34.9)	1.528 (38.8)	1.528 (38.8)	NOT AVAILABLE	
17	Length, GM92X2/GM94X2	L ₃	in max (mm max)	NOT AVAILABLE		3.101 (78.8)	3.101 (78.8)	3.101 (78.8)	3.101 (78.8)	3.101 (78.8)	3.101 (78.8)	3.256 (82.7)	3.256 (82.7)	NOT AVAILABLE	
18	Length, GM92X3/GM94X3	L ₃	in max (mm max)	NOT AVAILABLE		3.476 (88.3)	3.476 (88.3)	3.476 (88.3)	3.476 (88.3)	3.476 (88.3)	3.476 (88.3)	3.631 (92.2)	3.631 (92.2)	NOT AVAILABLE	
19	Length, GM92X4/GM94X4	L ₃	in max (mm max)	NOT AVAILABLE		3.676 (93.4)	3.676 (93.4)	3.676 (93.4)	3.676 (93.4)	3.676 (93.4)	3.676 (93.4)	3.831 (97.3)	3.831 (97.3)	NOT AVAILABLE	
20	Length, GM9235/GM9435	L ₃	in max (mm max)	NOT AVAILABLE		3.976 (101.1)	3.976 (101.1)	3.976 (101.1)	3.976 (101.1)	3.976 (101.1)	3.976 (101.1)	4.131 (104.9)	4.131 (104.9)	NOT AVAILABLE	
21	Length, GM9236/GM9436	L ₃	in max (mm max)	NOT AVAILABLE		4.326 (109.9)	4.326 (109.9)	4.326 (109.9)	4.326 (109.9)	4.326 (109.9)	4.326 (109.9)	4.481 (113.8)	4.481 (113.8)	NOT AVAILABLE	
NO-LOAD SPEED (All Gears)															
22	GM9X12	S _{NL}	rpm (rad/s)	1399 (147)	717 (75.1)	420 (44.0)	215 (22.5)	126 (13.2)	64.6 (6.76)	37.8 (3.96)	19.4 (2.03)	11.3 (1.18)	5.8 (.607)	3.4 (.356)	1.7 (.178)
23	GM9X32	S _{NL}	rpm (rad/s)	1189 (125)	610 (63.9)	357 (37.4)	183 (19.2)	107 (11.2)	54.9 (5.75)	32.1 (3.36)	16.5 (1.73)	9.6 (.513)	4.9 (.513)	2.9 (.304)	1.5 (.157)
24	GM9X13	S _{NL}	rpm (rad/s)	948 (99.3)	486 (50.9)	284 (29.7)	146 (15.3)	85.3 (8.93)	43.8 (4.59)	25.6 (2.68)	13.1 (1.37)	7.7 (.806)	3.9 (.408)	2.3 (.241)	1.2 (.126)
25	GM9X33	S _{NL}	rpm (rad/s)	1016 (106)	521 (54.6)	305 (31.9)	156 (16.3)	91.5 (9.58)	46.9 (4.91)	27.4 (2.87)	14.1 (1.48)	8.2 (.859)	4.2 (.440)	2.5 (.262)	1.3 (.136)
26	GM9X14	S _{NL}	rpm (rad/s)	1300 (136)	667 (69.8)	390 (40.8)	200 (20.9)	117 (12.3)	60.0 (6.28)	35.1 (3.68)	18.0 (1.88)	10.5 (1.10)	5.4 (.565)	3.2 (.335)	1.6 (.168)
27	GM9X34	S _{NL}	rpm (rad/s)	1043 (109)	535 (56.0)	313 (32.8)	160 (16.8)	93.9 (9.83)	48.1 (5.04)	28.2 (2.95)	14.4 (1.51)	8.5 (.890)	4.3 (.450)	2.5 (.262)	1.3 (.136)

¹Represents gearbox capability only. Continuous load torque capability will vary with gear ratio, motor selection, and operating conditions.

²Shaft rotation is designated while looking at output shaft with motor operating in a clockwise direction.

Gearmotor Data, continued

Line No.	Parameter	Symbol	Units	Reduction Ratios											
				5.9:1	11.5:1	19.7:1	38.3:1	65.5:1	127.8:1	218.4:1	425.9:1	728.1:1	1419.8:1	2426.9:1	4732.5:1
NO-LOAD SPEED (All Gears), continued															
28	GM9X35	S _{NL}	rpm	1075	552	322	166	96.9	49.7	29.1	14.9	8.7	4.4	2.6	1.3
			(rad/s)	(112.5)	(57.8)	(33.7)	(17.4)	(10.1)	(5.2)	(3.0)	(1.6)	(.913)	(.468)	(.274)	(.140)
29	GM9X36	S _{NL}	rpm	834	427	250	128	75	38.5	22.5	11.5	6.8	3.5	2.0	1.0
			(rad/s)	(87.3)	(44.7)	(26.2)	(13.4)	(7.85)	(4.03)	(2.36)	(1.20)	(.712)	(.367)	(.209)	(.105)

Motor Data

Line No.	Parameter	Symbol	Units	GM9X12	GM9X32	GM9X13	GM9X33	GM9X14	GM9X34	GM9X35	GM9X36
30	Continuous Torque (Max.) ³	T _C	oz-in (N-m)	1.6 (11.2 X 10 ⁻³)	2.3 (16.2 X 10 ⁻³)	3.2 (22.6 X 10 ⁻³)	4.7 (33.2 X 10 ⁻³)	3.9 (27.8 X 10 ⁻³)	6.1 (43.1 X 10 ⁻³)	6.9 (48.7 X 10 ⁻³)	9.5 (67.1 X 10 ⁻³)
31	Peak Torque (Stall) ⁴	T _{PK}	oz-in (N-m)	8.4 (59.0 X 10 ⁻³)	13.8 (97.5 X 10 ⁻³)	15.6 (110.2 X 10 ⁻³)	31.6 (223.2 X 10 ⁻³)	23.9 (168.8 X 10 ⁻³)	41.3 (291.7 X 10 ⁻³)	49.4 (348.9 X 10 ⁻³)	61.8 (436.4 X 10 ⁻³)
32	Motor Constant	K _M	oz-in/√W (N-m/√W)	1.16 (8.2 X 10 ⁻³)	1.62 (11.4 X 10 ⁻³)	1.94 (13.7 X 10 ⁻³)	2.66 (18.8 X 10 ⁻³)	2.05 (14.5 X 10 ⁻³)	3.01 (21.3 X 10 ⁻³)	3.21 (22.7 X 10 ⁻³)	4.11 (29.0 X 10 ⁻³)
33	No-Load Speed	S ₀	rpm (rad/s)	8251 (864.1)	7015 (734.6)	5592 (585.6)	5993 (627.6)	7666 (802.8)	6151 (644.2)	6348 (664.8)	4916 (514.8)
34	Friction Torque	T _F	oz-in (N-m)	0.4 (2.8 X 10 ⁻³)	0.5 (3.5 X 10 ⁻³)	0.5 (3.5 X 10 ⁻³)	0.6 (4.2 X 10 ⁻³)	0.5 (3.5 X 10 ⁻³)	0.6 (4.2 X 10 ⁻³)	0.65 (4.6 X 10 ⁻³)	0.8 (5.6 X 10 ⁻³)
35	Rotor Inertia	J _M	oz-in-s ² (kg-m ²)	2.2 X 10 ⁻⁴ (1.55 X 10 ⁻⁶)	2.7 X 10 ⁻⁴ (1.91 X 10 ⁻⁶)	3.9 X 10 ⁻⁴ (2.75 X 10 ⁻⁶)	4.6 X 10 ⁻⁴ (3.25 X 10 ⁻⁶)	5.4 X 10 ⁻⁴ (3.81 X 10 ⁻⁶)	5.9 X 10 ⁻⁴ (4.17 X 10 ⁻⁶)	7.9 X 10 ⁻⁴ (5.58 X 10 ⁻⁶)	1.0 X 10 ⁻³ (7.06 X 10 ⁻⁶)
36	Electrical Time Constant	τ _E	ms	0.53	0.63	0.74	0.84	0.80	0.85	0.89	1.06
37	Mechanical Time Constant	τ _M	ms	22.8	14.4	14.7	9.29	18.1	9.25	10.9	8.5
38	Viscous Damping—Infinite Source Impedance	D	oz-in/krpm (N-m/rad/s)	0.0086 (5.79 X 10 ⁻⁷)	0.0272 (1.83 X 10 ⁻⁶)	0.0113 (7.62 X 10 ⁻⁷)	0.0335 (2.25 X 10 ⁻⁶)	0.0125 (8.43 X 10 ⁻⁷)	0.0387 (2.60 X 10 ⁻⁶)	0.0450 (3.03 X 10 ⁻⁶)	0.0525 (3.54 X 10 ⁻⁶)
39	Viscous Damping—Zero Source Impedance	K _D	oz-in/krpm (N-m/rad/s)	1.00 (6.74 X 10 ⁻⁵)	1.94 (1.31 X 10 ⁻⁴)	2.78 (1.87 X 10 ⁻⁴)	5.23 (3.52 X 10 ⁻⁴)	3.11 (2.09 X 10 ⁻⁴)	6.68 (4.50 X 10 ⁻⁴)	7.6 (5.12 X 10 ⁻⁴)	12.5 (8.42 X 10 ⁻⁴)
40	Maximum Winding Temp.	θ _{MAX}	°F (°C)	311 (155)	311 (155)	311 (155)	311 (155)	311 (155)	311 (155)	311 (155)	311 (155)
41	Thermal Impedance	R _{TH}	°F/watt °C/watt	72.9 (22.7)	72.9 (22.7)	66.4 (19.1)	66.4 (19.1)	62.8 (17.1)	62.8 (17.1)	58.5 (14.7)	56.3 (13.5)
42	Thermal Time Constant	τ _{TH}	min	7.21	7.21	11.1	11.1	12.0	12.0	12.9	13.5
43	Motor Weight	W _M	oz (gm)	6.96 (197.3)	6.98 (197.9)	8.98 (254.6)	8.90 (252.3)	10.1 (286.3)	10.1 (286.3)	0.0 (TBD)	13.8 (391.2)

Model GM9XX2 Winding Data (Other windings available upon request)

Line No.	Parameter	Symbol	Units	9X12				9X32			
44	Reference Voltage	E	V	12.0	19.1	24.0	30.3	12.0	19.1	24.0	30.3
45	Torque Constant	K _T	oz-in/A (N-m/A)	1.86 (13.2 X 10 ⁻³)	2.95 (20.8 X 10 ⁻³)	3.72 (26.3 X 10 ⁻³)	4.68 (33.1 X 10 ⁻³)	2.20 (15.6 X 10 ⁻³)	3.50 (24.7 X 10 ⁻³)	4.40 (31.1 X 10 ⁻³)	5.53 (39.1 X 10 ⁻³)
46	Back-EMF Constant	K _E	V/krpm (V/rad/s)	1.38 (13.2 X 10 ⁻³)	2.18 (20.8 X 10 ⁻³)	2.75 (26.3 X 10 ⁻³)	3.46 (33.1 X 10 ⁻³)	1.63 (15.6 X 10 ⁻³)	2.59 (24.7 X 10 ⁻³)	3.25 (31.1 X 10 ⁻³)	4.09 (39.1 X 10 ⁻³)
47	Resistance	R _T	Ω	2.63	6.45	10.2	16.1	1.93	4.70	7.38	11.6
48	Inductance	L	mH	1.35	3.40	5.42	8.56	1.16	2.94	4.64	7.34
49	No-Load Current	I _{NL}	A	0.26	0.16	0.13	0.10	0.32	0.20	0.16	0.13
50	Peak Current (Stall)	I _p	A	4.56	2.96	2.35	1.88	6.22	4.06	3.25	2.60

³Continuous torque specified at 25°C ambient temperature and without additional heat sink.

SERIES GM9000

Model GM9XX3 Winding Data (Other windings available upon request)

Line No.	Parameter	Symbol	Units	9X13				9X33			
51	Reference Voltage	E	V	12.0	19.1	24.0	30.3	12.0	19.1	24.0	30.3
52	Torque Constant	K_T	oz-in/A (N-m/A)	2.80 (19.8×10^{-3})	4.47 (31.6×10^{-3})	5.60 (39.5×10^{-3})	7.07 (49.9×10^{-3})	2.67 (18.9×10^{-3})	4.20 (29.7×10^{-3})	5.28 (37.3×10^{-3})	6.68 (47.2×10^{-3})
53	Back-EMF Constant	K_E	V/krpm (V/rad/s)	2.07 (19.8×10^{-3})	3.31 (31.6×10^{-3})	4.14 (39.5×10^{-3})	5.23 (49.9×10^{-3})	1.98 (18.9×10^{-3})	3.10 (29.7×10^{-3})	3.90 (37.3×10^{-3})	4.94 (47.2×10^{-3})
54	Resistance	R_T	Ω	2.17	5.32	8.33	13.2	1.08	2.53	3.94	6.21
55	Inductance	L	mH	1.54	3.93	6.17	9.84	0.84	2.08	3.29	5.27
56	No-Load Current	I_{NL}	A	0.20	0.13	0.10	0.08	0.30	0.19	0.15	0.12
57	Peak Current (Stall)	I_p	A	5.54	3.59	2.88	2.30	11.1	7.55	6.09	4.88

Model GM9XX4 Winding Data (Other windings available upon request)

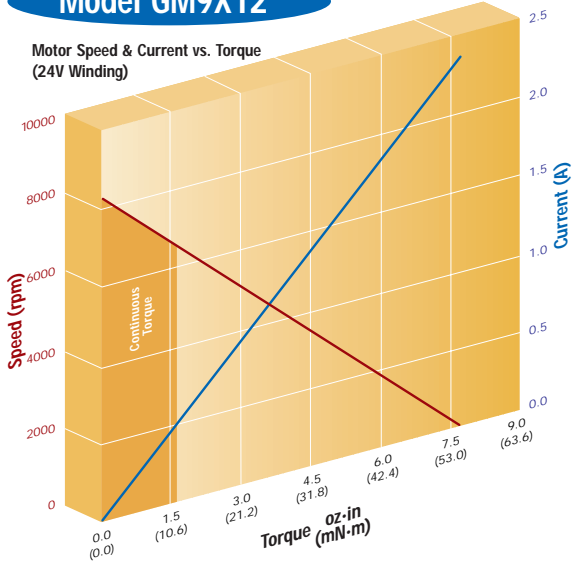
Line No.	Parameter	Symbol	Units	9X14				9X34			
58	Reference Voltage	E	V	12.0	19.1	24.0	30.3	12.0	19.1	24.0	30.3
59	Torque Constant	K_T	oz-in/A (oz-in/A)	2.06 (14.5×10^{-3})	3.27 (23.1×10^{-3})	4.13 (29.2×10^{-3})	5.22 (36.9×10^{-3})	2.58 (18.2×10^{-3})	4.07 (28.7×10^{-3})	5.17 (36.5×10^{-3})	6.50 (45.9×10^{-3})
60	Back-EMF Constant	K_E	V/krpm (V/krpm)	1.53 (14.5×10^{-3})	2.42 (23.1×10^{-3})	3.05 (29.2×10^{-3})	3.86 (36.9×10^{-3})	1.91 (18.2×10^{-3})	3.01 (28.7×10^{-3})	3.82 (36.5×10^{-3})	4.81 (45.9×10^{-3})
61	Resistance	R_T	Ω	1.10	2.59	4.06	6.40	0.83	1.89	2.96	4.62
62	Inductance	L	mH	0.81	2.04	3.25	5.19	0.63	1.56	2.51	3.97
63	No-Load Current	I_{NL}	A	0.29	0.18	0.14	0.11	0.33	0.21	0.16	0.13
64	Peak Current (Stall)	I_p	A	10.9	7.36	5.91	4.73	14.5	10.1	8.11	6.55

Model GM9X35/9X36 Winding Data (Other windings available upon request)

Line No.	Parameter	Symbol	Units	9X35				9X36			
65	Reference Voltage	E	V	12.0	19.1	24.0	30.3	12.0	19.1	24.0	30.3
66	Torque Constant	K_T	oz-in/A (oz-in/A)	2.47 (17.4×10^{-3})	3.99 (28.2×10^{-3})	4.94 (34.9×10^{-3})	6.27 (44.3×10^{-3})	3.25 (23.0×10^{-3})	5.24 (37.0×10^{-3})	6.49 (45.8×10^{-3})	8.24 (58.2×10^{-3})
67	Back-EMF Constant	K_E	V/krpm (V/krpm)	1.83 (17.4×10^{-3})	2.95 (28.2×10^{-3})	3.65 (34.9×10^{-3})	3.65 (44.3×10^{-3})	2.4 (23.0×10^{-3})	3.88 (37.0×10^{-3})	4.8 (45.8×10^{-3})	6.09 (58.2×10^{-3})
68	Resistance	R_T	Ω	.68	1.56	2.37	3.72	0.71	1.64	2.49	3.91
69	Inductance	L	mH	.51	1.34	2.05	3.30	0.66	1.72	2.63	4.24
70	No-Load Current	I_{NL}	A	0.38	0.24	0.19	0.16	0.33	0.20	0.16	0.13
71	Peak Current (Stall)	I_p	A	17.6	12.2	10.1	8.14	16.9	11.7	9.64	7.74

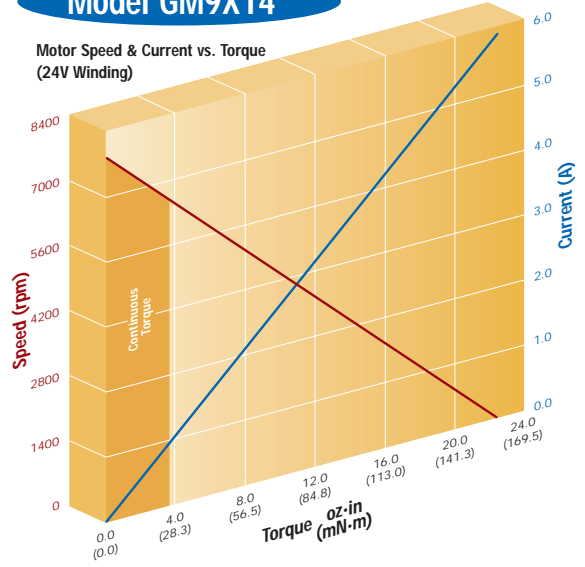
Model GM9X12

Motor Speed & Current vs. Torque
(24V Winding)



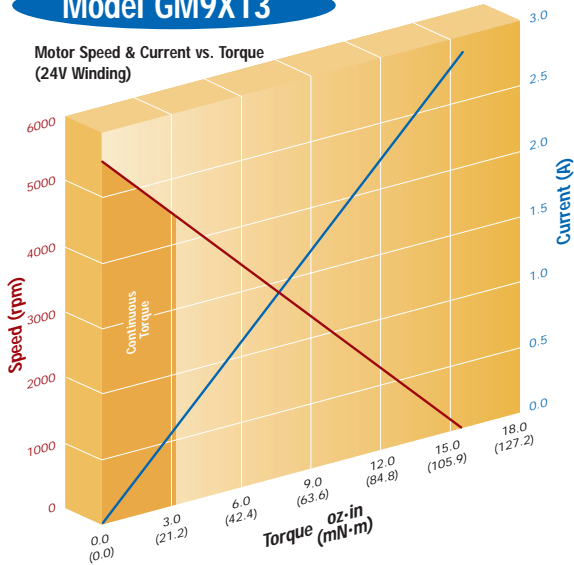
Model GM9X14

Motor Speed & Current vs. Torque
(24V Winding)



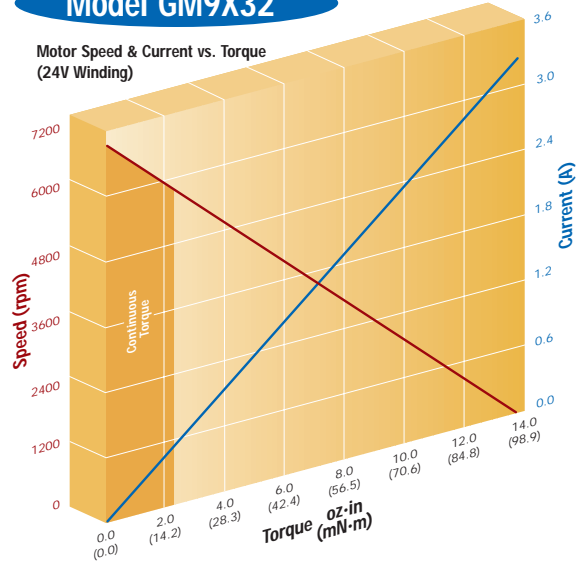
Model GM9X13

Motor Speed & Current vs. Torque
(24V Winding)



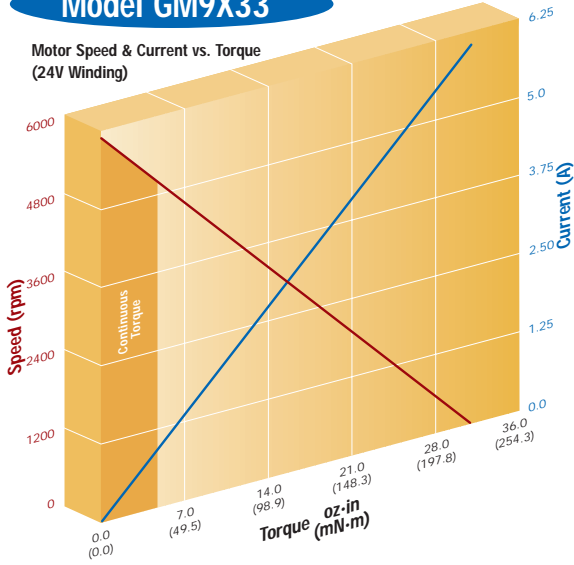
Model GM9X32

Motor Speed & Current vs. Torque
(24V Winding)



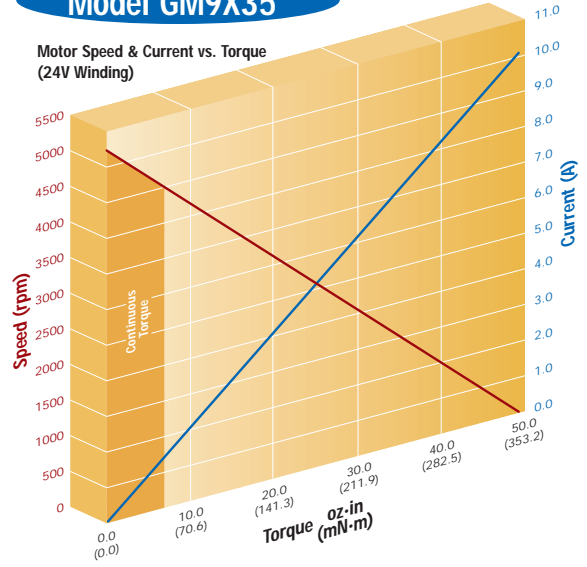
Model GM9X33

Motor Speed & Current vs. Torque
(24V Winding)



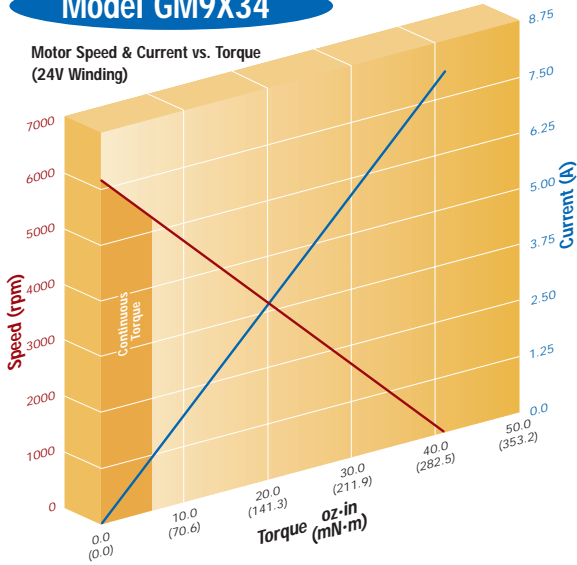
Model GM9X35

Motor Speed & Current vs. Torque
(24V Winding)



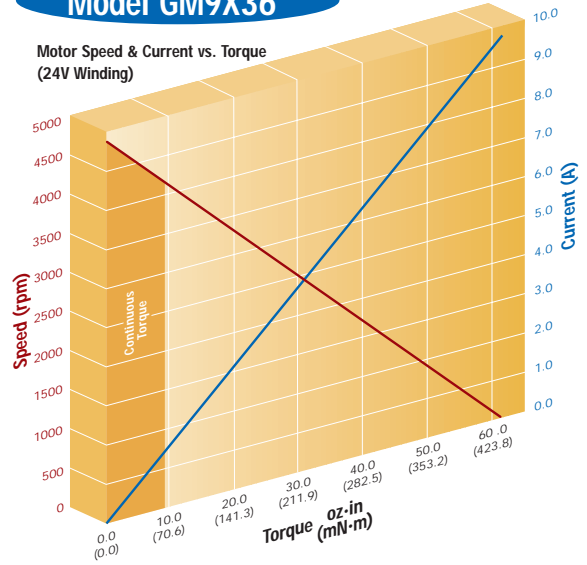
Model GM9X34

Motor Speed & Current vs. Torque
(24V Winding)

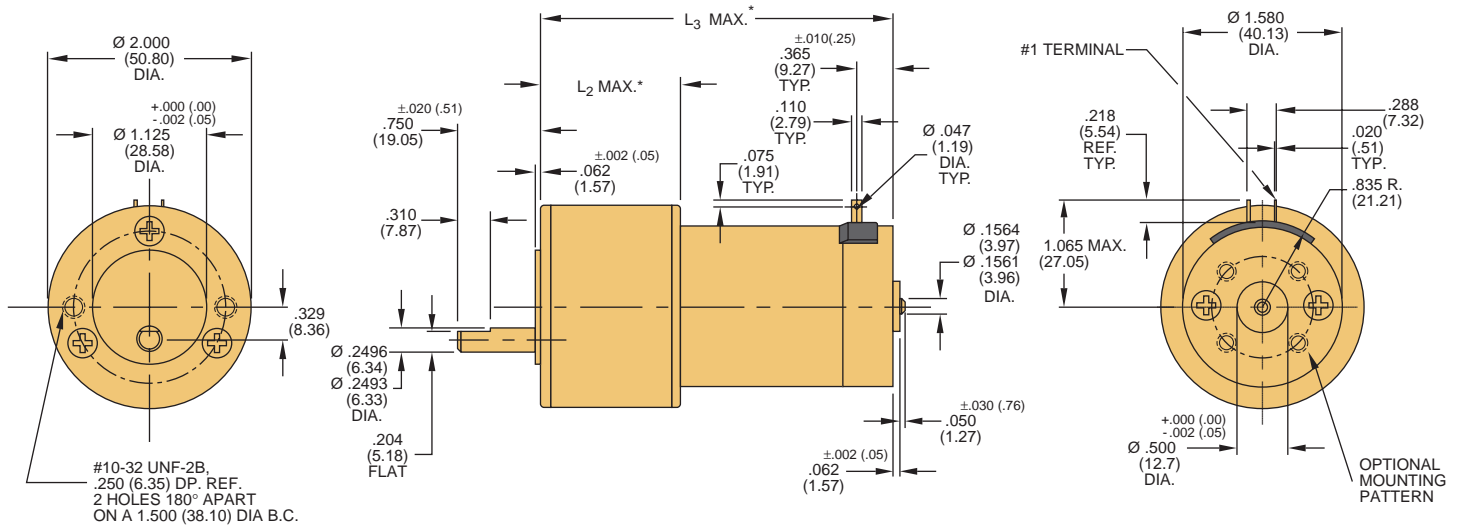


Model GM9X36

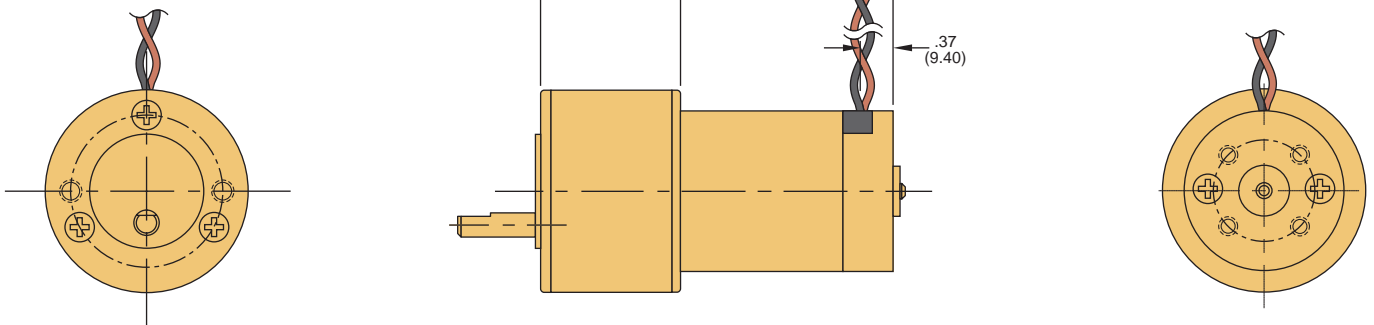
Motor Speed & Current vs. Torque
(24V Winding)



GM94XX Motor



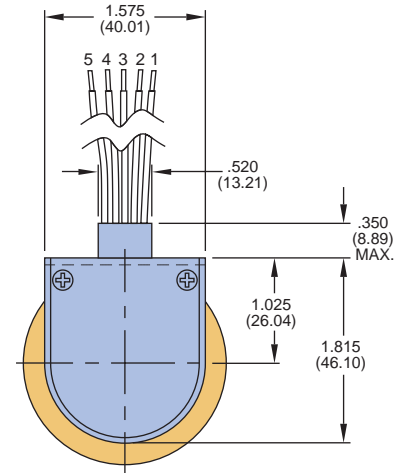
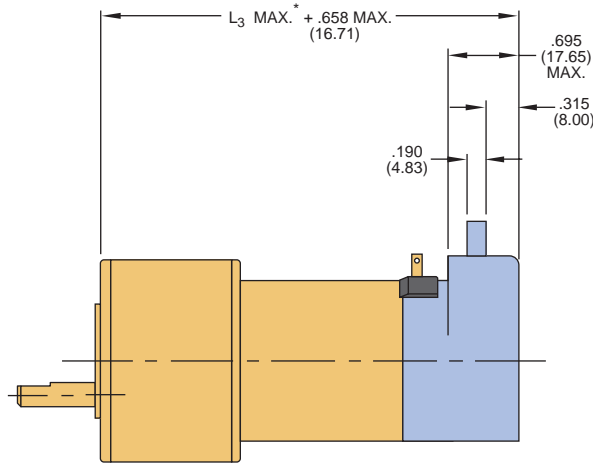
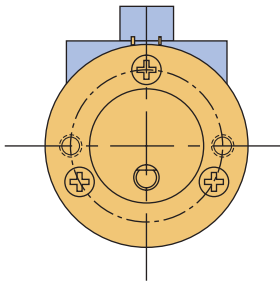
GM92XX Motor



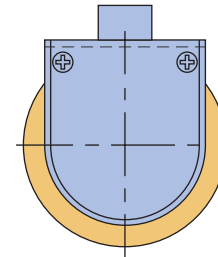
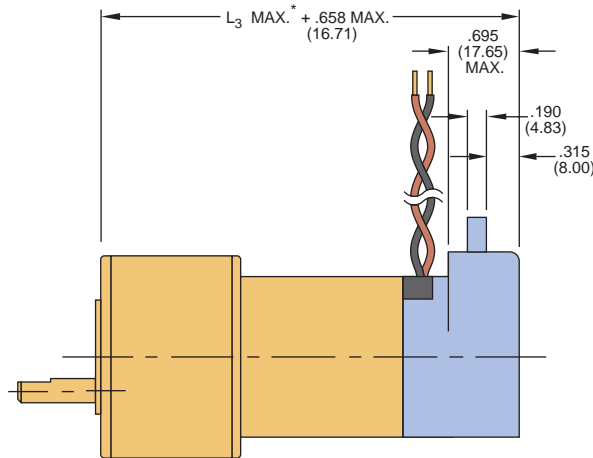
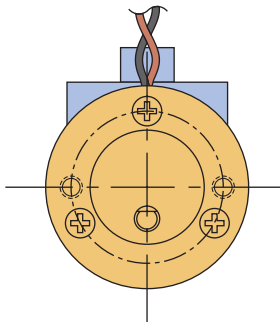
Notes:

- Unless otherwise specified, all tolerances are to be $\pm .005$ (.01)
- All measurements are in inches (mm)
- *See line numbers 6 through 11 and 17 through 21

**GM94XX Motor
with 91XX Encoder**



**GM92XX Motor
with 91XX Encoder**



Encoder Connection Chart

Pin No.	Color	Connection
1	Black	Ground
2	Green	Index/NC
3	Yellow	Channel A
4	Red	Vcc
5	Blue	Channel B

Notes:

- Unless otherwise specified, all tolerances are to be $\pm .005$ (.01)
- All measurements are in inches (mm)

*See line numbers 6 through 11 and 17 through 21

SERIES GM14900

Gearmotor Data

Line No.	Parameter	Symbol	Units	Reduction Ratios		
				5.9:1	19.7:1	65.5:1*
MECHANICAL SPECIFICATIONS (Standard and High-Torque Gears)						
1	Max. Load Standard Gears ¹	T_L	oz-in (N-m)	175 (1.24)	175 (1.24)	175 (1.24)
2	Max. Load High-Torque Gears ¹	T_L	oz-in (N-m)	N/A N/A	300 (2.12)	300 (2.12)
3	Gearbox Shaft Rotation ²	—	—	CW	CCW	CW
4	Gearbox Efficiency	—	%	81	73	66
5	Gearbox Weight	W_G	oz (gm)	5.90 (167.3)	6.26 (177.5)	6.62 (187.7)
6	Gearbox Length	L_2	in max (mm max)	1.373 (34.87)	1.373 (34.87)	1.373 (34.87)
7	Length, GM14901	L_3	in max (mm max)	4.322 (109.78)	4.322 (109.78)	4.322 (109.78)
8	Length, GM14902	L_3	in max (mm max)	4.572 (116.13)	4.572 (116.13)	4.572 (116.13)
MECHANICAL SPECIFICATIONS (High-Torque, Wide-Face Gears)						
9	Max. Load ¹	T_L	oz-in (N-m)	N/A N/A	500 (3.53)	500 (3.53)
10	Gearbox Shaft Rotation	—	—	CW	CCW	CW
11	Gearbox Efficiency	—	%	81	73	66
12	Gearbox Weight	W_G	oz (gm)	N/A N/A	6.52 (184.8)	6.88 (195.0)
13	Gearbox Length	L_2	in max (mm max)	N/A N/A	1.373 (34.87)	1.373 (34.87)
14	Length, GM14901	L_3	in max (mm max)	N/A N/A	4.322 (109.78)	4.322 (109.78)
15	Length, GM14902	L_3	in max (mm max)	N/A N/A	4.572 (116.13)	4.572 (116.13)
NO-LOAD SPEED (All Gears)						
16	GM14901	S_{NL}	rpm (rad/s)	713 (75)	214 (22)	64.2 (7)
17	GM14902	S_{NL}	rpm (rad/s)	690 (72)	207 (22)	62.1 (6)

¹Represents gearbox capability only. Continuous load torque capability will vary with gear ratio, motor selection, and operating conditions.

²Shaft rotation is designated while looking at output shaft with motor operating in a clockwise direction.

*Contact factory for higher ratios.

Motor Data

Line No.	Parameter	Symbol	Units	14X01	14X02
18	Continuous Torque ³	T _C	oz-in (N·m)	10.0 (70.6 X 10 ⁻³)	14.0 (98.9 X 10 ⁻³)
19	Peak Torque (Stall)	T _{PK}	oz-in (N·m)	62.8 (.44)	107 (.76)
20	Motor Constant	K _M	oz-in/√W (N·m/√W)	4.45 (31.4 X 10 ⁻³)	5.93 (41.9 X 10 ⁻³)
21	No-Load Speed	S ₀	rpm (rad/s)	4230 (443)	4087 (428)
22	Friction Torque	T _F	oz-in (N·m)	1.20 (8.5 X 10 ⁻³)	1.20 (8.5 X 10 ⁻³)
23	Rotor Inertia	J _M	oz-in·s ² (kg·m ²)	1.6 X 10 ⁻³ (1.13 X 10 ⁻⁵)	2.3 X 10 ⁻³ (1.62 X 10 ⁻⁵)
24	Electrical Time Constant	τ _E	ms	0.91	1.47
25	Mechanical Time Constant	τ _M	ms	11.4	9.26
26	Viscous Damping— Infinite Source Impedance	D	oz-in/krpm (N·m/(rad/s))	0.17 (1.15 X 10 ⁻⁵)	0.17 (1.15 X 10 ⁻⁵)
27	Viscous Damping— Zero Source Impedance	K _D	oz-in/krpm (N·m/(rad/s))	14.7 (9.91 X 10 ⁻⁴)	26.0 (1.75 X 10 ⁻³)
28	Maximum Winding Temperature	θ _{MAX}	°F (°C)	311 (155)	311 (155)
29	Thermal Impedance	R _{TH}	°F/watt °C/watt	49.8 (9.90)	48.2 (9.00)
30	Thermal Time Constant	τ _{TH}	min	22.0	24.0
31	Motor Weight	W _M	oz (gm)	20.8 (589.7)	26.0 (737.1)
32	Motor Length, 1410X, 1420X	L ₁	in max (mm max)	2.953 (75.01)	3.203 (81.36)

³Continuous torque specified at 25°C ambient temperature and without additional heat sink.

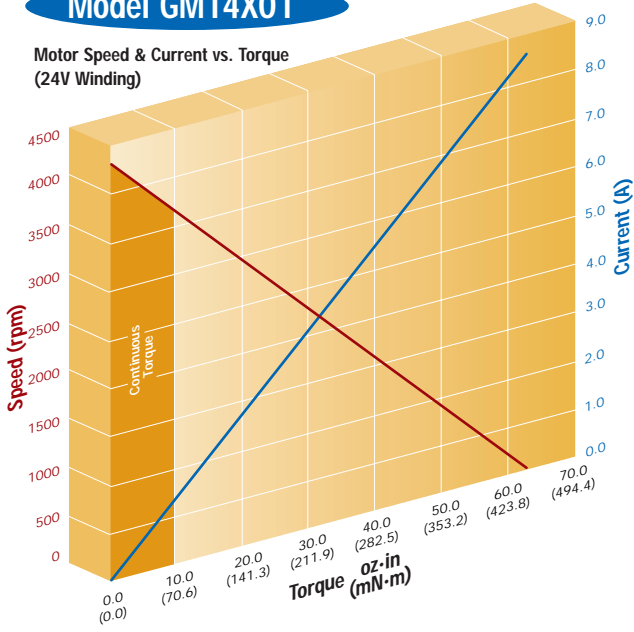
Model GM14X01/GM14X02 Winding Data (Other windings available upon request)

Line No.	Parameter	Symbol	Units	GM14X01				GM14X02			
33	Reference Voltage	E	V	12.0	19.1	24.0	30.3	12.0	19.1	24.0	30.3
34	Torque Constant	K _T	oz-in/A (N·m/A)	3.72 (26.3 X 10 ⁻³)	5.89 (41.6 X 10 ⁻³)	7.44 (52.5 X 10 ⁻³)	9.46 (66.8 X 10 ⁻³)	3.90 (27.5 X 10 ⁻³)	6.16 (43.5 X 10 ⁻³)	7.80 (55.1 X 10 ⁻³)	9.85 (69.6 X 10 ⁻³)
35	Back-EMF Constant	K _E	V/krpm (V/rad/s)	2.75 (26.3 X 10 ⁻³)	4.36 (41.6 X 10 ⁻³)	5.50 (52.5 X 10 ⁻³)	6.99 (66.8 X 10 ⁻³)	2.88 (27.5 X 10 ⁻³)	4.55 (43.5 X 10 ⁻³)	5.77 (55.1 X 10 ⁻³)	7.29 (69.6 X 10 ⁻³)
36	Resistance	R _T	Ω	0.72	1.76	2.79	4.45	0.45	1.09	1.73	2.74
37	Inductance	L	mH	0.63	1.59	2.54	4.10	0.63	1.58	2.54	4.05
38	No-Load Current	I _{NL}	A	0.52	0.33	0.26	0.20	0.49	0.31	0.24	0.19
39	Peak Current (Stall) ⁴	I _P	A	16.7	10.8	8.60	6.80	26.4	17.5	13.9	11.1

⁴Theoretical values supplied for reference only.

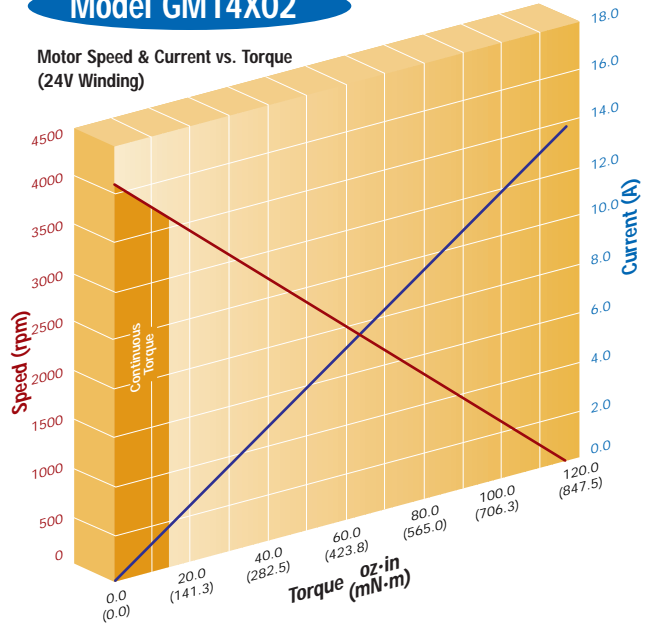
Model GM14X01

Motor Speed & Current vs. Torque
(24V Winding)



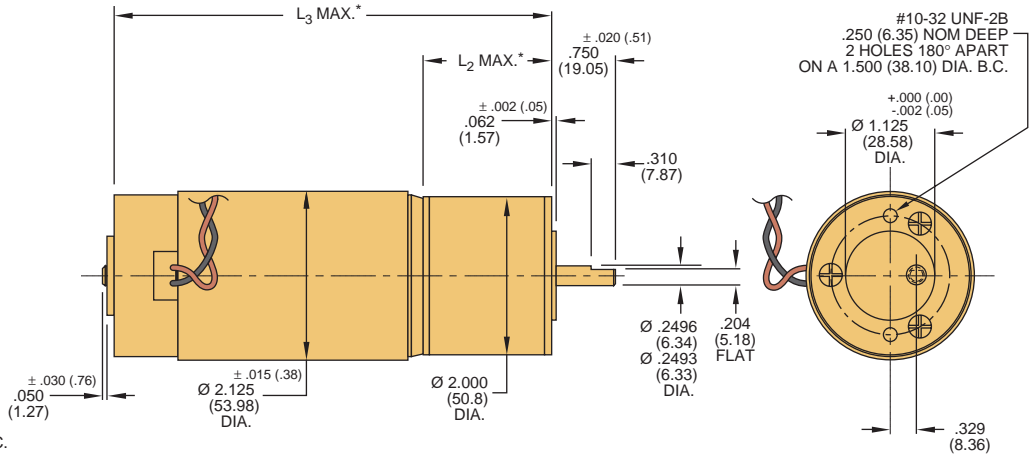
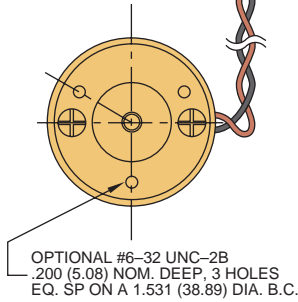
Model GM14X02

Motor Speed & Current vs. Torque
(24V Winding)



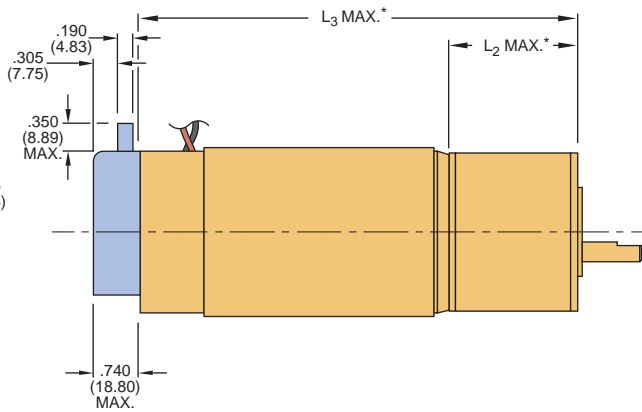
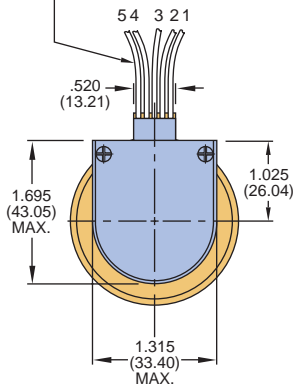
GM149XX Motor

RED & BLACK TWISTED PAIR, 20 AWG, PVC INSULATED, STRANDED WIRE, 18" (457) LONG

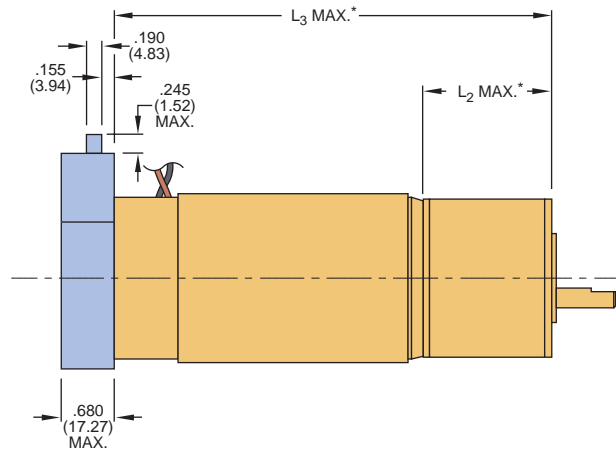
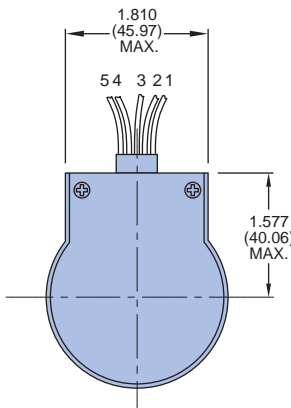


GM149XX Motor with 91X0 Encoder

OPTIONAL LEADWIRE PACKAGES AVAILABLE



GM149XX Motor with 90X0 Encoder



Encoder Connection Chart

Pin No.	Color	Connection
1	Black	Ground
2	Green	Index/NC
3	Yellow	Channel A
4	Red	Vcc
5	Blue	Channel B

Notes:

- Unless otherwise specified, all tolerances are to be $\pm .005$ (.01)
- All measurements are in inches (mm)
- *See line no. 6 through 8 and 13 through 15 in gearmotor data chart

Specifications subject to change without notice.



LCG-20

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