

Size 11 servomotor/encoder

CM-120-1024 servo motor / encoder



Description:

The CM-120 is a miniature, high performance brushless DC servomotor with an integral optical sinusoidal output encoder. The CP-120 was specifically designed for high speed/high resolution scanning and positioning applications.

The very low distortion sinusoidal encoder output allows interpolation of up to 10 bits for a resolution of 1,024,000 full quadrature cycles (4,096,000 discrete measuring points).

The motor is characterized by a very high torque to inertia ratio to optimize scanning rates.

Ordering information:

CP-120-1024-(1)

(1): 01 - 05 for different motor sizes

Please contact the factory for available winding configuration, encoder linecounts and power supply/amplitude/offset values.

mechanical:

shaft diameter: 3/16"
 shaft loading: 4 lbs radial and axial
 shaft runout: 0.0002" T.I.R.
 max speed: 10,000 rpm (mechanical)
 bearings: ABEC 5
 shaft material: 416 stainless

housing material: diecast aluminum
 bearing life: manufacturer's specs
 moment of inertia: see motor data
 weight: see motor data
 temperature: operating: -20°C to +85°C
 shock: 50 G's @ 11 ms
 vibration: 5-2,000 Hz @ 20 G's
 humidity: 98% without condensation
 protection: IP 64

encoder:

power supply: 5 Vdc
 code: incremental, sinusoidal
 line count: 1024
 output format: complementary A, B and index signals
 amplitude (A & B): Vpp = 0.5 V, centered around Vref
 amplitude index: 400 mV
 reference voltage: 2.14 Vdc

wire color assignments:

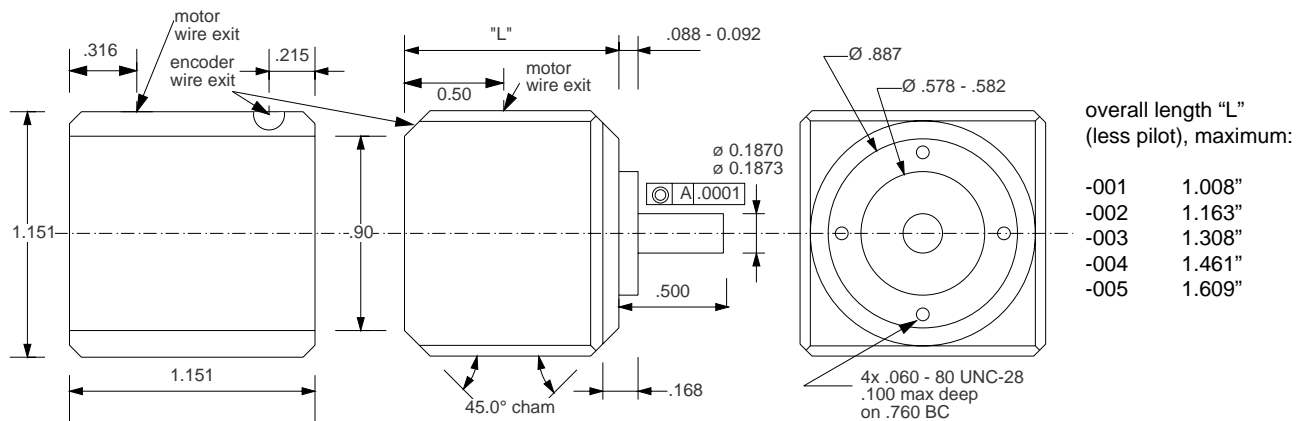
encoder (28 gauge wires, 10" long)

signal	PCB	wire color
power ground	1	black
index inverse	2	white
index	3	green
B inverse	4	violet
B channel	5	blue
+ 5Vdc	6	red
A inverse	7	orange
A channel	8	yellow

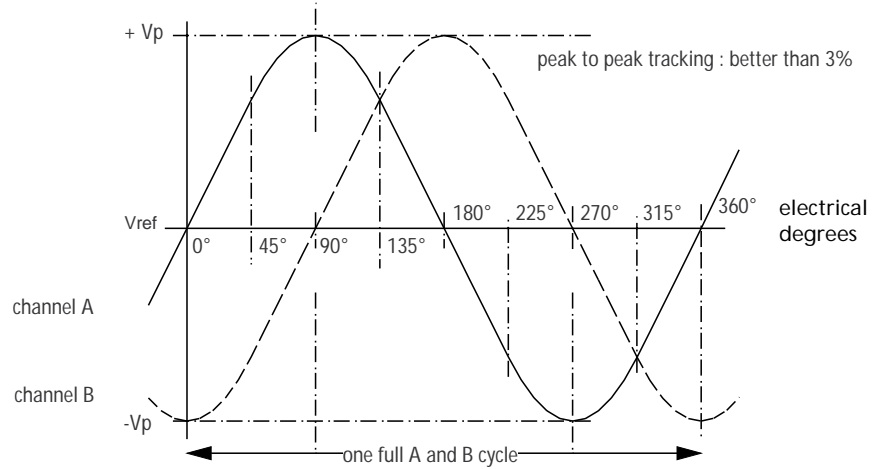
motor (28 gauge wires, 10" long)

coil	color
A	red
B	white
C	black

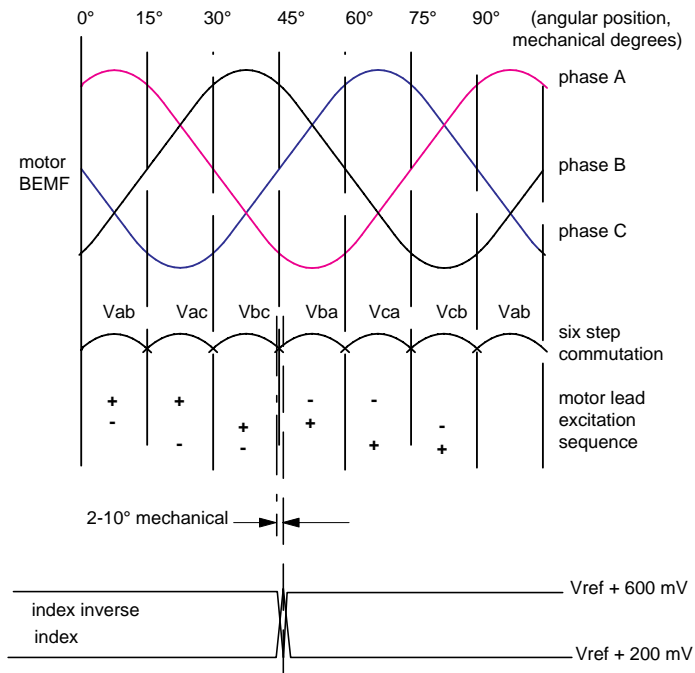
Outline:



A & B signals



motor BEMF & encoder index alignment



Motor specifications

size constants @ 20°C ambient:

parameter	symbol	unit	-01	-02	-03	-04	-05
maximum rated torque @ temperature rise of 150°C	Tr	in-oz	73	121	172	219	262
		Nm	0.51	0.85	1.22	1.54	1.85
maximum rated current	Ir	A	23	32	43	54	70
maximum continuous stall torque @ temperature rise of 90°C	Tc	in-oz	1.6	2.9	3.6	4.4	4.8
		mNm	12	20	26	31	34
maximum continuous output power @ temperature rise of 90°C	Pout	Watts	7.4	11.5	13.5	15.4	16.2
	Smpo	rpm	9,788	8,685	8,017	7,589	7,161
motor constant	Km	in-oz/W	0.88	1.44	1.75	2.03	2.22
		mNm/W	6.2	10.1	12.3	14.3	15.5
electrical time constant	Te	ms	0.10	0.16	0.19	0.22	0.23
mechanical time constant	Tm	ms	38.09	15.88	11.75	9.51	8.88
thermal resistance*	TPR	°C/Watt	14.45	13.25	12.32	11.50	10.83
maximum cogging torque	Tf	in-oz	0.09	0.11	0.12	0.13	0.14
		mNm	0.7	0.8	0.86	0.93	0.93
viscous damping (infinite source)	Fi	in-oz/rpm	2.3E-5	3.9E-5	5.2E-5	6.9E-5	7.8E-5
		mNm/rpm	1.6E-4	2.8E-4	3.7E-4	4.6E-4	5.5E-4
hysteresis drag torque	Th	in-oz	0.009	0.014	0.018	0.02	0.03
		mNm	0.06	0.09	0.12	0.15	0.17
number of poles		P	10	10	10	10	10
rotor inertia	Jm	in-oz-sec ²	2.0E-5	3.2E-5	4.4E-5	5.5E-5	6.6E-5
		kg.m ²	1.4E-7	2.2E-7	3.1E-7	3.9E-7	4.7E-7
motor weight		oz	1.8	2.1	2.5	3.3	3.9
		gram	52	75	87	117	138

(*) TPR assumes motor mounted to an aluminum heatsink of 2.6" x 2.6" x 0.25" in still air.

winding constants @ 20°C ambient*:

design voltage	Vp	Volt	20.0	20.0	20.0	20.0	20.0
peak torque, ± 25%	Tp	in-oz	4.8	10.6	14.9	19.6	24.7
		mNm	34	75	105	139	175
peak current, ± 25%	Ip	Ampere	1.49	2.76	3.70	4.81	6.64
torque sensitivity, ±10%	Kt	in-oz/A	3.21	3.83	4.00	4.08	3.73
		mNm/A	23	27	28	29	26
no-load speed	Snl	rpm	7,919	6,807	6,558	6,453	7,053
		rad/s	829	713	687	676	739
voltage constant	Kb	V/krpm	2.73	2.83	2.96	3.01	2.76
		V/rad/s	0.023	0.027	0.028	0.029	0.031
terminal resistance, ± 12%	Rm	Ohm	13.44	7.25	5.35	4.15	3.01
terminal inductance, ± 30%	Lm	mH	1.4	1.2	1.0	0.9	0.7

motor performance @ 20 V:

Continuous power output @ -temperature rise of 150°C, -still air cooling -ambient temperature of 20°C	power	Watt	4.8	8.5	10.8	13.1	15.5
		horsepower	0.006	0.011	0.015	0.018	0.021
	torque	in-oz	1.4	2.4	3.0	3.5	3.6
		mNm	10	17	21	25	25
	speed	rpm	4,521	4,726	4,867	5,018	5,874
	current	Ampere	0.55	0.76	0.91	1.05	1.20
	efficiency %		44	55	60	63	65