

SIGMALINE™ STANDARD HYBRID STEPPING MOTORS

SigmaLine stepping motors are industry's broadest line of hybrid stepping motors. Available in 2.2", 3.4" and 4.2" OD frame sizes with a choice of three rotor styles, this motor selection meets a wide variety of application requirements. These hybrid stepping motors were developed by Sigma Instruments, Inc., now part of Pacific Scientific.

SigmaLine stepping motors provide torque output over a range of 15 to 1700 oz-in. A wide range of torque and speed requirements are satisfied by the standard-model motors described here. Custom-wound motors are available for applications that call for unique combinations of torque and speed capability.

This selection of motors includes models compatible with each type of stepping motor

driver commonly utilized today (unipolar resistance-limited, bipolar resistance-limited, and bipolar chopper; full-step, half-step, and microstep).

SERIES 17

Low-inertia rotor (high acceleration)

SERIES 20

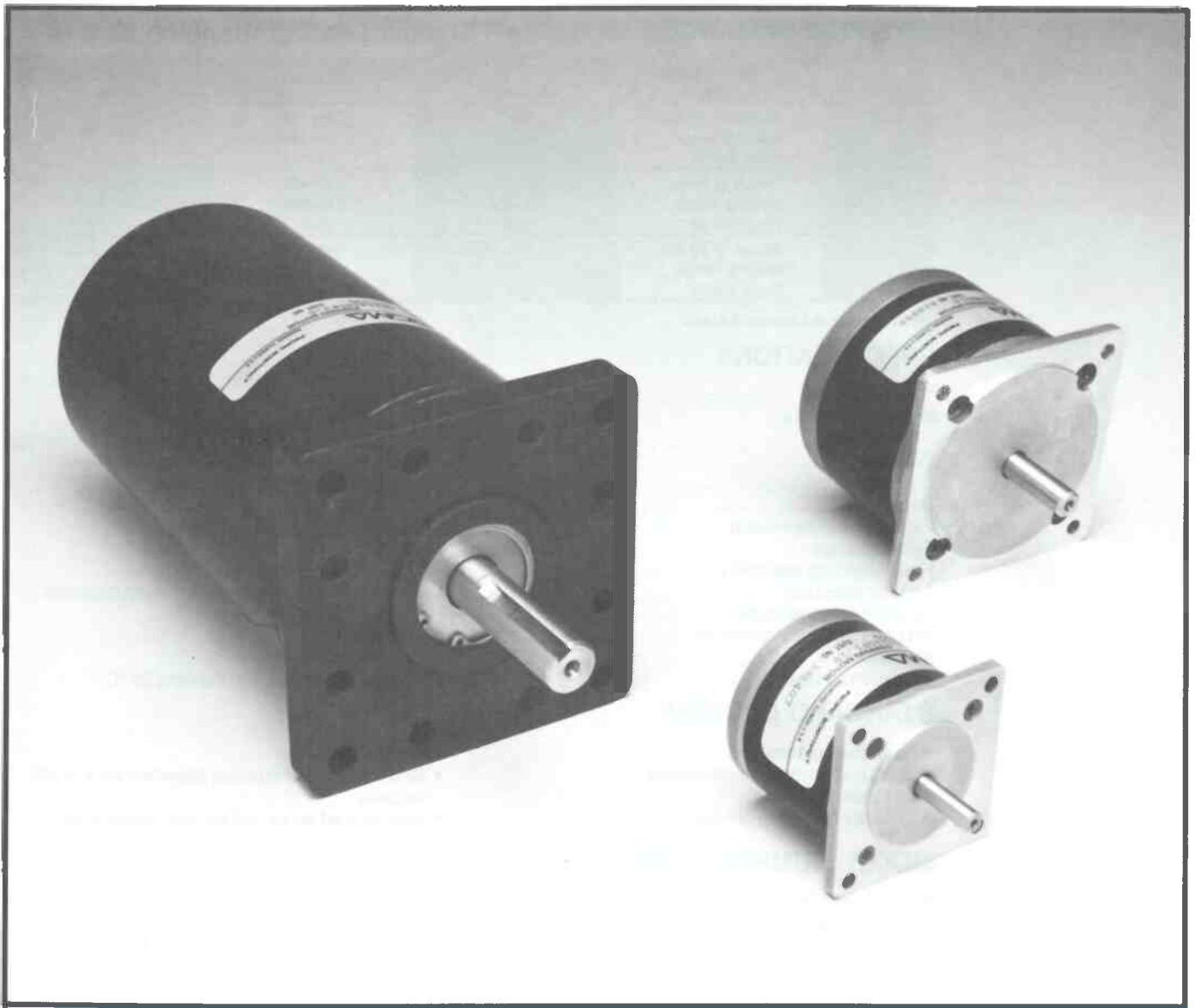
Solid rotor (improved low-speed characteristics)

SERIES 21

High-efficiency laminated rotor (improved high-speed characteristics)

SYNCHRONOUS MOTORS

For accurate bidirectional, constant-speed motor drive utilizing direct-line power supplies. See page 73.



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SIZE/PERFORMANCE... Sigmaline™ Standard-Hybrid Stepping Motors

O.D.	Specifications (Ranges) [△]	Solid Rotor/Low Inertia	Solid Rotor	Laminated Rotor
		Series 17	Series 20	Series 21
2.2"	Torque @ 50 sps.	15-105	20-155	26-140
	Holding Torque	49-130	30-168	31-180
	Rotor Inertia	.35-.75	.3-1.3	.42-1.5
3.4"	Torque @ 50 sps.	100-310	100-480	130-520
	Holding Torque	125-410	125-580	160-650
	Rotor Inertia	2-4.1	3-9	3.2-10.1
4.2"	Torque @ 50 sps.	—	540-1700	500-1480
	Holding Torque	—	635-2200	570-1850
	Rotor Inertia	—	17.4-56.1	19.3-59.2

[△] Torques (oz.-in.). Inertias (oz.-in.²)

SPECIFICATIONS

Type	hybrid
Rotor construction:	
Series 21	laminated and bonded (high-speed efficiency)
Series 17	low mass/low inertia (high acceleration)
Series 20	solid (low-speed, high torque)
Phases	2 or 4
Full steps per revolution	200
Full step angle	1.8°
Fractional-step capability	1/2, 1/4, and microstep
Angular accuracy	±3% of one step, no load, noncumulative
Operating temperature	-20° to 50°C
Maximum case temperature	100°C
Insulation	NEMA Class B
Insulation resistance	100 Megohm at 500 Vdc and 25°C

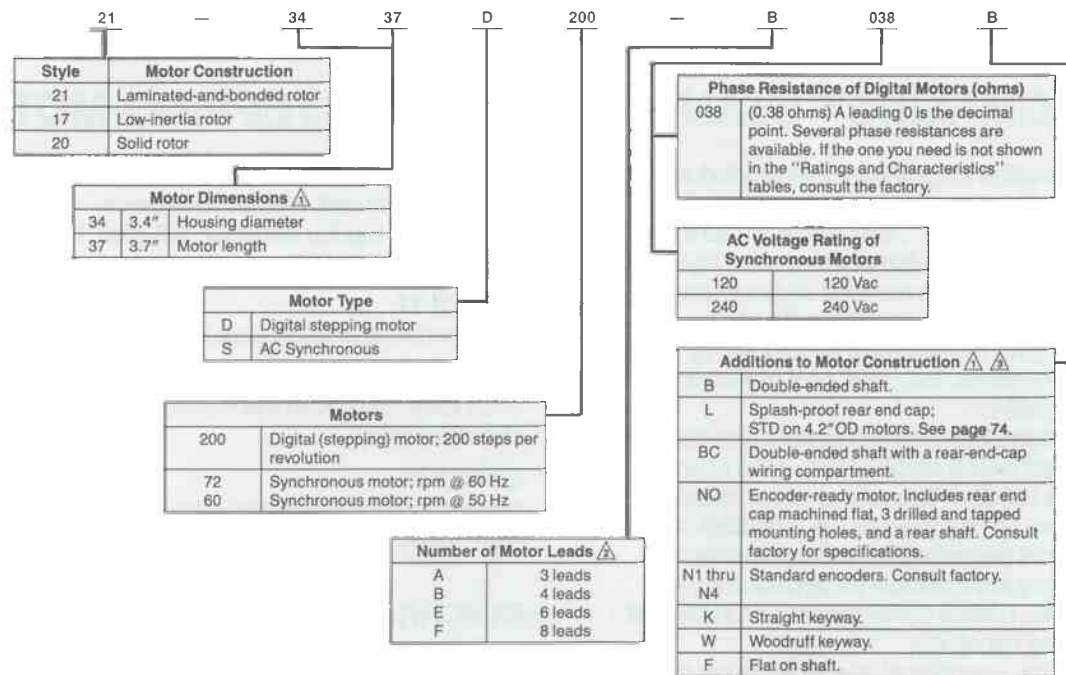
STANDARD OPTIONS

- Rear shaft extensions
- Shaft and keyway modifications
- Encoders (installed)
- Encoder-mounting provisions
- Special windings
- Splashproof construction (standard on 4.2" OD models)
- Special lead wires, cables, and connectors

MODEL NUMBER CODE

The following illustrates the numbering system for Sigmaline standard-hybrid stepping motors,

and for Sigmaline synchronous motors (see page 73).



[△] Special motor constructions, such as splashproof end caps, change dimensions of motors.

Always refer to the outline drawing of the particular motor. See page 74.

[△] See page 76 for connection diagrams.

[△] Keyways are on drive-shaft end only.

HIGH-EFFICIENCY SERIES 21

2.2", 3.4", and 4.2" OD

Sigmaline™ Series 21 motors are high-efficiency low-loss stepping motors.

They provide the high-speed-drive capability well suited for applications that demand rapid traversing.

Their excellent torque production at high speed permits use of reduction ratios, vastly improving system resolution.

- High-efficiency laminated-and-bonded rotor
- Good torque production over wide speed range, up to 6000 rpm
- Wide selection: 2.2", 3.4", 4.2" OD motor frame sizes
- Winding configurations for all types of stepping drives
- Industry-standard mounting pattern and shaft dimensions



RATINGS AND CHARACTERISTICS (Examples of standard motors)

OD (inches)	Model number	# of leads	Torque at 50 sps Δ oz-in./N-m	Holding torque oz-in./N-m	Detent torque oz-in./Nm	Phase current (amps)		Phase resistance (ohms) $\pm 10\%$	Phase inductance (mH) $\pm 20\%$	Rotor inertia oz-in. ² /10 ⁻³ kg-m ²	Weight lbs/kg	Power dissipation (watts) Δ	Performance curve Δ
						Uni-polar	Bi-polar Δ						
2.2	21-2215D200B02	4	38/0.27	50/0.35	1.4/0.010	—	5.0	0.22	0.47	0.42/0.008	0.85/0.38	11	—
2.2	21-2215D200E1.5	6	26/0.18	31/0.22	1.4/0.010	1.7	—	1.45	1.52	0.42/0.008	0.85/0.38	8	—
2.2	21-2220D200B016	4	57/0.4	71/0.5	5.0/0.035	—	5.0	0.16	0.59	0.67/0.012	1.25/0.56	8	yes
2.2	21-2220D200E5.1	6	49/0.35	61/0.43	5.0/0.035	1.0	—	5.2	9.2	0.67/0.012	1.25/0.56	10	—
2.2	21-2235D200B019	4	140/0.49	180/1.27	9.0/0.064	—	5.0	0.19	0.94	1.5/0.027	2.4/1.1	9.5	yes
2.2	21-2235D200E037	6	103/0.73	140/1.00	9.0/0.064	4.4	—	0.36	0.94	1.5/0.027	2.4/1.1	14	—
3.4	21-3424D200B025	4	180/1.27	220/1.55	5.6/0.040	—	5.0	0.23	1.68	3.2/0.059	3.1/1.4	11.5	yes
3.4	21-3424D200E05	6	130/0.92	160/1.13	5.6/0.040	4.2	—	0.47	1.68	3.2/0.059	3.1/1.4	17	—
3.4	21-3437D200B038	4	330/2.33	460/3.26	12.5/0.088	—	5.0	0.38	3.9	6.6/0.121	5.5/2.5	19	yes
3.4	21-3437D200E075	6	280/1.85	312/2.22	12.5/0.088	4.0	—	0.76	3.9	6.6/0.121	5.5/2.5	24	—
3.4	21-3450D200B06	4	520/3.67	680/4.80	24/0.172	—	5.0	0.55	6.6	10.1/0.185	7.8/3.6	29	yes
3.4	21-3450D200E1.2	6	420/2.98	540/3.83	24/0.172	3.5	—	1.1	6.6	10.1/0.185	7.8/3.6	29	—
4.2	21-4247D200B022	4	520/3.69	624/4.43	21/0.147	—	7.5	0.23	1.30	19.3/0.35	10.2/4.6	25	yes
4.2	21-4247D200F1.3	8	500/3.53	570/4.03	21/0.147	3.1	4.4	1.29	7.1	19.3/0.35	10.2/4.6	25	—
4.2	21-4270D200B03	4	1030/7.31	1236/8.78	38/0.265	—	7.5	0.29	6.8	37.1/0.68	19/8.6	34	yes
4.2	21-4270D200F1.2	8	990/6.99	1120/7.91	38/0.265	3.7	5.3	1.21	12.1	37.1/0.681	19/8.6	34	—
4.2	21-4288D200B022	4	1210/8.59	1452/10.31	56/0.392	—	10.5	0.21	4.2	59.2/1.08	24/10.7	45	yes
4.2	21-4288D200F03	8	1480/10.5	1850/13.1	56/0.392	9.3	13.2	0.26	2.5	59.2/1.08	24/10.7	45	—

closest?

Δ Torque at 50 steps per second is provided as a widely-applicable performance gauge. Assuming adequate voltage is supplied to fully energize the windings, motor torque at this stepping rate is not driver-voltage sensitive.

Δ Current rating shown is for "B" or "F" winding configuration, the latter connected in parallel. When "F" winding is connected in series, the phase-current rating is half this value.

Δ Maximum allowable motor power dissipation for 50°C temperature rise.

Δ A column entry of "yes" indicates a performance curve is provided in this catalog.

DIMENSIONS

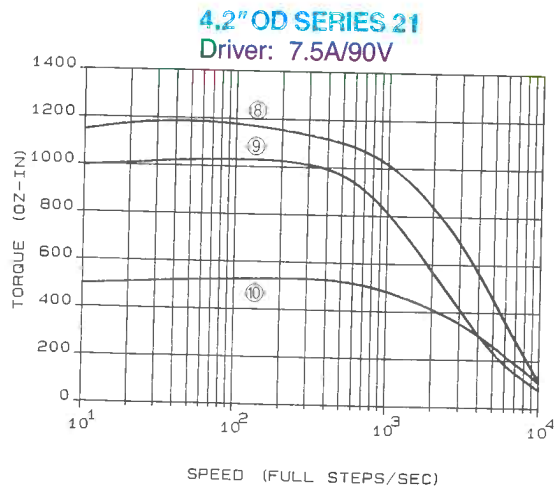
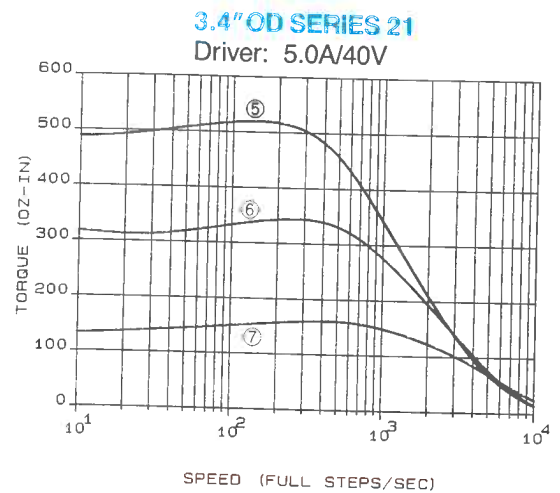
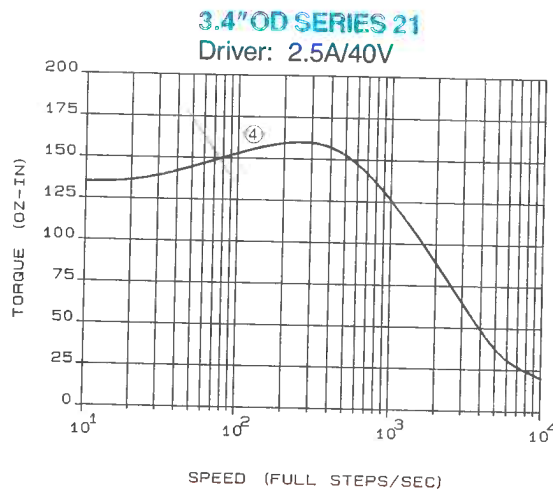
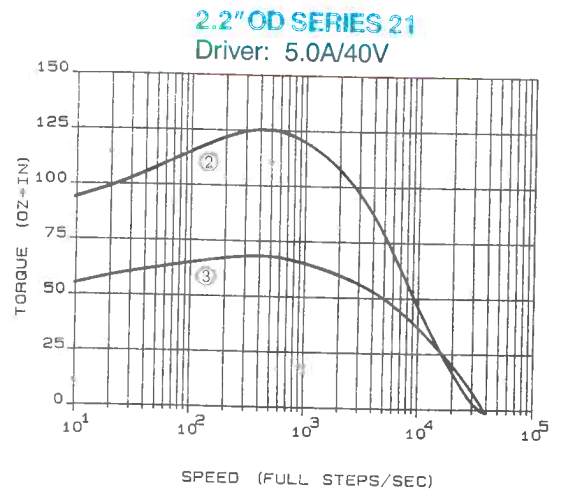
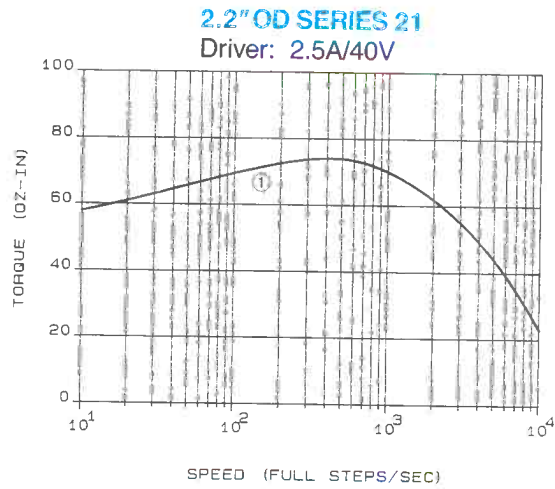
See page 74.

CONNECTION DIAGRAMS

See page 76.

PERFORMANCE . . . Series 21 motors

Shown here are performance curves of selected 2.2" 3.4" and 4.2" OD Series 21 motors driven in full-step mode by Sigmaline™ drivers. Motor and driver information as regarding each performance curve is provided in the accompanying table. Δ



CURVE TABULATION

Curve no.	Driver	Motor size OD/length	Motor model no.
1	2.5A/40V	2.2"/2.0"	21-2220D200-B055
2	5.0A/40V	2.2"/3.5"	21-2235D200-B019
3	5.0A/40V	2.2"/2.0"	21-2220D200-B016
4	2.5A/40V	3.4"/2.4"	21-3424D200-F1.8 Δ
5	5.0A/40V	3.4"/5.0"	21-3450D200-B06
6	5.0A/40V	3.4"/3.7"	21-3437D200-B038
7	5.0A/40V	3.4"/2.4"	21-3424D200-B025
8	7.5A/90V	4.2"/8.8"	21-4288D200-B022
9	7.5A/90V	4.2"/17.0"	21-4270D200-B03
10	7.5A/90V	4.2"/14.7"	21-4247D200-B022

Δ The torque-speed curves shown are nominal values. They were generated using Sigmaline bipolar chopper drivers equipped with mid-range stability control, operated in full-step mode. Some loss of torque will be experienced in portions of the mid-range region (1000-5000 sps) if drivers without mid-range stability control are used.

Δ Parallel connected.