Applied Motion Products
404 Westridge Dr. • Watsonville, CA 95076
831/761-6555 • 800/525-1609 • FAX 831/761-6544
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PDO 3540 Packaged Pulse and Direction Step Motor Drive

wih Digital Oscillator

Features

- AC input 110V or 220V switch selectable, 50-60 Hz
- DC bus voltage 35 VDC full load, 40 VDC nominal
- Switch selectable motor current from 0.4–3.5 amps/phase
- Microstepping:
  - Pulse and Direction mode: switch selectable 200 to 50,800 steps/rev
  - Oscillator/Joystick mode: 12,800 steps/rev
- Switch selectable idle current reduction, 0 or 50%
- Optically isolated inputs/outputs
  - Speed, Enable: optically isolated, differential 5 – 24 V logic
  - Step, Direction: optically isolated, differential 5 – 12 V logic
  - Wiper: 0–5 VDC analog signal
  - Tach output: isolated phototransistor. Tach output is 100 pulses per motor revolution, 50% duty cycle.
- Internal Pot:
  - Low speed 0–5 rps
  - High speed 0–25 rps
  - Accel/decel 1–250 rev/sec/sec
- External Speed, Pot or Joystick 3 terminal type, 1k–10k ohms
- Self test, switch selectable
- 140 watts of usable power
- Screw terminal connectors
- Dual, MOSFET H-bridge, 3 state, pulse width modulated amplifier switching at 20–30 KHz
- Ideal for 4, 6 or 8 leaded step motors NEMA sizes 11, 14, 17 and 23
- CE and TUV compliant

Description

The PDO 3540 is a stepper drive packaged in a rugged steel case painted black with white epoxy silkscreen. Integral heat sink, mounting brackets, switch covers and connectors are included with each drive. The drive has been matched with twelve recommended NEMA 11, 14, 17 & 23 motors in order to create a complete stepper motion solution.

The PDO 3540 provides the user with four modes of operation to choose from, Self test, Pulse & Direction, Joystick or Oscillator. The specific operation mode desired is selected during set up via DIP switch. DIP switches are also provided for setting the drive's step resolution as well as the motor current.

Self Test Mode is used for troubleshooting. If you are unsure about the motor or signal connections to the drive you can use the self-test.

Pulse & Direction Mode allows the PDO 3540 to receive step pulses from an indexer such as the Applied Motion's Si-100 or Si-1 or from a PLC or any other external controller.

Joystick Mode allows speed and direction to be determined by an external analog voltage. STEP and DIR inputs can be used for limit switches. SPEED input selects speed range. LO SPEED and HI SPEED pots adjust the 2 speed ranges.

Oscillator Mode can control speed by onboard potentiometers and/or by an external analog voltage. STEP input starts and stops the motor. DIR input controls direction of rotation. SPEED input selects the speed range.

The PDO 3540 also provides a Tach Output and Enable Input.

A Tach Out signal is provided for measuring the motor speed. It generates 100 pulses per revolution. If connected to a frequency counter, speed reads out in revs/second with two decimal places.

ENABLE allows the user to turn off the current to the motor by setting this signal to logic 0. The logic circuitry continues to operate, the drive "remembers" the step position even when the amplifier is disabled.

Factory set to operate at 110-volt input; the PDO 3540 can be reset by the user to operate at 220-volt input by a simple switch selection.

Pluggable screw terminal blocks are provided for the motor, AC input and 8-position signal input/output. Mating connectors are provided with the drive.

The PDO 3540 is both CE and TUV compliant.

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PDO 3540 Technical Specifications

POWER AMPLIFIER:

AMPLIFIER TYPE	MOSFET, dual H-Bridge.
CURRENT CONTROL	3 state, pulse width modulated, switching at 20–30 KHz.
OUTPUT CURRENT	0.4–3.5 amps, dip switch selectable in 0.1 increments.
POWER SUPPLY	Linear, toroidal transformer based for high reliability and low noise. 110 or 220 VAC input, switch selectable. 50/60 Hz.
DC BUS VOLTAGE	DC voltage at nominal line voltage: 35 VDC full load, 40 VDC no load.
AC INPUT VOLTAGE	110 or 220 VAC (switch selectable) 50/60 Hz.
MAXIMUM OUTPUT POWER	140 Watts.
IDLE CURRENT REDUCTION	0% or 50% dip switch selectable.
MOTOR RESOLUTION	16 resolutions. 200, 400, 1000, 2000, 5000, 10000, 12800, 18000, 20000, 21600, 25000, 25400, 25600, 36000, 50000, 50800.

CONTROLLER SECTION:

MODE OF OPERATION	**Self Test**: Used for trouble shooting to test motor and/or signal connections. **Pulse & Direction**: Allows amplifier to receive step pulses from a controller such as Applied's Si-100 or Si-1, or any other pulse source PLC or controller. **Joystick**: allows speed and direction to be determined by an external analog voltage. Step and Dir inputs can be used for limit switches. Speed input selects speed range. LO SPEED and HI SPEED pots adjust the 2 speed ranges. **Digital Oscillator**: allows for precise speed control with automatic ramps between speeds. Accel/Decel rates are set by on board potentiometer and/or external analog voltage.
STEP AND DIRECTION INPUT	Optically isolated: 5-12 VDC
SPEED RANGE	LO speed range: 0-5 rev/sec. HIGH speed range: 0-25 rev/sec Accel/decel range: 1-250 rev/sec/sec
TACH OUPUT	Optically isolated phototransistor. 30 VDC, 20mA max.

SYSTEM SPECIFICATIONS:

OVERALL SIZE	2.25˝ x 7.8˝ x 5.40˝.
CHASSIS MATERIAL	Aluminum, black anodized with integral heat sink.
CASE	Steel with black paint and white epoxy silk screen. Includes switch covers.
WEIGHT	5 lbs.
AMBIENT TEMPERATURE	0˚ to 50˚C (32˚ to 122˚F).
HUMIDITY	Maximum of 90% non-condensing.
CONNECTORS	Screw terminal connectors for input power and motor, and input/output signals.
MOTORS	Can drive 4, 6 or 8 lead motors, NEMA sizes 11– 23.
AGENCY APPROVAL	CE & TUV.

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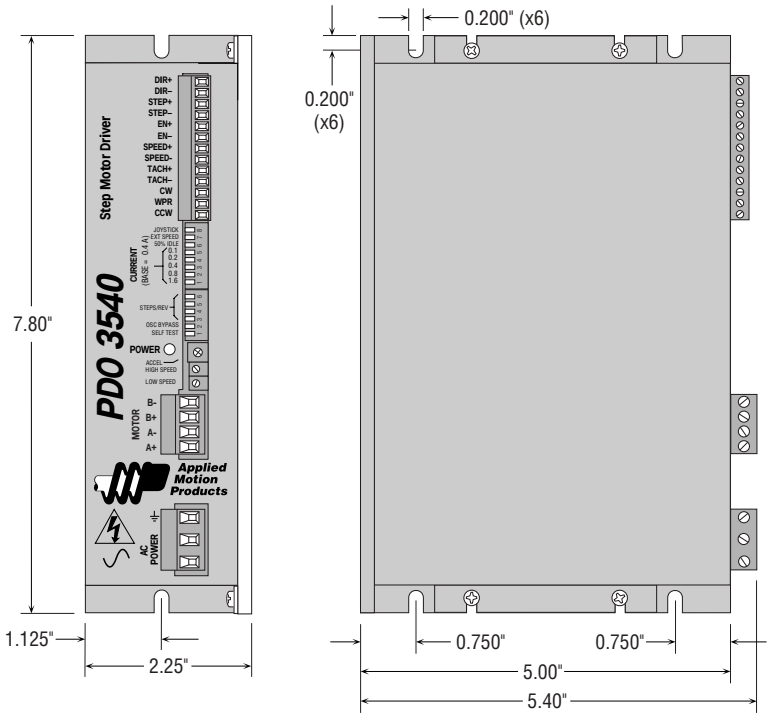
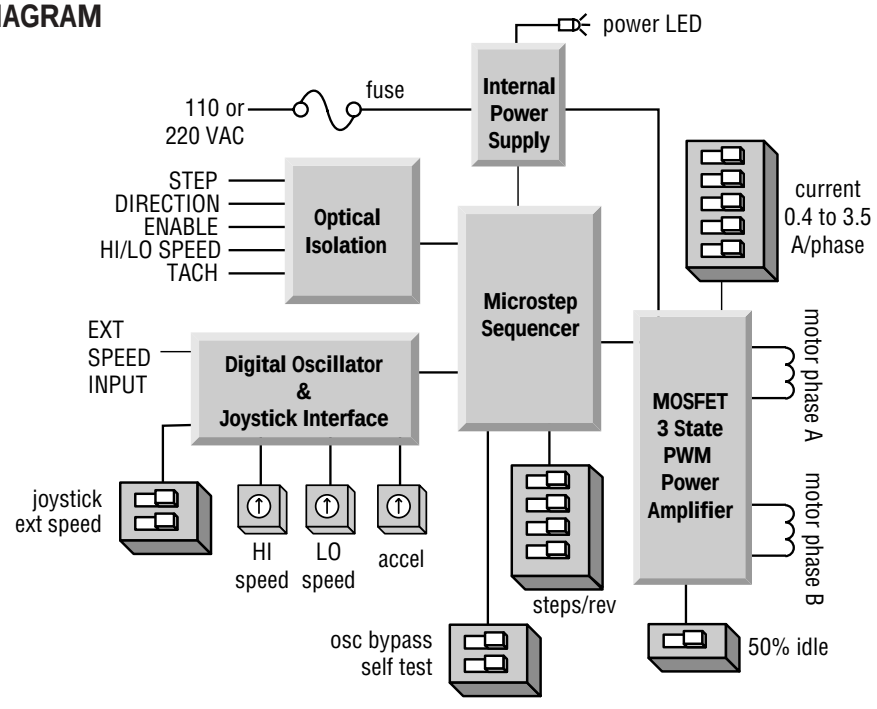
PDO 3540 Technical Drawings

MECHANICAL OUTLINE



BLOCK DIAGRAM



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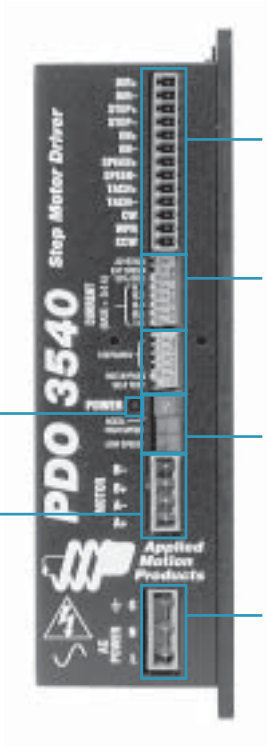
PDO 3540 Connectors and Switches



connector
input/output

dip switches
current/resolution/
joystick/external speed

power LED

potentiometers
oscillator speed, accel & decel

motor connector

AC power connector

INPUTS (13 pin)

position no.	
1	dir+
2	dir–
3	step+
4	step–
5	en+
6	en–
7	speed+
8	speed–
9	tach+
10	tach–
11	cw
12	wpr
13	ccw

MOTOR

position no.	
1	B–
2	B+
3	A–
4	B+

AC POWER

position no.	
1	G
2	N
3	L

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NEMA 11, 14, 17 Motor Data

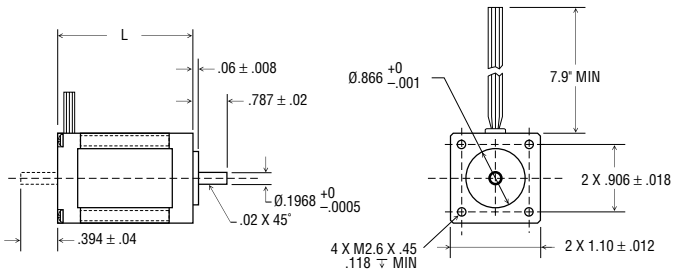
	RECOMMENDED MOTORS FOR PDO 3540					
FEATURES	11	11	14	17	17	17
Motor P/N:	11012	11013	14842	17068	17071	17075
Motor Current amps	1.00	1.00	1.00	1.34	1.70	1.70
Resistance Ohms	1.40	2.00	4.30	2.10	1.70	1.70
Holding Torque oz-in	7.4	15.3	26	31.4	51	62.6
Rotor Inertia oz-in^2	0.044	0.098	0.109	0.19	0.29	0.37
Bearings						
Thrust Load (lbs)	3.0	3.0	3.0	3.0	3.0	3.0
Radial Load (lbs)	5.0	5.0	5.0	5.0	5.0	5.0
Radial Play inch/lbs	.001 max @ 1 lb	.001 max @ 1 lb	.0004 max @ 1 lb	.0008 max @ 1 lb	.0008 max @ 1 lb	.0008 max @ 1 lb
End Play inch/lbs	.003 max @ 2 lbs	.003 max @ 2 lbs	.0004 max @ 2 lbs	.003 max @ 2.2 lbs	.003 max @ 2.2 lbs	.003 max @ 2.2 lbs
Weight lbs.	0.26	0.39	0.47	0.44	0.57	0.73

Motor current, resistance and torque ratings are with parallel connection

NEMA 11, 14, 17 Motor Dimensions

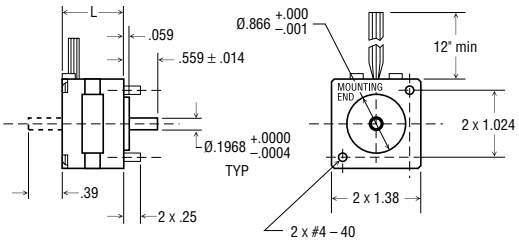
NEMA 11

Model	L
11012	1.32″
11013	1.87″



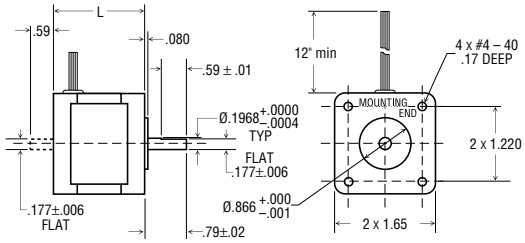
NEMA 14

Model	L
14842	1.57″



NEMA 17

Model	L
17068	1.30″
17071	1.54″
17075	1.85″



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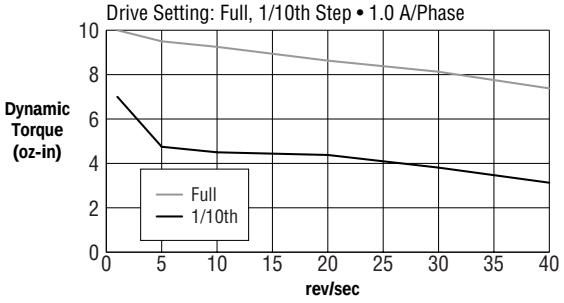
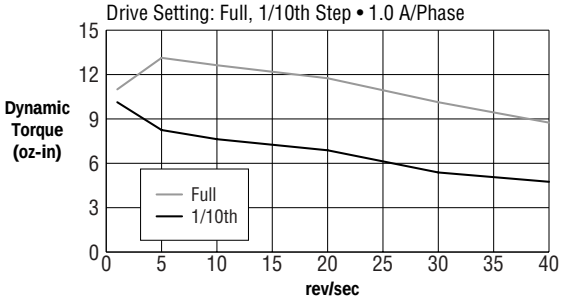
Torque Curves
PDO 3540 with NEMA 11, 14, 17 Step Motors

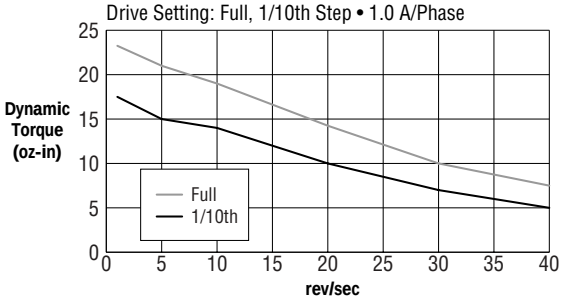
11012 MOTOR
Motor Connection: 4 Lead Bipolar
Drive Setting: Full, 1/10th Step • 1.0 A/Phase



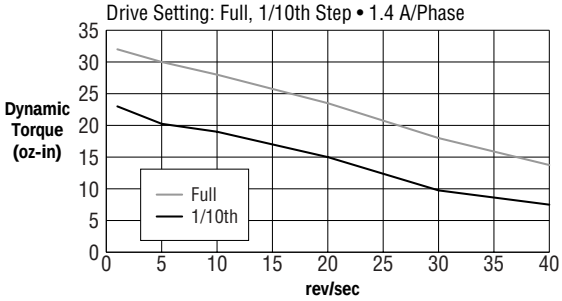
11013 MOTOR
Motor Connection: 4 Lead Bipolar
Drive Setting: Full, 1/10th Step • 1.0 A/Phase



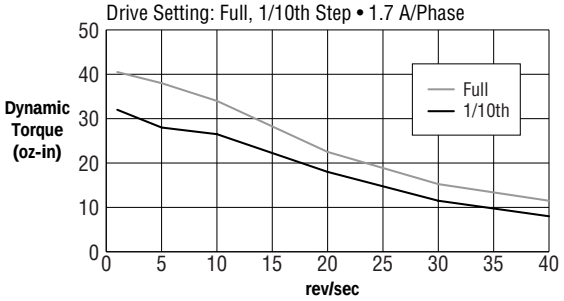
14842 MOTOR
Motor Connection: Parallel
Drive Setting: Full, 1/10th Step • 1.0 A/Phase



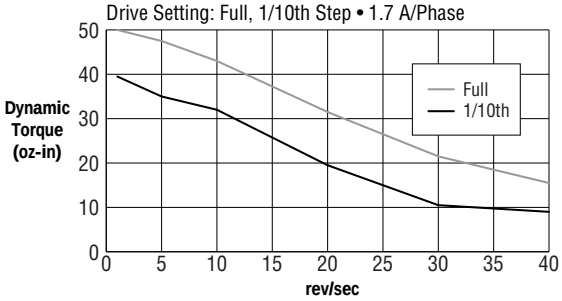
17068 MOTOR
Motor Connection: Parallel
Drive Setting: Full, 1/10th Step • 1.4 A/Phase



17071 MOTOR
Motor Connection: Parallel
Drive Setting: Full, 1/10th Step • 1.7 A/Phase



17075 MOTOR
Motor Connection: Parallel
Drive Setting: Full, 1/10th Step • 1.7 A/Phase



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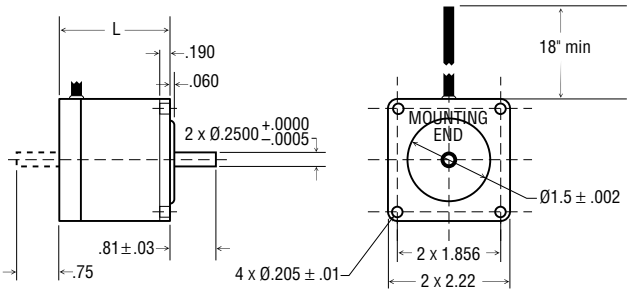
NEMA 23 Motor Data

FEATURES	RECOMMENDED MOTORS FOR PDO 3540					
Motor P/N:	23122	23123	23124	23394	23397	23400
Motor Current amps	2.00	2.50	3.50	2.83	2.83	2.83
Resistance Ohms	1.24	1.18	0.82	.070	0.90	1.10
Holding Torque oz-in	98	158	225	77	177	264
Rotor Inertia oz-in^2	0.55	1.14	1.72	0.66	1.64	2.62
Bearings						
Thrust Load (lbs)	25	25	25	25	25	25
Radial Load (lbs)	15	15	15	15	15	15
Radial Play inch/lbs	.001 max @ 1 lb	.001 max @ 1 lb	.001 max @ 1 lb	.001 max @ 1 lb	.001 max @ 1 lb	.001 max @ 1 lb
End Play inch/lbs	.001 max @ 9 lbs	.001 max @ 9 lbs	.001 max @ 9 lbs	.003 max @ 2.2 lbs	.003 max @ 2.2 lbs	.003 max @ 2.2 lbs
Weight lbs.	1.17	2.00	2.80	1.00	1.54	2.20

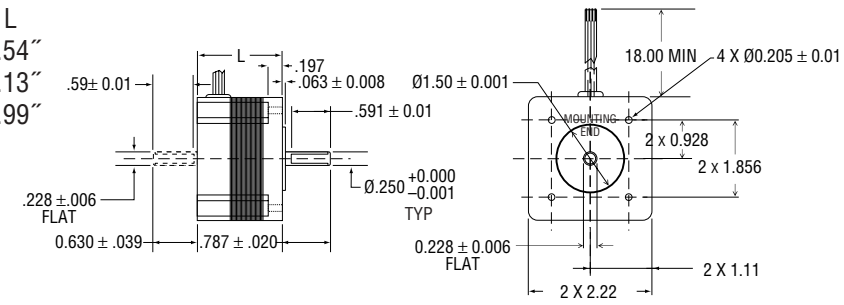
Motor current, resistance and torque ratings are with parallel connection

NEMA 23 Motor Dimensions

Model	L
23122	2.00″
23123	3.00″
23124	4.00″



Model	L
23394	1.54″
23397	2.13″
23400	2.99″



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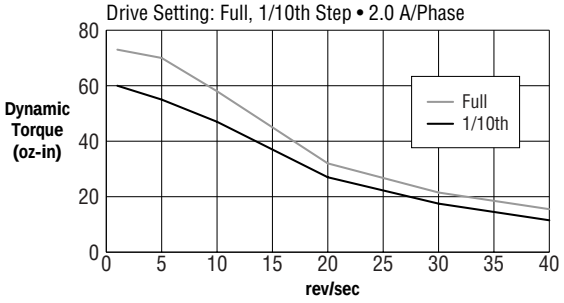
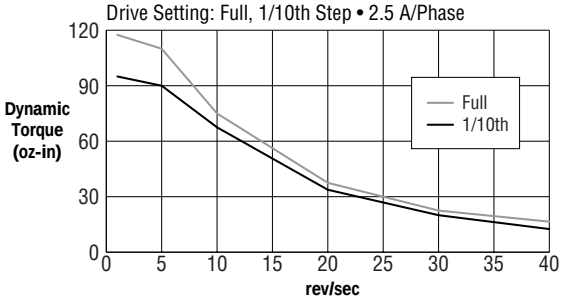
Torque Curves
PDO 3540 with NEMA 23 Step Motors

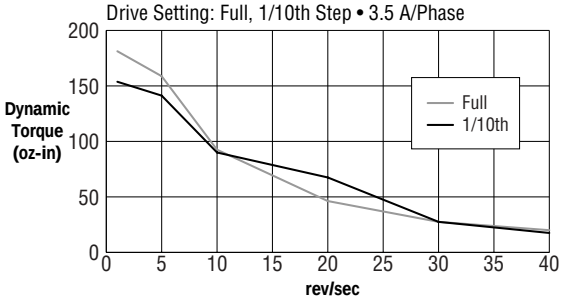
23122 MOTOR
Motor Connection: Parallel
Drive Setting: Full, 1/10th Step • 2.0 A/Phase



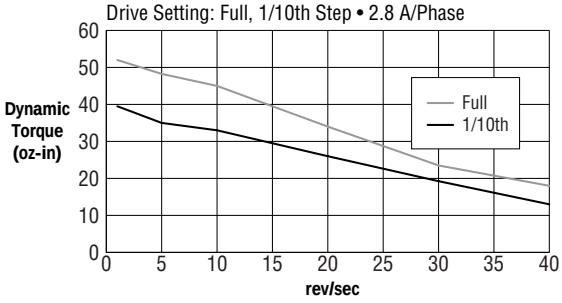
23123 MOTOR
Motor Connection: Parallel
Drive Setting: Full, 1/10th Step • 2.5 A/Phase



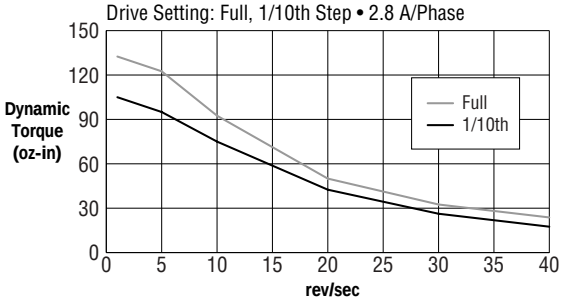
23124 MOTOR
Motor Connection: Parallel
Drive Setting: Full, 1/10th Step • 3.5 A/Phase



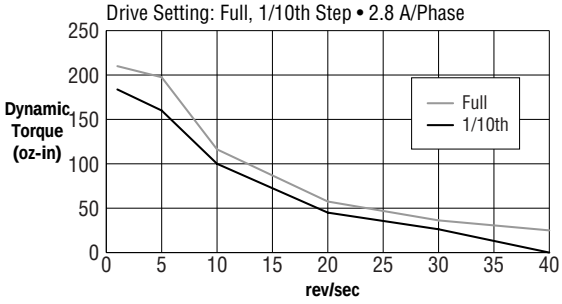
23394 MOTOR
Motor Connection: Parallel
Drive Setting: Full, 1/10th Step • 2.8 A/Phase



23397 MOTOR
Motor Connection: Parallel
Drive Setting: Full, 1/10th Step • 2.8 A/Phase



23400 MOTOR
Motor Connection: Parallel
Drive Setting: Full, 1/10th Step • 2.8 A/Phase



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PDO 3540 Ordering Information

COMPLETE SYSTEM ORDERING

Drive Type	Motor System Number	Step Motor Description
PDO 3540	11012	NEMA 11 high torque one stack
Si3540	11013	NEMA 11 high torque two stack
	14842	NEMA 14 two stack
	17068	NEMA 17 high torque one stack
	17071	NEMA 17 high torque two stack
	17075	NEMA 17 high torque three stack
	23122	NEMA 23 one stack
	23123	NEMA 23 two stack
	23124	NEMA 23 three stack
	23394	NEMA 23 high torque one stack
	23397	NEMA 23 high torque two stack
	23400	NEMA 23 high torque three stack

System Ordering Example: PDO 3540 - 23122

DRIVE ONLY ORDERING

Drive Type	Description
PDO 3540	Packaged 3.5 amps, 40 VDC, 110/220 VAC input. Microstepping pulse & direction/oscillator drive.
Si3540	Packaged 3.5 amps, 40 VDC, 110/220 VAC input. Microstepping fully programmable drive/indexer with *Si™* software.