Pacific Scientific Model 6430
120/240 VAC Off-line Microstepping Stepper Drive

FEATURES

- **Off line 120/240 VAC 50/60 Hz**
- **Patented 4-phase Bipolar Chopper Drive for superior current regulation and low ripple current**
- **Output current adjustable from 0.625 A_{RMS} to 5 A_{RMS} with 3 position DIP switch**
- **Microstepping for smooth operation and increased resolution.**
- **Patented Digital Electronic Damping reduces instability at mid-speed ranges.**
- **Idle current reduction to reduce motor heating in many applications**
- **Output for 2nd Axis:**
  - 66 VDC ± 2 volts available via three position plug-in connector to power additional axis (total power available for internal and external axis = 300 W)
- **Drive Fault protection:**
  - Line-to-line and line-to-neutral
- **Power supply fault protection:**
  - Over temperature
  - Short circuit
  - Under voltage
- **Optically isolated command interface:**
  - Step
  - Direction
  - Enable
  - Enabled output
- **Selectable step filter**
  - Rejection of electrical noise on step input
- **Small size - 6.25" x 2.25" x 11.75"**
- **UL and CSA recognition pending**
- **CE conformance pending**

APPLICATIONS

- **X-Y tables and slides**
- **Packaging machinery**
- **Robotics**
- **Specialty machinery**
- **Index feed of materials**
- **Labeling machines**

PRODUCT DESCRIPTION

Danaher Motion's Pacific Scientific 6430 is a low-cost, compact stepper drive converting step and direction inputs into winding currents for two-phase stepper motors.

Resolution with 1.8º motors is adjustable to 200, 400, 1000, 2000, 5000, 10,000, 25,000, or 50,000 steps per revolution with decimal step size selected, and 400, 800, 1600, 3200, 6400, 12800, 25600, or 51200 steps per revolution with binary step size selected. Higher resolution (microstepping) provides smoother operation through resonance regions as well as increased position resolution.

A patented digital electronic damping circuit ensures the availability of full motor torque at all speed ranges. This compensation damps motor oscillations common with stepper systems. Whether in the full step or microstepping mode, full motor torque is achieved throughout the speed range.

The default output current is 5 A_{RMS}. The current can be reduced in increments of 0.625 A_{RMS} using a 3 position DIP switch.

A patented 4-phase PWM (pulse width modulated) chopper electronically controls the motor winding currents at 20 kHz. This combines the best of recirculating and non-recirculating current regulation to provide high back EMF rejection with low ripple current. Benefits include reduced heat dissipation, low electrical noise and improved current control during dynamic braking.

The patented 4-phase control circuit, combined with digital electronic damping, provides significantly more motor output power than from other drives.

Idle current reduction permits an automatic 50% reduction in motor winding current during motor idle conditions to minimize heating during dwell periods. If no step commands have been received for 0.1 second (0.05 and 1.0 seconds can also be selected through DIP switch settings), the current is automatically reduced. Current is restored to full amplitude upon arrival of a step command.

SPECIFICATIONS

Input Power

Voltage	120/240 VAC (+10%, -15%) 50-60 Hz (switch selectable)
Line Current	At full (300 W) load 240 VAC 2.3 A_{RMS} 120 VAC 3.5 A_{RMS}
Output motor phase current	5 A_{RMS} max. 5 A_{PEAK} full step (square wave) 7.1 A_{PEAK} microstepping (sine wave) Adjustable from 0.625 to 5 A_{RMS} in 0.625 A_{RMS} increments (See Figure 3)
66 VDC	66 ± 2 volts Total power (internal + external) = 300 W
Inputs	(See Figures 1 and 2)
STEP	Optically isolated TTL compatible Min. opto current (opto on): 5.5 mA Max. opto current (opto on): 10 mA Min. pulse width: 250 ns (1 ms) Max. frequency: 2 MHz (500 kHz) Motion occurs on low-to-high transition of STEP- input ***BOLD** values indicate step filter enabled.*
DIR	Optically isolated TTL compatible For normal motor connections: Current in opto (opto on): Rotation CCW looking at motor shaft Min. opto current (opto on): 3 mA Max. opto current (opto on): 4.5 mA Min. setup time: 50.0 ms Min. hold time: zero
ENABLE	Optically isolated TTL compatible Sense of ENABLE input can be changed using ENBL_SENSE jumper: Jumper In: Current in opto (opto on) enables drive Jumper Out: Current in opto (opto on) disables drive Min. opto current (opto on): 3 mA Max. opto current (opto on): 4.5 mA

Output (See Figures 1 and 2)

ENABLED Optically isolated open collector, open emitter

Drive Enabled: opto transistor on, Vsat = 0.5 V max. at 2.0 mA

Drive Disabled: opto transistor off, Vce max. = 35 V

Step Size Set using 3 positions of DIP switch and decimal jumper (See Figure 3).

Step Size	**Steps per Revolution** (1.8^o motor)
Full (1/2)	200 (400)
1/2 (1/4)	400 (800)
1/5 (1/8)	1000 (1600)
1/10 (1/16)	2000 (3200)
1/25 (1/32)	5000 (6400)
1/50 (1/64)	10000 (12800)
1/125 (1/128)	25000 (25600)
1/250 (1/256)	50000 (51200)

*Binary values are in **BOLD***

Idle Current Reduction Enabled or disabled with DIP switch

50% output current reduction after 0.1 second from last step command

(0.05 and 1.0 second time-outs can also be selected using a plug-on jumper.

Consult factory for other current reduction options)

See Figure 3.

Digital Electronic Damping Enabled or disabled with DIP switch (See Figure 3)

Max. delay from input step to change in motor excitation:

Step frequency < 500 full steps/sec: 500 µs
Step frequency > 500 full steps/sec: 270^o of step period

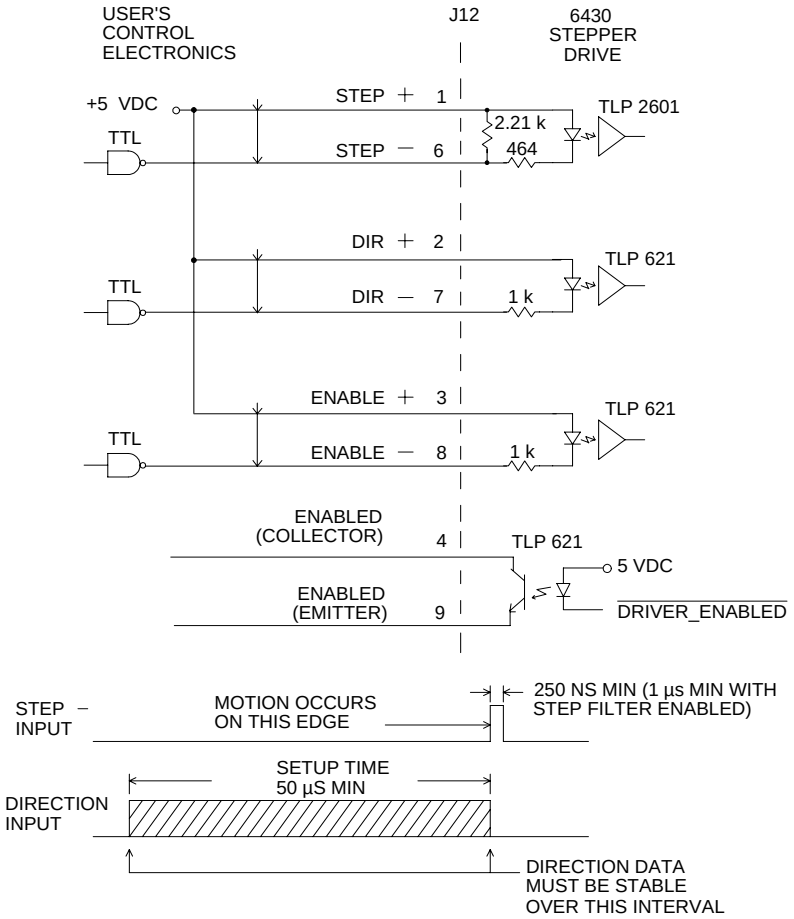


Figure 2: Interface Circuits

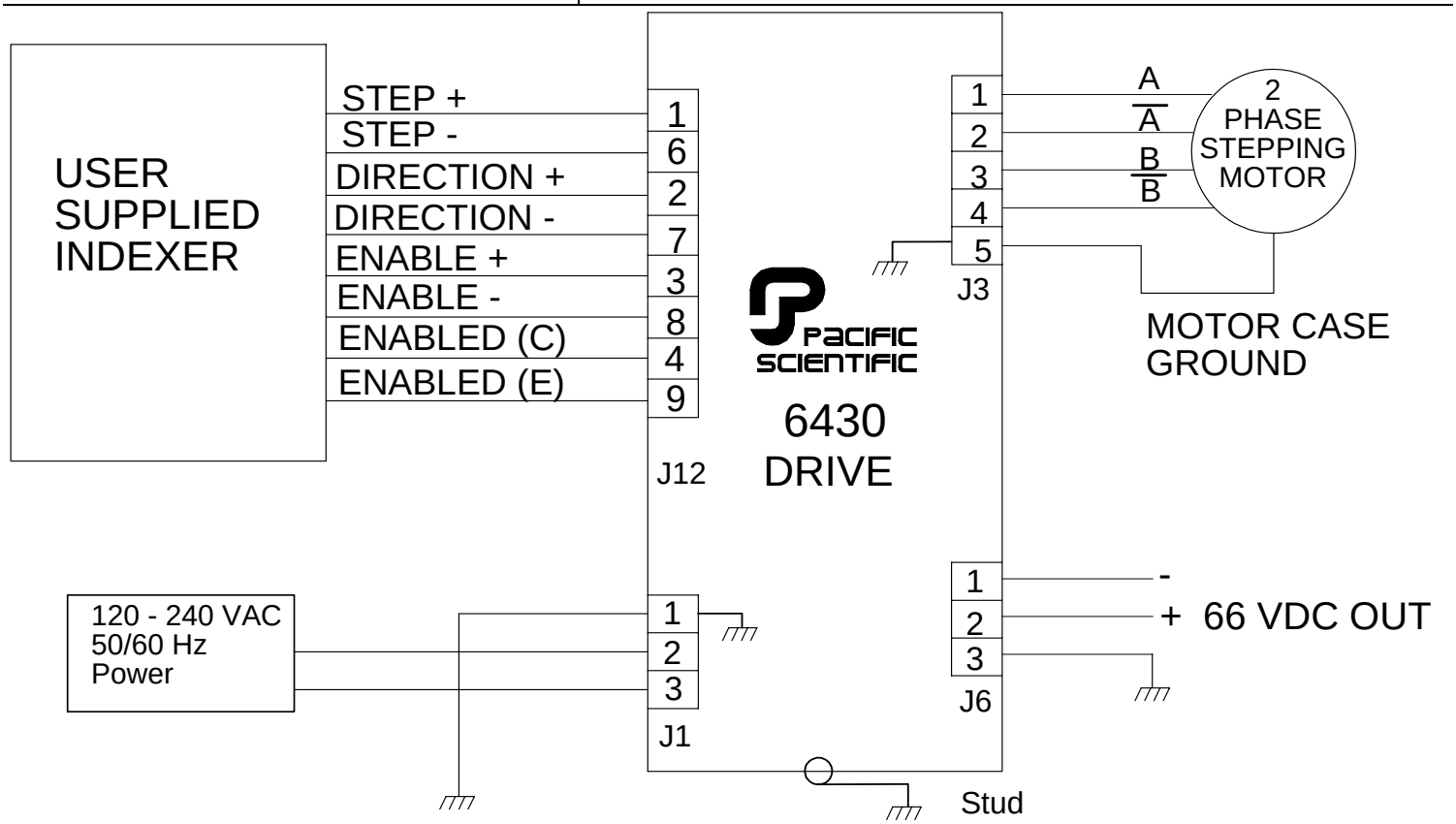


Figure 1 6430 Connection Diagram

Environmental Requirements

Storage temperature	-40° C to +70° C
Operating temperature	0 to 50° C ambient 50° C to 60° C (derated)
Altitude	5000 ft (1500 m) by design
Humidity Range	10 to 90%, non-condensing
Vibration	IEC Standard 68-2-6 Pending

Mechanical

Dimensions	6.25 in x 2.25 in x 11.75 in 158.75 mm x 57.15 mm x 298.45 mm
Weight	6 lbs. nominal

Connectors

Power Supply	Phoenix MCI, 5/3-G-3,81 connector. Mating connector: Phoenix MCI, 5/3-ST-3,81.
Motor	Phoenix MCI, 5/5-ST-3,81 connector. Mating connector: Phoenix MCI, 5/5-ST-3,81.
AC Input	Phoenix MSTBA 2,5/3-G connector. Mating connector: Phoenix MSTB 2,5/3-ST.
Signal	9 contact female D connector, Mating connector: ITT Cannon DE-9P with ITT Cannon DE110963 Hood and D20419 Clamp Kit.

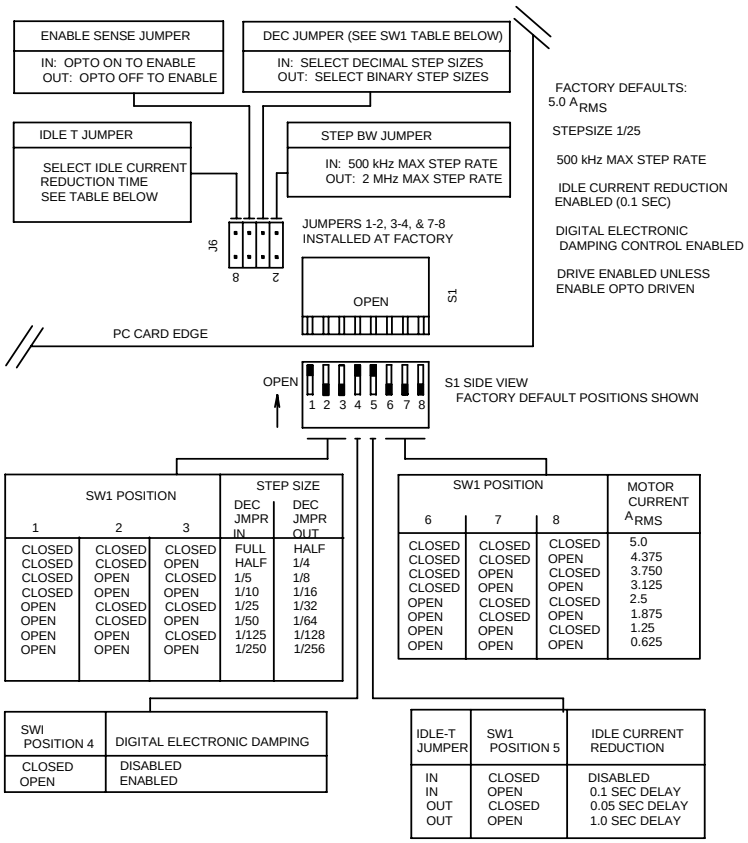


Figure 3 DIP Switch Settings

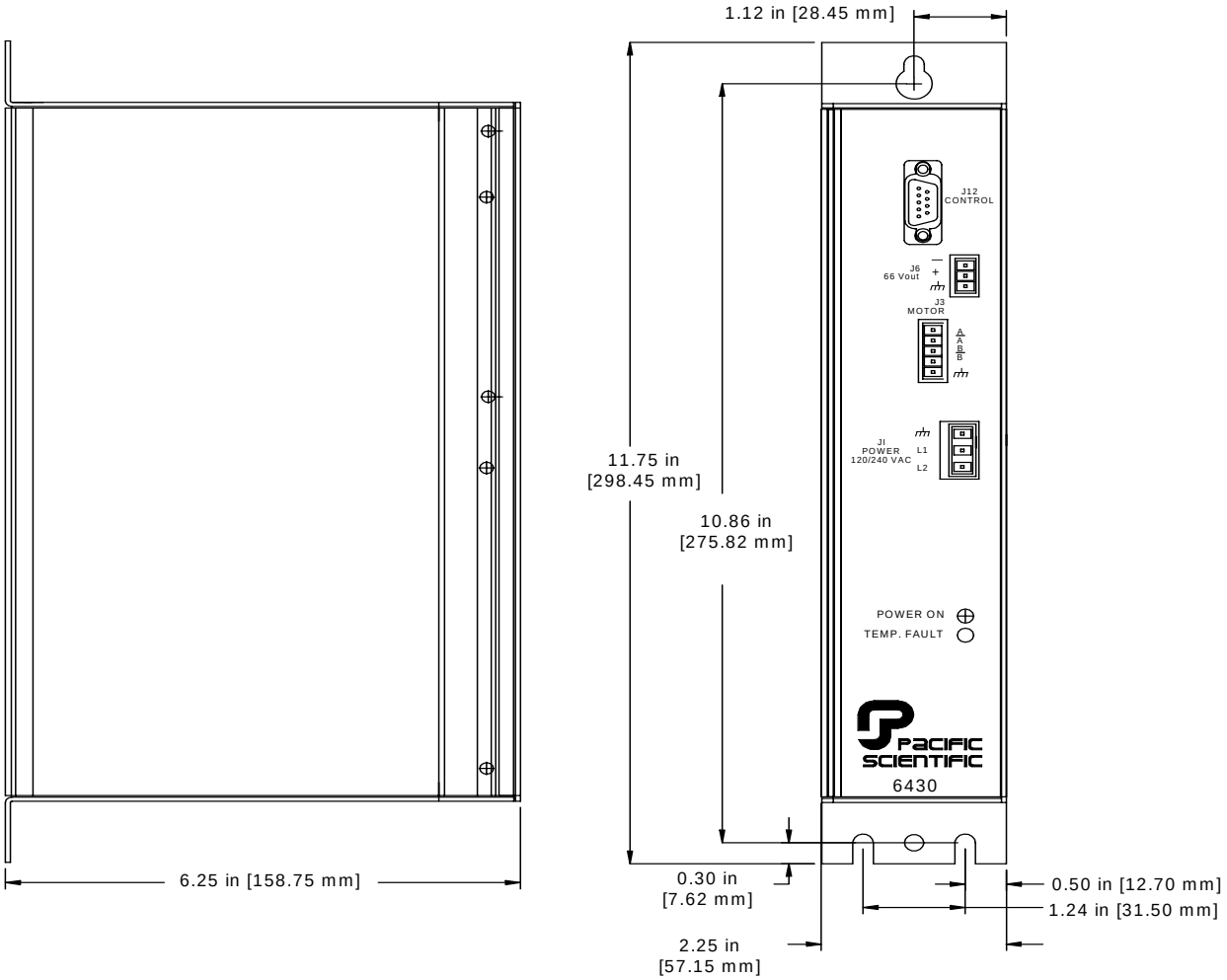
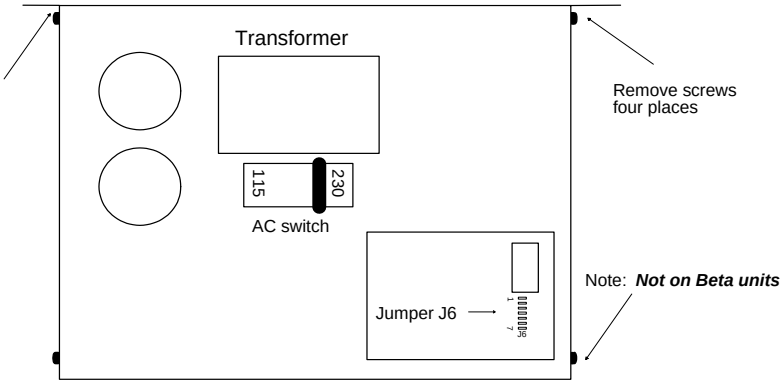


Figure 4 Mounting Dimensions

JUMPER & AC SWITCH SETTINGS

The AC switch is preset at the factory in the 240 VAC position. The J6 Jumper and AC switch settings are easily accessible by opening the cover. First, make certain the power connections have been removed. Rest the unit on its side as shown. Remove the two screws toward the back of the unit. Select appropriate settings. Replace cover and mounting screws. Do NOT over tighten mounting screws. (5.0 in-lbs max)

Connecting 240 VAC with switch in 120 VAC position will permanently damage the drive.



66 VDC OUTPUT CONNECTOR J6

The 6430 package has an external 66 VDC connector designed to power an additional drive. The total power available for both the internal and external drives is 66 VDC at 4.6 amps or approximately 300 watts. If the two drives are running simultaneously and require more than 4.6 amps, the voltage drops. The power supply has a low voltage protection circuit that faults the drive if the voltage is less than 55 VDC.

A twisted pair plus ground cable utilizing 16, 18, or 20 gauge wire, is recommended to connect the remote connector to the external drive. A 470 mf 100 VDC aluminum electrolytic capacitor, rated for 2 A ripple current or greater, must be installed at the additional drive if the cable length is over 3 feet.

TROUBLESHOOTING

Problem	Possible Cause	Action
Unit does not start, LEDs ON	120/240 VAC switch in 240 position, input from 120 VAC	Turn power off, correct switch position.
	Dead short or overload across external 66 VDC connector	Remove short or reduce load.
	Over temperature	
Unit does not start, LEDs OFF	240 VAC applied and switch in 120 VAC position.	Return to factory for service.
Unit runs for a while and then both LEDs come on	Over temperature	Reduce load. Check for excessive ambient temperature.
Unit turns on and off on its own and red LED flashing	120 VAC applied and switch in 240 VAC position	Correct switch position.
Or	Over load	Reduce Load
Unit stops after running once	AC input line low	Check input AC line voltage for low line.
	Internal failure	Return to factory for service.
Output voltage > 70 VDC and < 78 VDC	Very low load on unit	Normal to reach these values under light load.

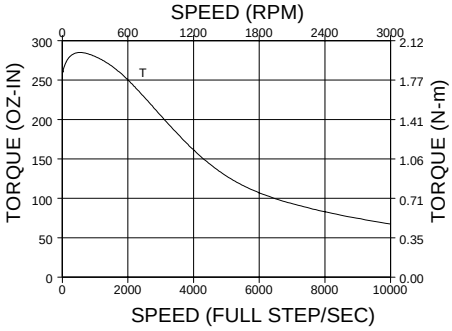
PERFORMANCE - 6400 SERIES CONTROLS

Motors perform as shown without the winding temperature exceeding a rise of 90° C. The motor is operated unmounted (without heat sink) in an ambient temperature of up to 40° C. The curves do not reflect systems resonance points, which will vary with motor coupling and systems parameters.

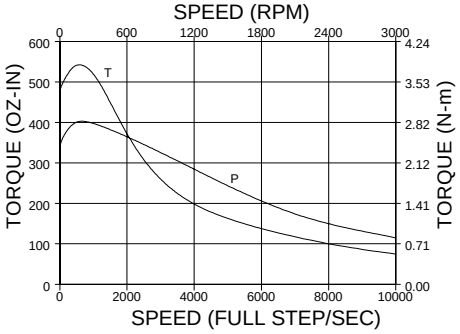
In addition to those shown below, Danaher Motion offers a wide range of other motor windings to meet specific performance requirements.

Torque/Speed Curves - Recommended Motors for 5.0 A operation

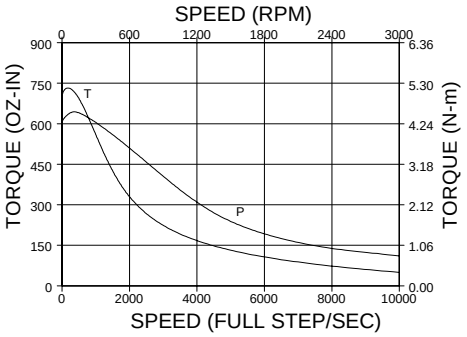
(3"MOTOR-ONE ROTOR STACK)
E31NX-HTLNN-NS50
5.0 A/65 V PER PHASE



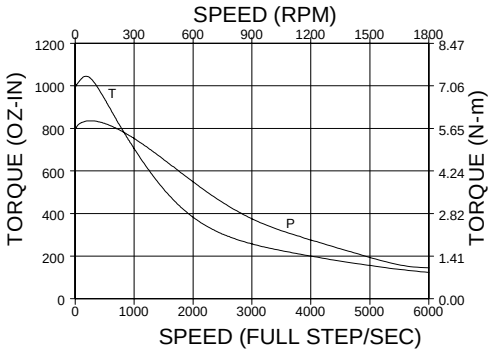
(3"MOTOR-TWO ROTOR STACK)
E32NX-HTLNN-NS50
E32NX-HPLNN-NS50
5.0 A/65 V PER PHASE



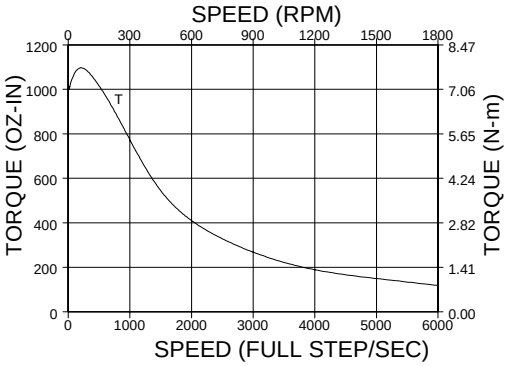
(3"MOTOR-THREE ROTOR STACKS)
E33NX-HTLNK-NS50
E33NX-HPLNK-NS50
5.0 A/65 V PER PHASE



(3"MOTOR-FOUR ROTOR STACKS)
E34HX-HTLNK-NS50
E32HX-HPLNK-NS50
5.0 A/65 V PER PHASE

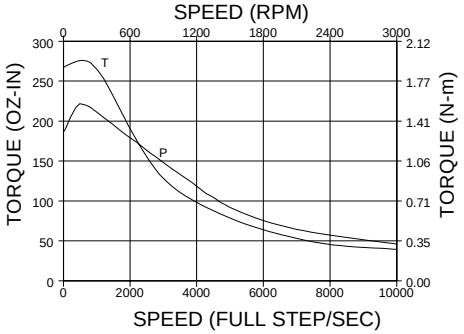


(4" MOTOR-ONE ROTOR STACK)
E41HX-HTLNK-NS50
5.0 A/65 V PER PHASE

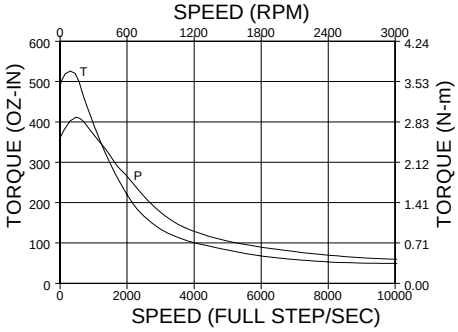


Torque/Speed Curves - Recommended Motors for 2.5 A Operation

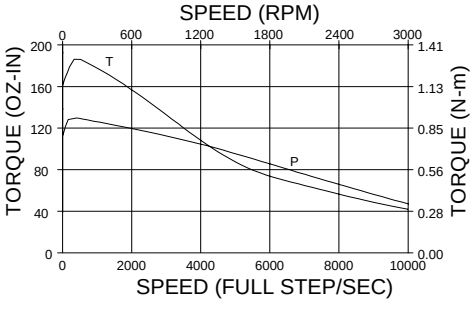
(3"MOTOR-ONE ROTOR STACK)
E31NX-LTLNN-NS50
E31NX-LPLNN-NS50
2.5 A/65 V PER PHASE



(3"MOTOR-TWO ROTOR STACK)
E32NX-LTLNN-NS50
E32NX-LPLNN-NS50
2.5 A/65 V PER PHASE



(2"MOTOR-TWO ROTOR STACKS)
E22NX-LTLNN-NS50
E22NX-LPLNN-NS50
2.5 A/65 V PER PHASE



Customer Support

Danaher Motion products are available world-wide through an extensive authorized distributor network. These distributors offer literature, technical assistance, and a wide range of models off the shelf for the fastest possible delivery.

Danaher Motion sales engineers are conveniently located to provide prompt attention to customer needs. Call the nearest office for ordering and application information and assistance or for the address of the closest authorized distributor. If you do not know who your sales representative is, contact us at:

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