

FEATURES

- Single power supply
- Patented 4-phase Bi-polar Chopper drive for superior current regulation and low ripple current
- Output current adjustable from 0.625 A to 5 A_{RMS} with 3-position dipswitch
- Microstepping for smooth operation and increased resolution
- Patented digital electronic damping reduces instability at speeds in middle of operating range.
- Idle current reduction to reduce motor heating in many applications
- Fault protection:
 - Line-to-line and line-to-neutral shorts
 - Internal power supply under-voltage
 - Bus over-voltage
- Optically-isolated command interface:
 - Step
 - Direction
 - Enable
 - Enabled output
- Selectable step filter
 - Rejection of electrical noise on step input
- Small size – only 7.5 in² of panel space (5" x 1.5" x 4.3")
- UL recognized

APPLICATIONS

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

PRODUCT DESCRIPTION

The Pacific Scientific 6410 is a low-cost, compact stepper drive converting step and direction inputs into winding currents for two-phase stepper motors.

Resolution with 1.8° motor is adjustable to 200, 400, 1000, 2000, 5000, 10000, 25000, or 50000 steps-per-revolution for decimal step size and 400, 800, 1600, 3200, 6400, 12800, 25600, or 51200 steps-per-revolution for binary step size. Higher resolution (microstepping) provides smoother operation through resonance regions and increased position resolution.

The 6410 operates from a single supply voltage ranging from 24 to 75 VDC.

The default output current is 5 A_{RMS}. The current is reduced in increments of 0.625 A using a 3-position DIPswitch.

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

The digital electronic damping eliminates motor oscillations common with stepper systems at speeds in the middle of the operating region. This, along with 4-phase chopping gives significantly more motor output power than competitive systems.

Idle current reduction reduces motor current by 50% if no step commands have been received for 0.1 second (0.05 and 1.0 seconds can also be selected). Current is restored to full amplitude upon arrival of a step command.

The 6410 uses just 7.5 in² of panel space. The optional side-mounted heat sink increases width by 1.0" to 2.5." Heat is removed either from the rear or side of the driver (cold plate mounting), allowing maximum flexibility for system packing.



Pacific Scientific 6410

SPECIFICATIONS

Input Power

| | |
|----------------|--|
| Voltage | 24 to 75 VDC |
| Current | Motor and load dependent. Usually < motor phase current. |

Output Motor Phase current

| |
|--------------------------|
| 5 A _{RMS} max. |
| 5 A peak full step |
| 7.1 A peak microstepping |

Inputs STEP

(See Figures 1 and 2)
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 μs)
Max. frequency: 2 MHz (**500 kHz**)
Motion occurs on low-to-high transition of STEP- input
NOTE: 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 μs
Min. hold time: zero

ENABLE

Optically-isolated TTL-compatible
Sense of ENABLE input is changed using ENBL_SENSE jumper:
Jumper In: Current in opto (opto on) enables driver
Jumper Out: Current in opto (opto on) disables driver
Min. opto current (opto on): 3 mA
Max. opto current (opto on): 4.5 mA

SPECIFICATIONS (continued)

| | |
|--|--|
| Output | (See Figures 1 and 2) |
| ENABLED | Optically-isolated open collector, open emitter Drive Enabled: opto transistor on, $V_{SAT} = 0.5$ V max. at 2.0 mA Drive Disabled: opto transistor off, V_{CE} max. = 35 V |
| Step Size | Set using 3 positions of DIPswitch and decimal jumper (see Figure 3). |
| Step Size | Steps-per-Revolution (1.8° 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) |
| 1/220 (1/256) | 50000 (51200) |
| Idle Current Reduction | Enabled or disabled with DIPswitch 50% output current reduction after 0.1 second from last command (0.05 and 1.0 second can also be selected using a plug-on jumper. Consult factory for other current reduction options). See Figure 3. |
| Mid-hand instability compensation | Enabled or disabled with DIPswitch (See Figure 3) Max. delay from input step to change in motor excitation: Step frequency < 500 full steps/sec: 500 μ s Step frequency > 500 full steps/sec: 270° of step period |
| Protection | (Any fault disables the drive and must be cleared by cycling input power) Line-to-Line Short |

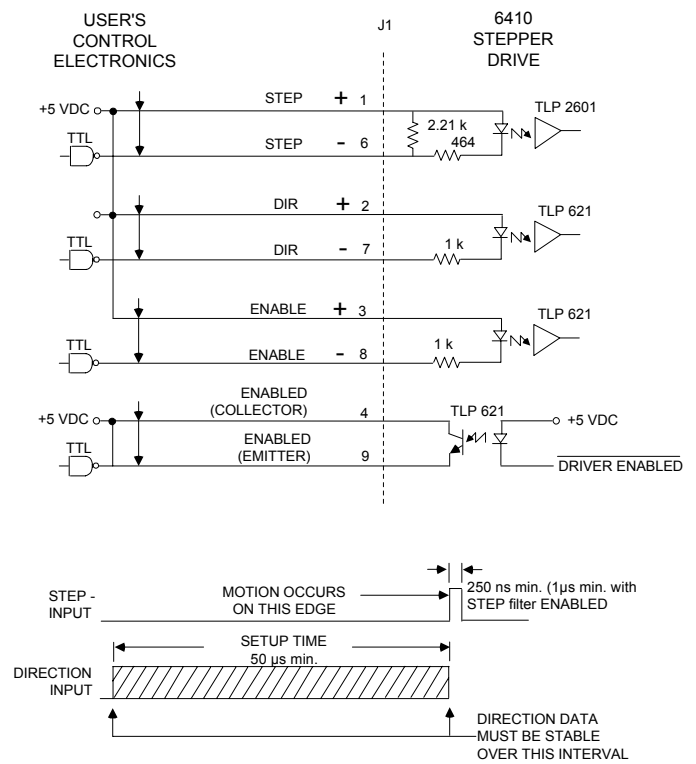


Figure 2 – Interface Circuits

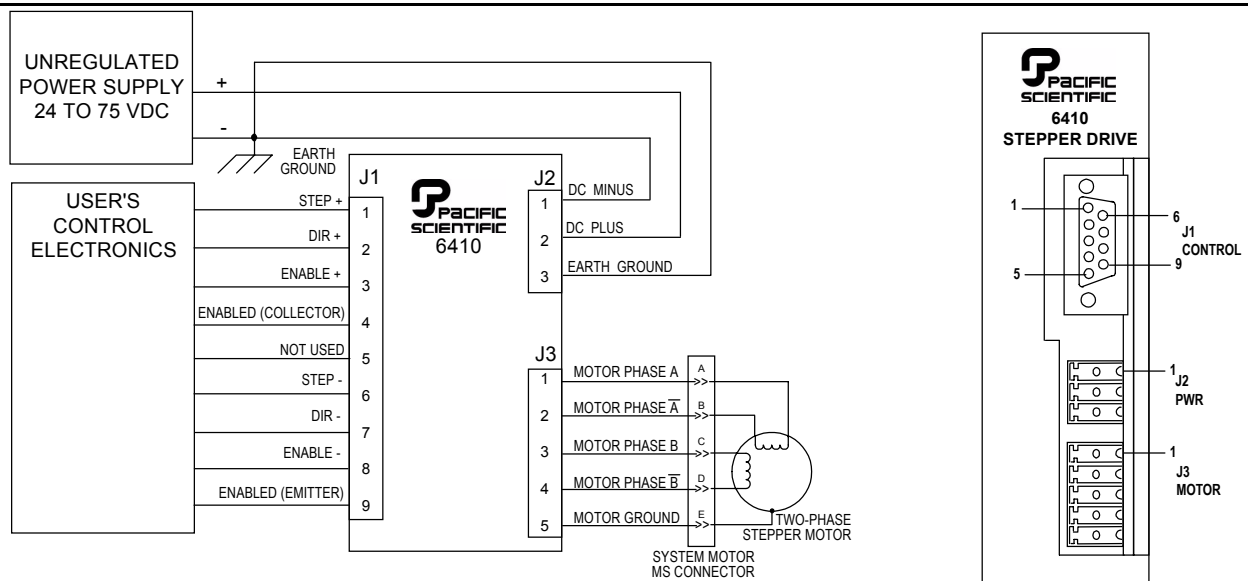


Figure 1 – 6410 Connection Diagram

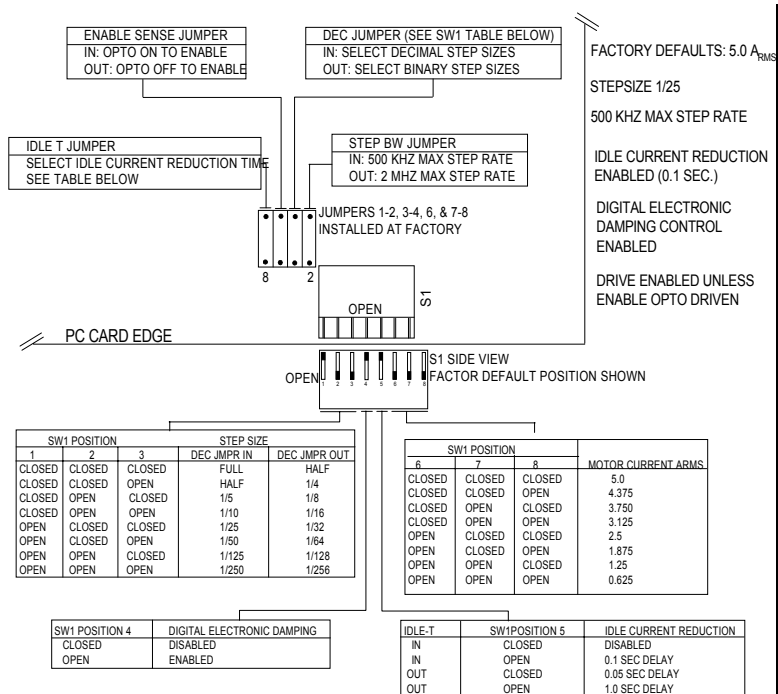


Figure 3 – DIPswitch Settings

Environmental Requirements

Storage Temperature -55° C to +70° C

Operating Temperature 0° C to +50° C ambient air with or without cover

Maximum Chassis Temperature 60° C

Temperature *Note: For optimal thermal performance, mount the 6410 chassis (back or side) to a cooling plate or heatsink. Use a thermal pad or grease if surface is irregular. A fan or idle current reduction may be employed to keep chassis below +60° C.*

Convection Cooling (6410 not mounted on cooling plate)

With optional heat sink Full rating (5 A) at 25° C ambient

2.5 A max at 45° C ambient

Without heat sink 2.5 A max at 25° C ambient

1.25 A max at 45° C ambient

See Figure 4 for plot of drive power dissipation vs. output current.

Humidity Range 10 to 90%, non-condensing

Mechanical

Dimensions 5" x 1.5" x 4.3" (without cover)

5" x 1.7" x 4.3" (with cover & screws)

Weight 1 lb. Nominal

Connectors (See Figure 1)

Power Supply Motor 3 contact plug-in screw terminal

5 contact plug-in screw terminal

Signal 9 socket D Sub miniature

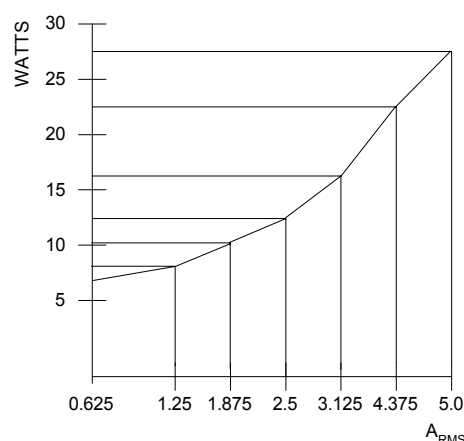


Figure 4 – Power Dissipation vs. Output Current

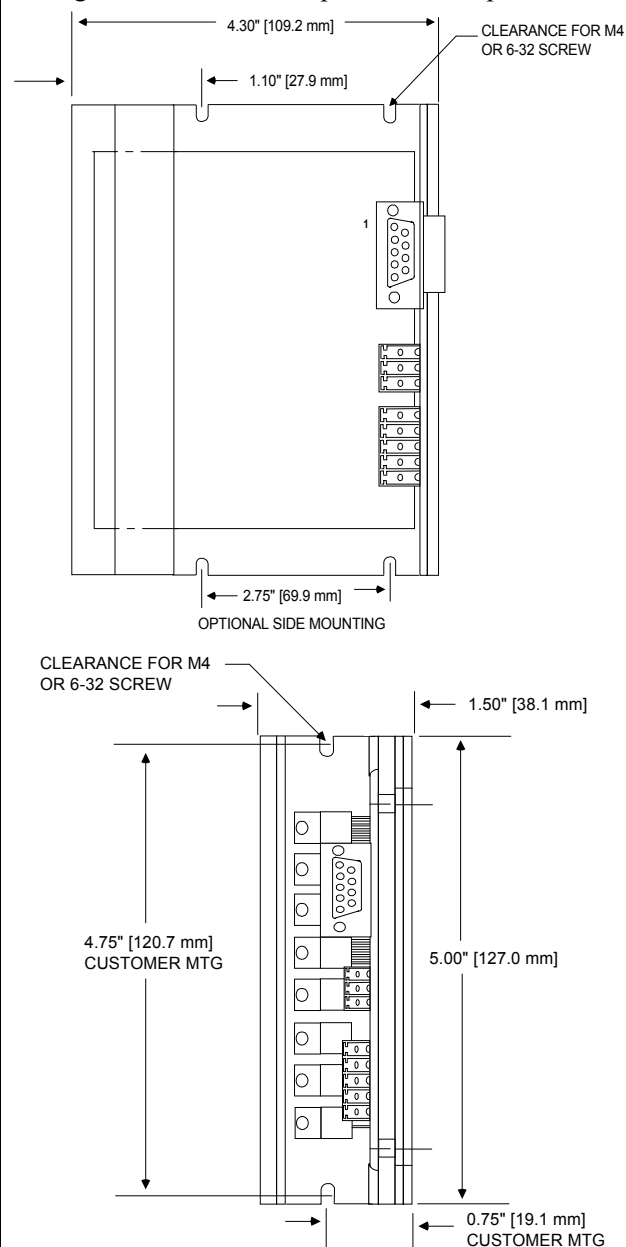


Figure 5 – Mounting Dimensions

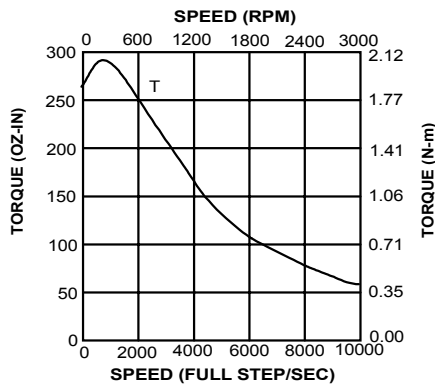
PERFORMANCE – 6400 SERIES CONTROLS

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

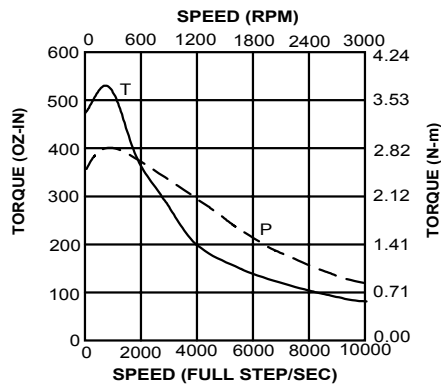
In addition to those shown below, Danaher Motion offers a wide range of other motor windings to meet specific performance requirements.

Torque/Speed Curves – Recommended Motors for 5.0 A operation

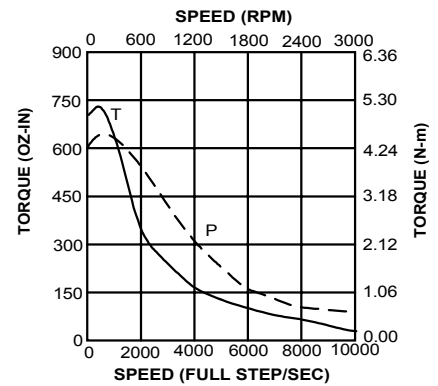
(3" MOTOR-ONE ROTOR STACK)
E31NX-HTLNN-NS50
5.0 A/65 V PER PHASE



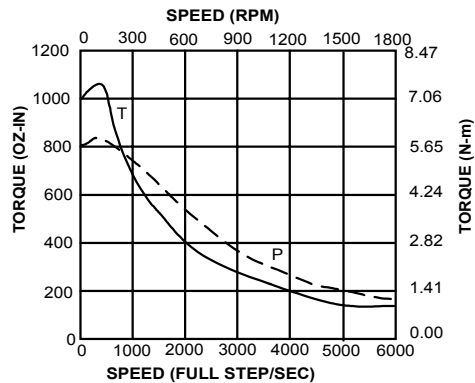
(3" MOTOR-TWO ROTOR STACK)
E32NX-HTLNN-NS50
E32NX-HPNN-NS50
5.0 A/65 V PER PHASE



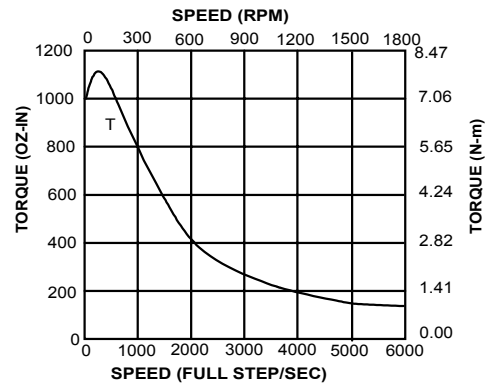
(3" MOTOR-THREE ROTOR STACK)
E33NX-HTNk-NS50
E33-HPLNK-NS50
5.0 A/65 V PER PHASE



(3" MOTOR-FOUR ROTOR STACK)
E34HX-HTLNK-NS50
E34HX-PLNK-NS50
5.0 A/65 V PER PHASE

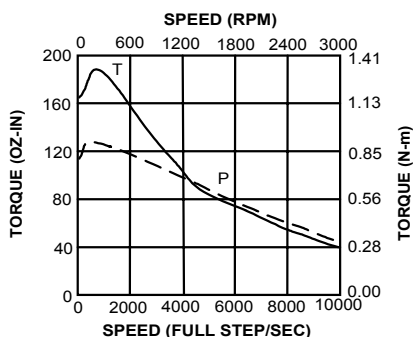


(4" MOTOR-ONE ROTOR STACK)
E41hX-HTLNK-NS50
5.0 A/65 V PER PHASE

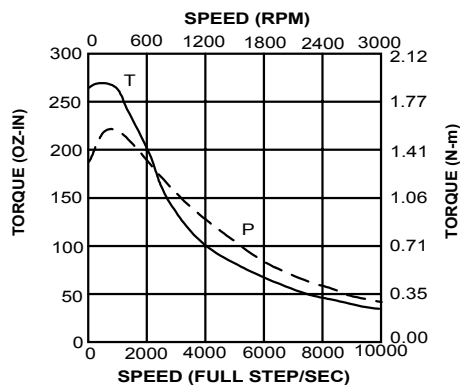


Torque/Speed Curves – Recommended Motors for 2.5 A operation

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



(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

