SELECTION GUIDE

P7000

High Performance Microstepping Drives

Solutions by

D A N A H E R
M O T I O N

Solutions by
DANAHER
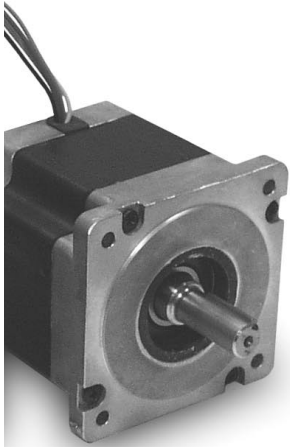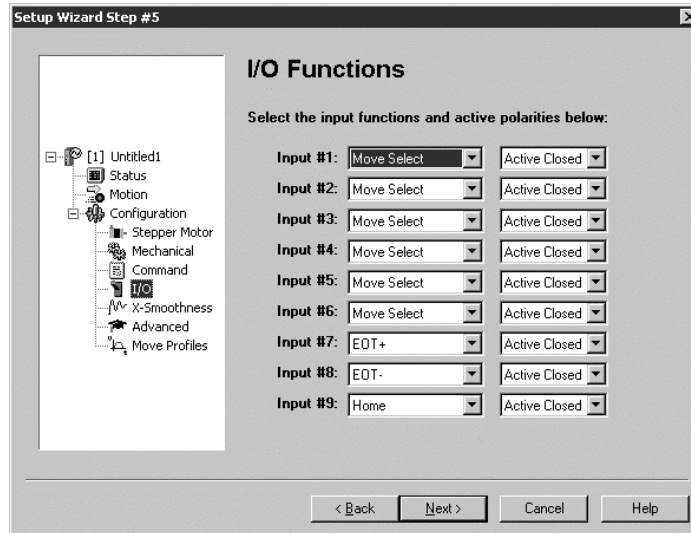**MOTION**
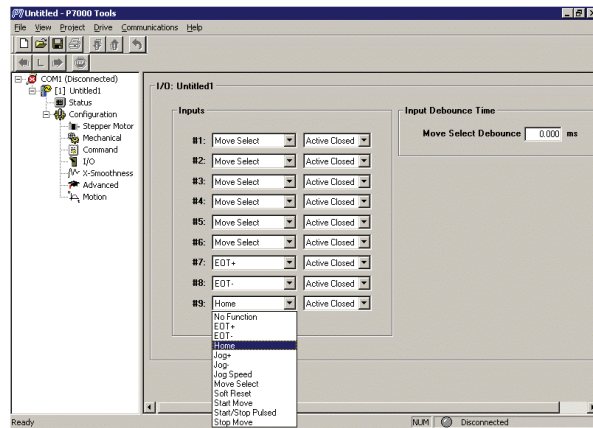
Your World in Motion. At Your Fingertips.

Only Danaher Motion puts a world of motion control solutions at your fingertips. Danaher Motion product lines – Kollmorgen, Pacific Scientific, IDC, Portescap, Thomson–-offer complete motion control solutions from brands you have trusted for years. Our engineers have pioneered breakthroughs in motion control technology for over 70 years benefiting industries as diverse as semiconductor manufacturing, aerospace, electronic assembly, packaging, medical devices and robotics and contributing to innovations such as the Segway™ Human Transporter and the world's first self-contained mechanical heart. That's why today, Danaher Motion is the motion control expert.

Danaher Motion's growing family of leading motion control product brands tells only half the story. With a worldwide service and support infrastructure, our field service engineers and support teams are available when you need them. It's part of Danaher Corporation's unrelenting focus on you, our customer. That's why more and more people are turning to Danaher Motion for their motion control solutions – products such as our new Kollmorgen servo motors and drives, described in this catalog, that take motion control to a whole new level of performance.

Pacific Scientific P7000 Drives and Step Motors - Choices without compromise.

Our new Pacific Scientific P7000 stepper drives and motors provide you servo like system performance with the cost and simplicity of a stepper solution. System selection couldn't be easier. Choose from a select set of optimized motor drive combinations with the wide range of standard motor features you come to expect from Pacific Scientific. Looking for a little more performance? The P7000 drives bring you a unique level of system smoothness, functionality, high-speed performance and innovation unmatched in the industry.

Setup Wizard Step #5

I/O Functions

Select the input functions and active polarities below:

- [1] Untitled1
  - Status
  - Motion
  - Configuration
    - Stepper Motor
    - Mechanical
    - Command
    - I/O
    - X-Smoothness
    - Advanced
    - Move Profiles

Input #1: Move Select — Active Closed
Input #2: Move Select — Active Closed
Input #3: Move Select — Active Closed
Input #4: Move Select — Active Closed
Input #5: Move Select — Active Closed
Input #6: Move Select — Active Closed
Input #7: EOT+ — Active Closed
Input #8: EOT- — Active Closed
Input #9: Home — Active Closed

[< Back] [Next >] [Cancel] [Help]

Continuous Improvement – It's the Danaher Way

At Danaher, we are passionate about continually improving our operations to bring increasing value to our customers. The Danaher Business System (DBS) helps us improve the efficiency of our manufacturing and product development processes. DBS is a team-based approach based on the principles of Kaizen that lets us continuously and aggressively eliminate waste in every aspect of our business operations. The DBS focuses our entire organization on achieving breakthrough results that create competitive advantage in quality, delivery and performance – advantages that we pass on to you, our customer.

Whatever your motion control requirements may be, Danaher Motion has a solution that is right for you. Our unsurpassed product selection and service means faster time to market, higher reliability and increased productivity. Let the experts at Danaher Motion put a world of motion control solutions at your fingertips.

Your World in Motion. Control It.

Solutions by
DANAHER
MOTION
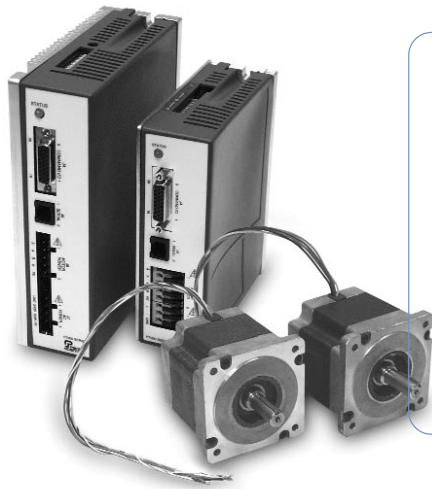
Danaher Motion introduces Pacific Scientific's P7000 Series Step Motor Drives. Previously unheard of stepper features allow the P7000 to provide true servo-like performance at a fraction of the cost.

The P7000 Step motor drives are the next generation of Pacific Scientific's line of digital step motor controls. They bring you a unique level of system smoothness, functionality, high-speed performance and innovation unmatched in the industry. Available for AC or DC operation, the P7000 is designed to power any 2-phase NEMA step motor. Its unique features make it an ideal solution for single or multi-axis applications that require high-speed performance or low speed smoothness. The P70530 DC step drive is designed to power any 2-phase NEMA 17–34 frame motor. With a wide input voltage range of 24-75 Vdc the P70530 is ideally suited to meet your multi-axis application requirements. The P70360 AC step drive is compact yet loaded with power. It will power any 2-phase NEMA 23-42 frame motor. With a standard input voltage of 120 or 240 Vac, this product is a perfect choice to apply anywhere throughout the world.

P7000 Features

Like all Pacific Scientific step motor drives the P7000 series includes optically isolated step and direction inputs. The drives are configured by either on-board switches, or via the P7000 Graphical User Interface (GUI). A full line of standard PacSci stepper motors can be set up with the on-board switches. The GUI is perfect when using an alternative motor type or one with a unique winding. There are a number of advanced features offered in the P7000 systems making it the best choice to meet your application requirements.

• Motor Stall Detection w/o Feedback
• Multistepping™ coarse steps to micro-steps
• Motor Wave Shape Tuning for ultra smooth low speed operation
• Mid-Band Anti-Resonance Control
• Idle & Rest Current Adjustment
• Internal Motion Engine

Stall Detection- Digitally configured via DIP switches or through the GUI. Motor Stalling or shaft displacement at rest can be detected. This is the only reliable stall detection method available to date which does not require a feed back device.

Multistepping™- Also known as auto smoothing. The P7000 drive accepts full step pulse commands from the indexer and inserts fine micro-steps to smooth coarse low speed motion. This allows you to significantly upgrade machine performance without having to redesign machine control architecture..

Motor Wave Shape Tuning - Advanced current auto-tuning techniques provide extreme low speed smoothness comparable to many servo systems, but at a fraction of the cost. Whether using a standard PacSci stepping motor or another type the drives probe the motor to determine it's electrical and mechanical characteristics. The current control algorithms are then optimized to the motor.

Mid-Band Anti-Resonance Control- All open loop stepper systems inherently are susceptible to mid-speed torque loss due to mechanical resonance in the system. The P7000 utilizes pulse placement techniques to minimize mid-speed torque loss.

Current Reduction- -Reduce motor heating and power consumption when the motor is at rest. The current can be scaled from 0-100% in 1% increments.

Internal Motion Engine-A Motion Node option with standard ModBus RTU interface adds enhanced indexing capabilities at significant savings when compared to the cost of a standard indexer. This allows the user to store up to 63 independent moves which can be executed based upon the input configuration or through the serial port. Moves can be chained conditionally together creating the ability to generate numerous motion profiles. The GUI includes a "Fill in the Blank" Wizard to assit you in developing your profiles.

MOTIONEERING® Software makes the selection process easy.
MOTIONEERING ® is a menu driven, Windows®-based program that automatically takes into account load, motor and drive parameters. A wide variety of mechanisms are accommodated including: lead screw, rack and pinion, conveyor (belt and pulley), nip rolls, and rotary, as well as direct data entry.

MOTIONEERING® provides a versatile environment for choosing the optimum system for your application, and is available free of charge.

Features

- Open Loop Stall Detect (OLSD) allows detection of stalled motor without an encoder or resolver. It can also detect if the motor position shifts while at rest.
- Multistepping™ allows low-resolution full step input pulses to be converted to smooth micro stepping commands.
- Dynamic Smoothing™ rounds the edges of the move profile (psuedo-S curve). Minimizes jerk during acceleration.
- Xtreme Smoothing™ eliminates the motor's natural resonance speeds. Provides more usable torque throughout the speed range.
- Anti-Resonance best preforming and largest range in the industry (7.2°). Provides optimum torque and nulls midrange instability.
- Programmable jog function with dual speed settings.
- Current reduction modes with programmable time and reduction amount.
- Nine programmable inputs allow Jog+, Jog-, Jog Speed, EOT+, EOT-, Move Select, Soft Reset, Start Move, Start/Stop Pulse, Stop Move.
- Fault Output
- All I/O user configurable to active high or active low operation 5-24 VDC.
- Compact size and ability to mount tightly together.
- Agency approvals (pending) UL recognized 508C, type R file #E137798, CE compliant, EMC standard EN61800-3 and safety EN50178.
- Flash Firmware for field retrofittable upgrades.
- Diagnostic LEDs provide easy drive assessment.
- RS232
- Configurable software for custom motor options and fine tuning.
- Motion Node allows simple indexing up to 63 moves.

Specifications	Units	P70530	P70360
Input Voltage Range	Volts	24-75 VDC	120 or 240 VAC
Continuous Current	Amps rms	5	3
Microstep Peak Current	Amps peak	7.1	4.2
Dedicated Inputs	-	+/-Enable, +/- Step & Dir 5 VDC TTL	+/-Enable, +/- Step & Dir 5 VDC TTL
Programmable Inputs	-	9 Configurable Optically Isolated 5-24 VDC Sinking or Sourcing	9 Configurable Optically Isolated 5-24 VDC Sinking or Sourcing
Fault Output		Open collector 5-24 VDC	Open collector 5-24 VDC
Idle Current Reduction	Integer	Settable 0-100% in	Settable 0-100% in
Step Resolution	-	200-25600 steps/rev	200-25600 steps/rev
Package Size	W x D x H Inches (mm)	1.74 x 4.43 x 5.67 (44.3 x 112.5 x 144)	2.06 x 5.2 x 6.7 (52.3 x 132 x 170)
Ambient Temperature	Degrees	0-45	0-45
Max Chassis Temperature	Degrees C	70	70
Motor Frames	-	NEMA 23, 34, 42	NEMA 23, 34, 42
Max Shaft Power	Watts	300	525
Speed Range	Revs/Second	0-50	0-50
Motor Inductance Range	mH	.8-10	50-200

Pacific Scientific P70530
Microstepping is...
Modular, Functional and Flexible

P70530

112.5
(4.430)

44.3 (1.743)

26.8 (1.055)

144
(5.670)

136
(5.350)

Modular
The Pacific Scientific P70530 DC stepper drive is modular to support a broad range of requirements. Its compact bookshelf style footprint is ideally suited for multi axis applications. It's common to use a single power supply as the source for the drives.
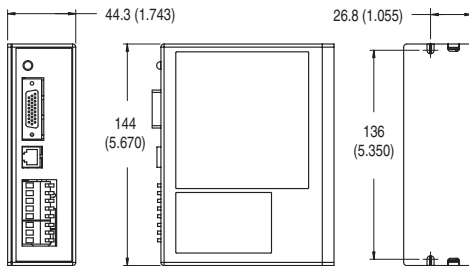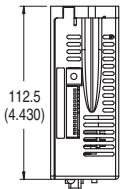
Functional & Flexible
The drive is designed to power any 2-phase NEMA 17–34 frame motor. Whether you are using a Pacific Scientific brand or other it can be configured to get the optimum power out of the motor. With a wide input voltage range of 24-75 Vdc the P70530 is ideally suited to meet your application requirements.
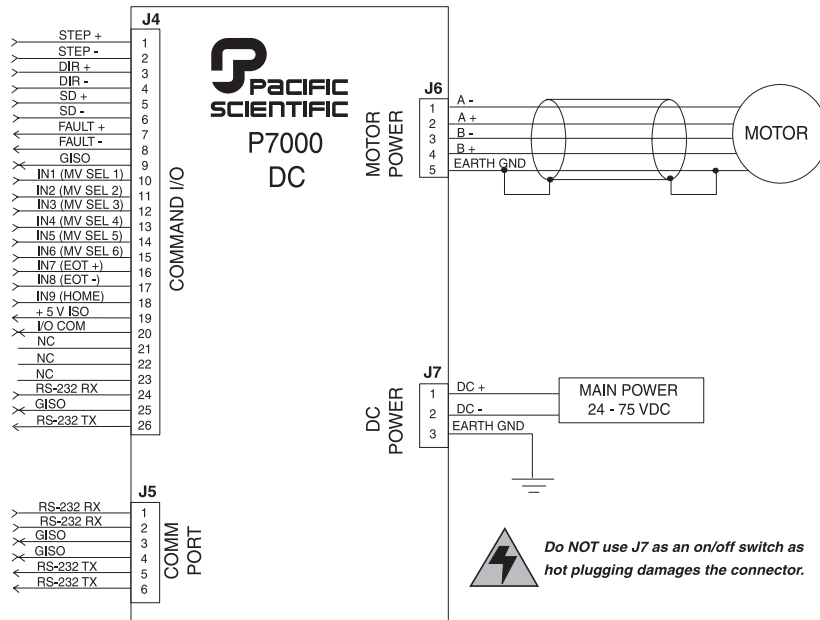
The drive can be set up using on-board selector switches or via the software utility provided, P7000Tools. Current settings, Auto-Smoothing, Motor Wave Shaping, Mid-Band Ant-Resonance and current reduction are all selected through the switch settings. P7000Tools includes a Graphical User Interface (GUI) to allow set-up for custom windings or third party motors.

The P70530 is offered in two standard versions. The P70530-SDN is designed with a conventional step and direction interface. Dedicated inputs are available for Jog+/-, enable and Step/direction control. The user provides the pulse train to rotate the motor. The P70530-PNN adds a motion node indexing capability to the base drive. This allows the user to program up to 63 independent moves. These moves can be executed through input settings or through the serial port. The P70530-PNN supports ModBus RTU protocol.

Agency Approval
CUL, CE

c **UL** us   C E

EN60034-1
EN60034-5

J4
STEP +	1
STEP -	2
DIR +	3
DIR -	4
SD +	5
SD -	6
FAULT +	7
FAULT -	8
GISO	9
IN1 (MV SEL 1)	10
IN2 (MV SEL 2)	11
IN3 (MV SEL 3)	12
IN4 (MV SEL 4)	13
IN5 (MV SEL 5)	14
IN6 (MV SEL 6)	15
IN7 (EOT +)	16
IN8 (EOT -)	17
IN9 (HOME)	18
+ 5 V ISO	19
I/O COM	20
NC	21
NC	22
NC	23
RS-232 RX	24
GISO	25
RS-232 TX	26

COMMAND I/O

PACIFIC SCIENTIFIC
P7000 DC

J6   MOTOR POWER
A -	1	
A +	2	
B -	3	
B +	4	MOTOR
EARTH GND	5	

J7   DC POWER
DC +	1	MAIN POWER
DC -	2	24 - 75 VDC
EARTH GND	3	

J5
RS-232 RX	1
RS-232 RX	2
GISO	3
GISO	4
RS-232 TX	5
RS-232 TX	6

COMM PORT

⚡ *Do NOT use J7 as an on/off switch as hot plugging damages the connector.*

Pacific Scientific P70360 Microstepping are...

Packaged, Functional and Flexible

Packaged

The Pacific Scientific P70360 AC stepper drive is a packaged drive including an integral power supply The P70360 AC step drive is compact yet loaded with power. With a standard input voltage of 120 or 240 Vac, this product is a perfect choice to apply anywhere throughout the world.
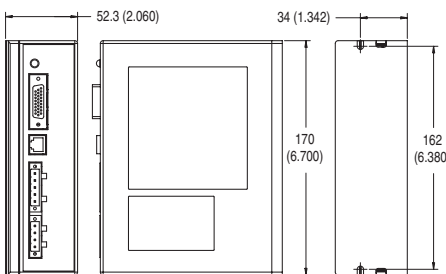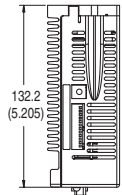
Functional and Flexible

The drive is designed to power any 2-phase NEMA 23-42 frame motor. Whether you are using a Pacific Scientific brand or other it can be configured to get the optimum power out of the motor. The P70360 accepts either a 120 or 240 Vac single-phase power source in the same package.
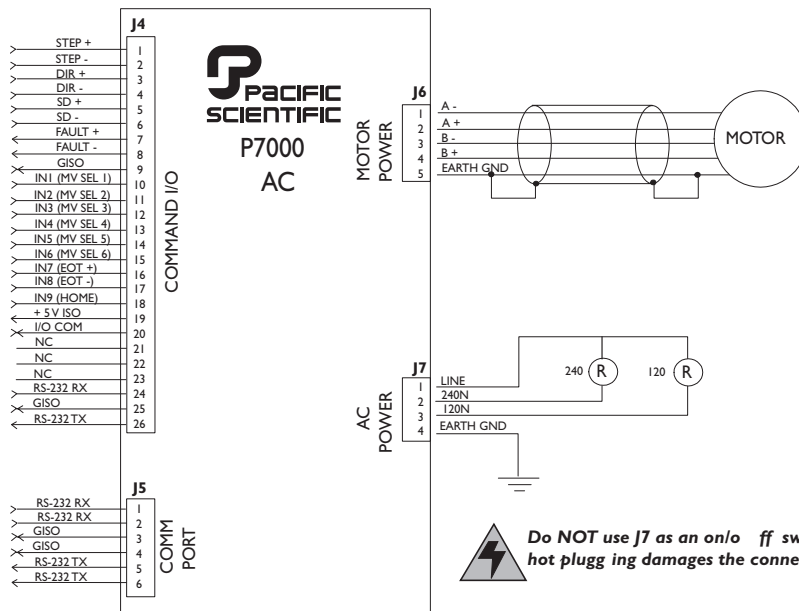
The drive can be set up using on-board selector switches or via the software utility provided, P7000Tools. Current settings, Auto-Smoothing, Motor Wave Shaping, Mid-Band Ant-Resonance and current reduction are all selected through the switch settings. P7000Tools includes a Graphical User Interface (GUI) to allow set-up for custom windings or third party motors.

The P70360 is offered in two standard versions. The P70360-SDN is designed with a conventional step and direction interface. Dedicated inputs are available for Jog+/-, enable and Step/direction control. The user provides the pulse train to rotate the motor. The P70360-PNN adds a motion node indexing capability to the base drive. This allows the user to program up to 63 independent moves. These moves can be executed through input settings or through the serial port. The P70530-PNN supports ModBus RTU protocol.
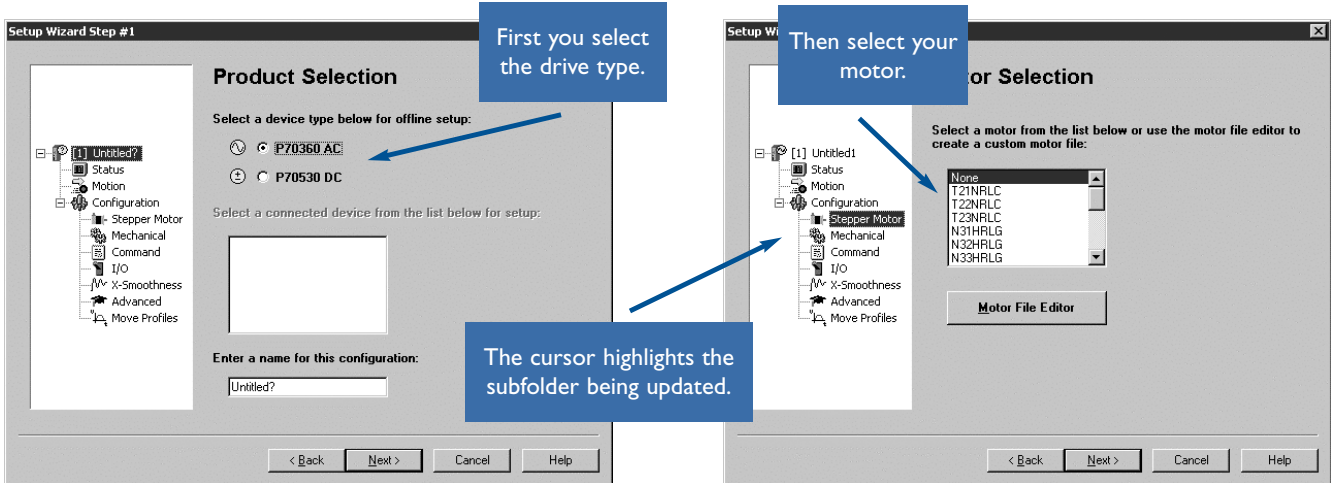
Agency Approval
CUL, CE

P70360

132.2 (5.205)

52.3 (2.060)   34 (1.342)

170 (6.700)   162 (6.380)

J4

STEP +	1	
STEP -	2	
DIR +	3	
DIR -	4	
SD +	5	
SD -	6	
FAULT +	7	
FAULT -	8	
GISO	9	
IN1 (MV SEL 1)	10	
IN2 (MV SEL 2)	11	
IN3 (MV SEL 3)	12	
IN4 (MV SEL 4)	13	
IN5 (MV SEL 5)	14	
IN6 (MV SEL 6)	15	
IN7 (EOT +)	16	
IN8 (EOT -)	17	
IN9 (HOME)	18	
+ 5 V ISO	19	
I/O COM	20	
NC	21	
NC	22	
NC	23	
RS-232 RX	24	
GISO	25	
RS-232 TX	26	

COMMAND I/O

PACIFIC SCIENTIFIC
P7000
AC

J6 MOTOR POWER

A -	1
A +	2
B -	3
B +	4
EARTH GND	5

MOTOR

J7 AC POWER

LINE	1
240N	2
120N	3
EARTH GND	4

240 (R)   120 (R)

J5

RS-232 RX	1	
RS-232 RX	2	
GISO	3	
GISO	4	
RS-232 TX	5	
RS-232 TX	6	

COMM PORT

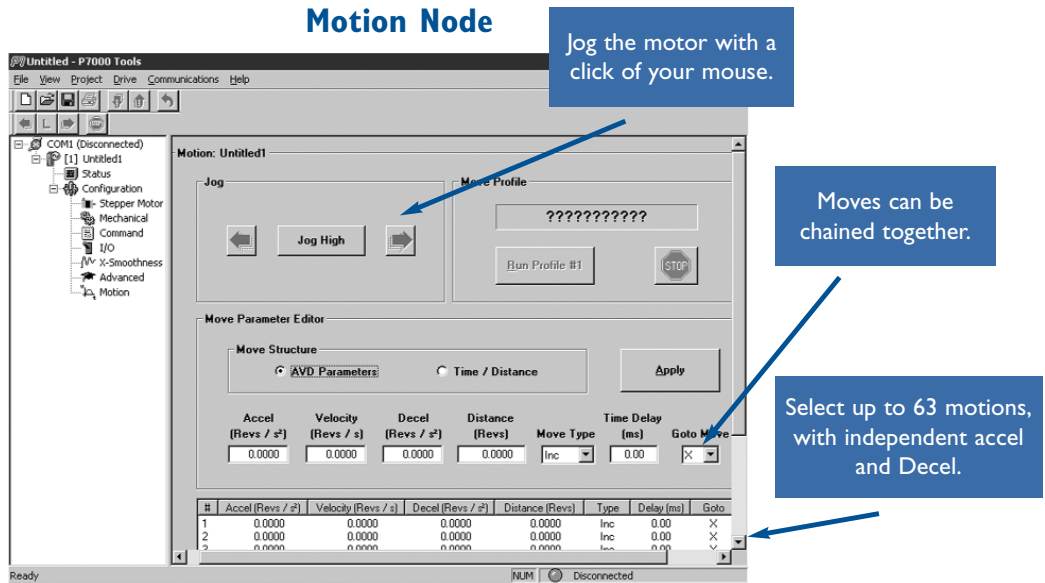⚡ **Do NOT use J7 as an on/off switch as hot plugging damages the connector.**

P7000Tools

P7000tools is Pacific Scientific's latest Graphical User Interface (GUI) to date. Whether you are an experienced Microsoft Windows user or not this utility makes it easy to get your system up and running. In fact we believe it is so intuitive that you don't even need a manual. Just run the software and the Set Up Wizard will help you along.
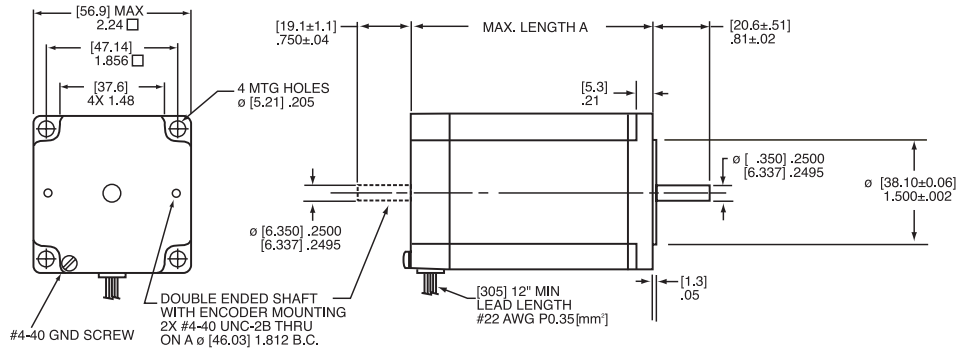
P7000 Set Up Wizard

First you select the drive type.

Then select your motor.

The cursor highlights the subfolder being updated.

The wizard then guides you through the mechanical configuration, drive command type and finally the I/O set up. In a matter of minutes your system is set up and your ready to spin the motor. You can set up to 63 moves with the optional motion node.

Motion Node

Jog the motor with a click of your mouse.

Moves can be chained together.

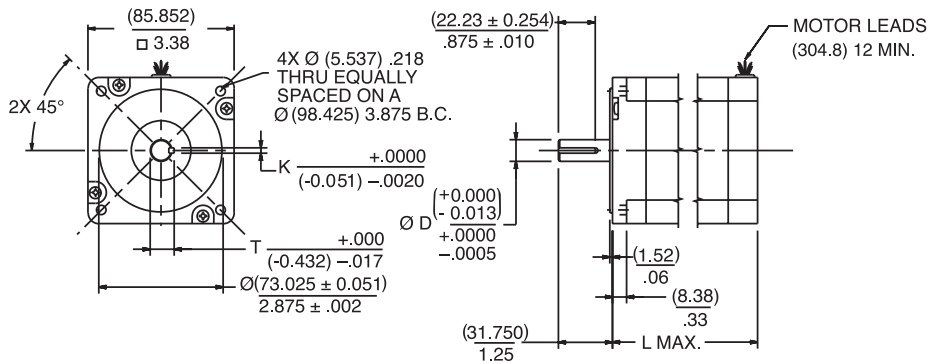Select up to 63 motions, with independent accel and Decel.

For experienced users the Wizard is easily turned off. There are a number of advanced features, which give you the ability to control the motor like no other drive in the industry.
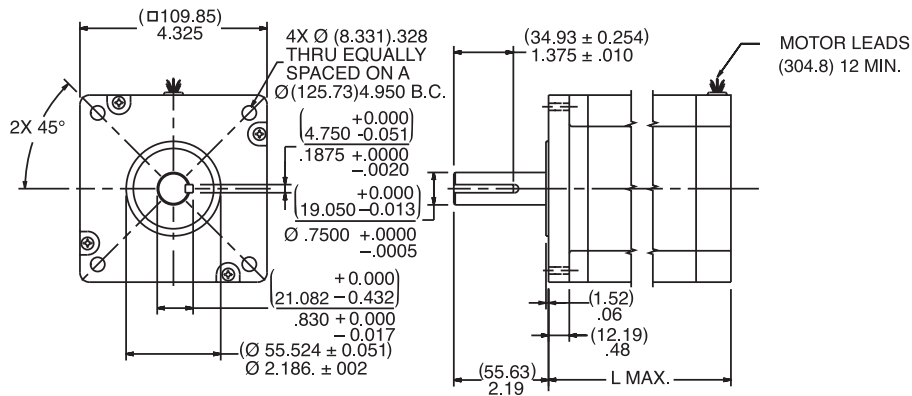
T-SERIES NEMA 23 HIGH TORQUE MOTORS

[56.9] MAX 2.24 □

[47.14] 1.856 □

[37.6] 4X 1.48

4 MTG HOLES ø [5.21] .205

[19.1±1.1] .750±.04

MAX. LENGTH A

[20.6±.51] .81±.02

[5.3] .21

ø [.350] .2500 [6.337] .2495

ø [38.10±0.06] 1.500±.002

ø [6.350] .2500 [6.337] .2495

DOUBLE ENDED SHAFT WITH ENCODER MOUNTING 2X #4-40 UNC-2B THRU ON A ø [46.03] 1.812 B.C.

#4-40 GND SCREW

[305] 12" MIN LEAD LENGTH #22 AWG P0.35[mm²]

[1.3] .05

N&K SERIES NEMA 34 HIGH TORQUE MOTORS

(85.852) □ 3.38

2X 45°

4X Ø (5.537) .218 THRU EQUALLY SPACED ON A Ø (98.425) 3.875 B.C.

K $\dfrac{+.0000}{(-0.051)\ -.0020}$

T $\dfrac{+.000}{(-0.432)\ -.017}$

Ø(73.025 ± 0.051) 2.875 ± .002

(22.23 ± 0.254) .875 ± .010

MOTOR LEADS (304.8) 12 MIN.

Ø D $\dfrac{(+0.000)}{-0.013}$ $\dfrac{+.0000}{-.0005}$

(1.52) .06

(8.38) .33

(31.750) 1.25

L MAX.

N&K SERIES NEMA 42 HIGH TORQUE MOTORS

(□109.85) 4.325

2X 45°

4X Ø (8.331).328 THRU EQUALLY SPACED ON A Ø (125.73)4.950 B.C.

$\left(4.750\ \dfrac{+0.000}{-0.051}\right)$ .1875 $\dfrac{+.0000}{-.0020}$

$\left(19.050\ \dfrac{+0.000}{-0.013}\right)$ Ø .7500 $\dfrac{+.0000}{-.0005}$

$\left(21.082\ \dfrac{+0.000}{-0.432}\right)$ .830 $\dfrac{+0.000}{-0.017}$

(Ø 55.524 ± 0.051) Ø 2.186. ± 002

(34.93 ± 0.254) 1.375 ± .010

MOTOR LEADS (304.8) 12 MIN.

(1.52) .06

(12.19) .48

(55.63) 2.19

L MAX.

Motor	AMAX Length	Motor	D	K	T	LMAX	Motor	LMAX Length
T2H	1.64	31HR	0.5	0.125	0.555	3.13	41HR	5.2
T21	2.21	32HR	0.5	0.125	0.555	4.65	42HR	7.22
T22	3.06	33HR	0.625	0.1875	0.705	6.17		
T23	4.06	34HR	0.625	0.1875	0.705	7.68		

P70530 System Curves

T21, T22, T23 75 Vdc

T21LE-1.4 Amps   T22LG- 2.3 Amps   T23LH-3 Apms
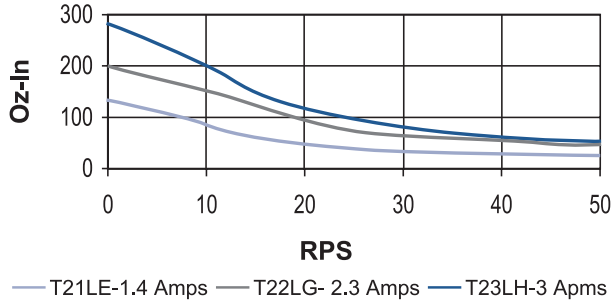
N32 & K32 5 Arms, 75 Vdc

N32 HJ   K32 HJ
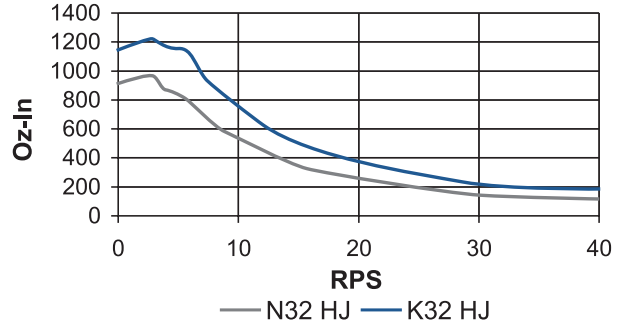
N31 & K31 5 Arms, 75 Vdc

N31 HJ   K31 HJ
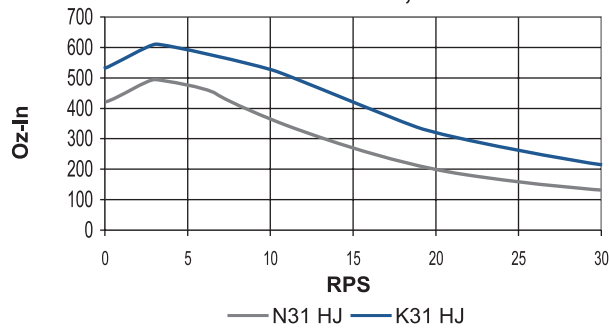
N34 & K34 5Arms, 75 Vdc

N34 HJ   K34 HJ
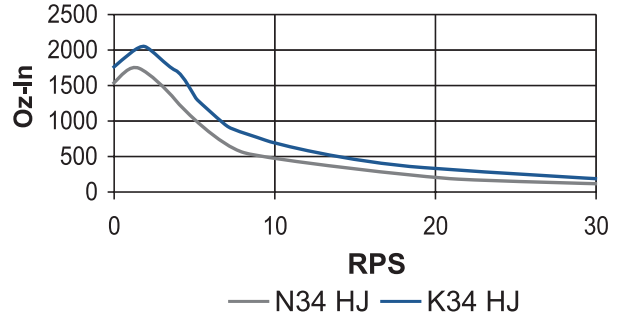
N33 & K33 5Arms, 75 Vdc

N33 HJ   K33 HJ
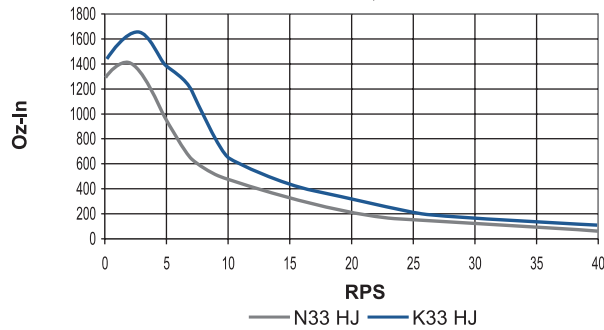
N41 & K41 5Arms, 75 Vdc

N41 HJ   K41 HJ
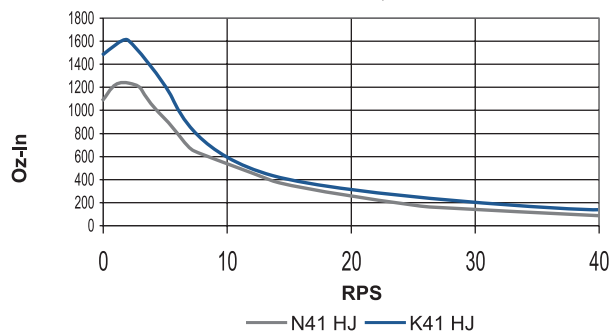
DC Drive	Motor Type
	NEMA 23 T Series
P70530-xxx	T21NRLE-LNN-NS-00
P70530-xxx	T22NRLG-LNN-NS-00
P70530-xxx	T23NRLH-LNN-NS-00
	NEMA 34 N & K
P70530-xxx	N31HRHJ-LNK-NS-00
P70530-xxx	N32HRHJ-LNK-NS-00
P70530-xxx	N33HRHJ-LNK-NS-00
P70530-xxx	N34HRHJ-LNK-NS-00
P70530-xxx	K31HRHJ-LNK-NS-00
P70530-xxx	K32HRHJ-LNK-NS-00
P70530-xxx	K33HRHJ-LNK-NS-00
P70530-xxx	K34HRHJ-LNK-NS-00
	NEMA 42 N & K
P70530-xxx	N41HRHJ-LNK-NS-00
P70530-xxx	K41HRHJ-LNK-NS-00

P70360 System Curves

Speed Torque T21, 22, 23

Speed Torque N, K 32

Speed Torque N, K 31

Speed Torque N, K 34

Speed Torque N, K 33

Torque Curve N, K 42

Speed Torque N, K 41
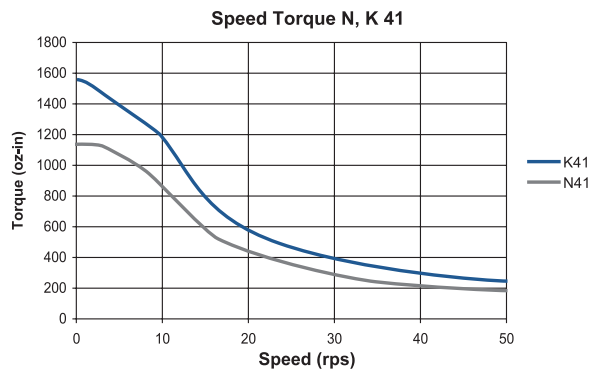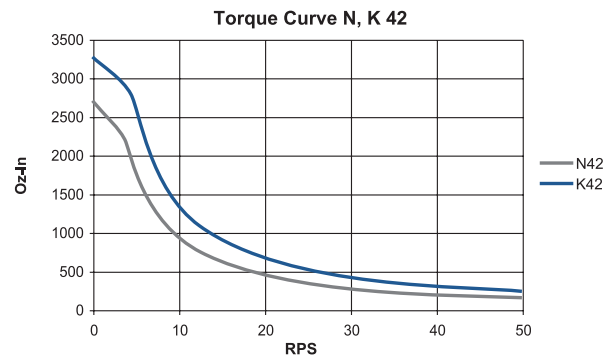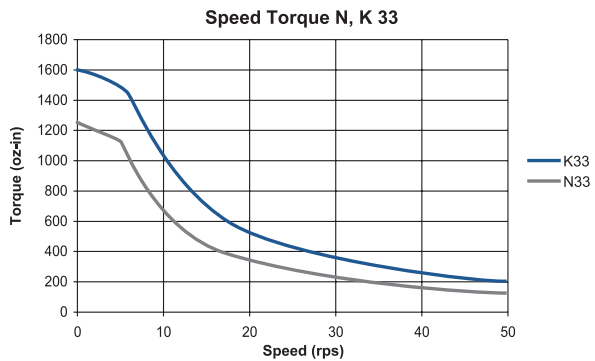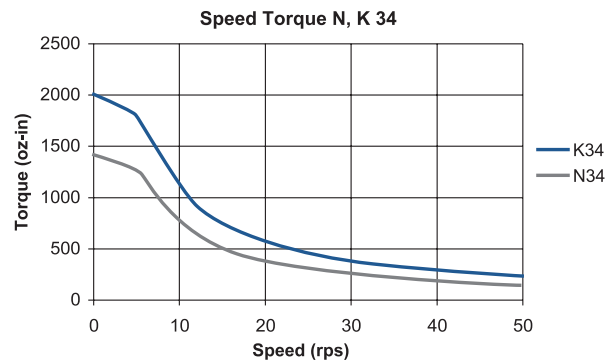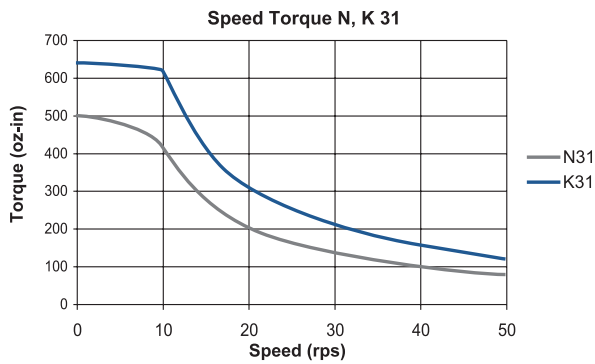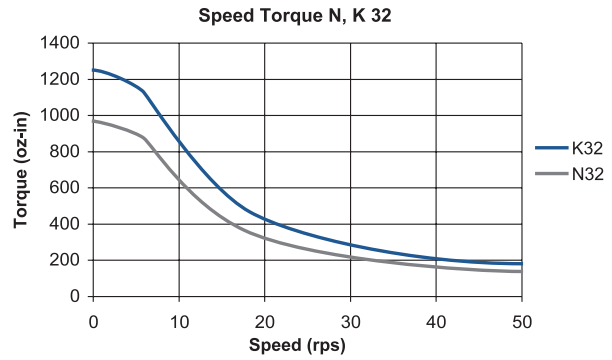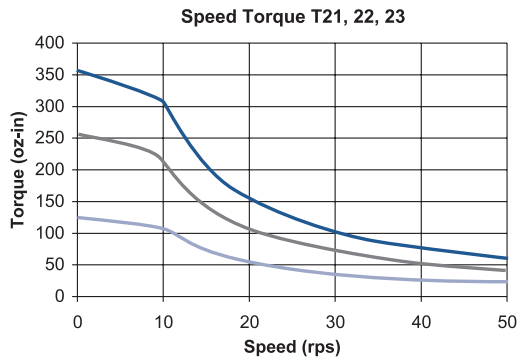
AC Drive	Motor Type
	NEMA 23 T Series
P70360-xxx	T21NRLC-LNN-NS-00
P70360-xxx	T22NRLC-LNN-NS-00
P70360-xxx	T23NRLC-LNF-NS-00
	NEMA 34 N & K
P70360-xxx	N31HRLG-LNK-NS-00
P70360-xxx	N32HRLG-LNK-NS-00
P70360-xxx	N33HRLG-LNK-NS-00
P70360-xxx	N34HRLG-LNK-NS-00
P70360-xxx	K31HRLG-LNK-NS-00
P70360-xxx	K32HRLG-LNK-NS-00
P70360-xxx	K33HRLG-LNK-NS-00
P70360-xxx	K34HRLG-LNK-NS-00
	NEMA 42 N & K
P70360-xxx	N41HRLG-LNK-NS-00
P70360-xxx	N42HRLG-LNK-NS-00
P70360-xxx	K41HRLG-LNK-NS-00
P70360-xxx	K42HRLG-LNK-NS-00

P7000 Series Microstepping Drive

Ordering Information: P7 05 3 0 - SD N - xxx

Stepper Drive Family
P7 = P7000 series

Current Rating
03 = 3 A_{rms} continuous, 4.2 A_{peak} (AC models only)
05 = 5 A_{rms} continuous, 7.1 A_{peak} (DC models only)

Voltage Range
3 = 24 - 75 VDC
6 = 120/240 VAC

Electrical Options
0 = None

Customization
Omit field for standard configurations

Feedback Device Support
N = None

Functionality
PN = Motion Node indexing
SD = Step/Direction base drive

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Danaher Motion enjoys a reputation of excellence based on constant endeavors to update products. Information in this brochure is subject to change.