

# P7000 MICROSTEPPING DRIVES

April 2004

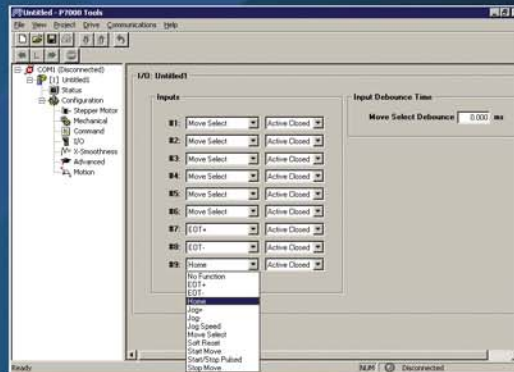
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## Servo-Like Performance At Stepper Systems Cost

Pacific Scientific's line of digital step motor controls bring you a unique level of system smoothness, functionality, high-speed performance and innovation unmatched in the industry.

 **PACIFIC  
SCIENTIFIC**



 **DANAHER  
MOTION**

Solutions by

*P7000Tools makes it easy to get your  
system up and running fast.*





## New Name, Established Brands

Danaher Motion's wide range of motion control systems and components offer customers an unprecedented choice in selecting the right solution for their particular application requirements. Our product innovations have been improving the efficiency and productivity of complex manufacturing operations for over 60 years through trusted brand names such as Dover, Kollmorgen, Pacific Scientific, Portescap and Thomson in industries as diverse as semiconductor, aerospace and defense, mobile-off-highway, packaging, medical and robotics.

Danaher Motion's growing family of leading motion control products 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 is part of the Danaher Corporation's unrelenting focus on you, our customer. That's why more and more design engineers are turning to Danaher Motion to meet their motion control requirements.

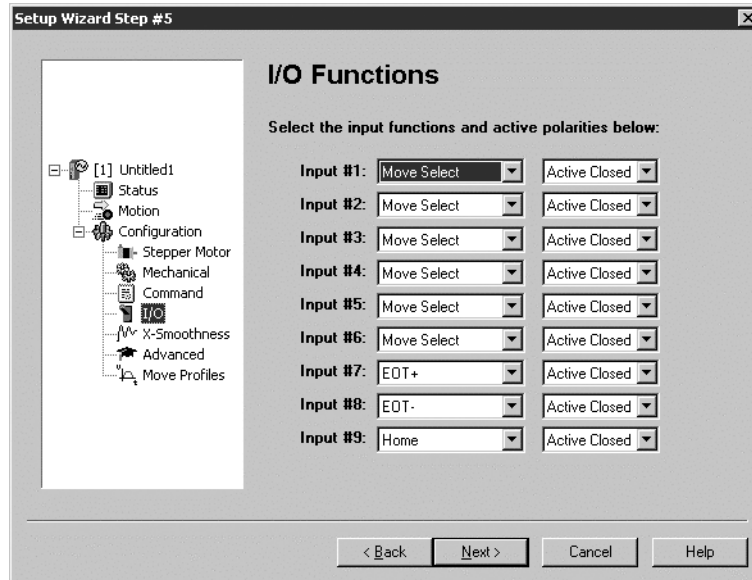
## Pacific Scientific P7000 Drives and Step Motors - Choices without compromise.

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.



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## 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.**





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 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 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 Step Drives

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
- Multistep™ 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.

**Multistep™** - 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 assist 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.
- Multi-Stepping™ 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 performing 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, one user-configurable output 5-24 VDC.
- 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 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	P70360
<b>Input Voltage Range</b>	Volts	120 or 240 VAC
<b>Continuous Current</b>	Amps rms	2.5
<b>Microstep Peak Current</b>	Amps peak	3.5
<b>Dedicated Inputs</b>	-	+/- Enable, +/- Step & Dir 5 VDC TTL
<b>Programmable Inputs</b>	-	9 Configurable Optically Isolated 5-24 VDC Sinking or Sourcing
<b>Fault Output, user-configurable output</b>		Open collector 5-24 VDC
<b>Idle Current Reduction</b>	Integer	Settable 0-100% in
<b>Step Resolution</b>	-	200-25600 steps/rev
<b>Package Size</b>	W x D x H Inches (mm)	2.06 x 5.2 x 6.7 (52.3 x 132 x 170)
<b>Ambient Temperature</b>	Degrees C	0-45
<b>Max Chassis Temperature</b>	Degrees C	70
<b>Motor Frames</b>	-	NEMA 23, 34, 42
<b>Max Shaft Power</b>	Watts	525
<b>Speed Range</b>	Revs/Second	0-50
<b>Motor Inductance Range</b>	mH	50-200

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## Pacific Scientific P70360 Microstepping drives 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.

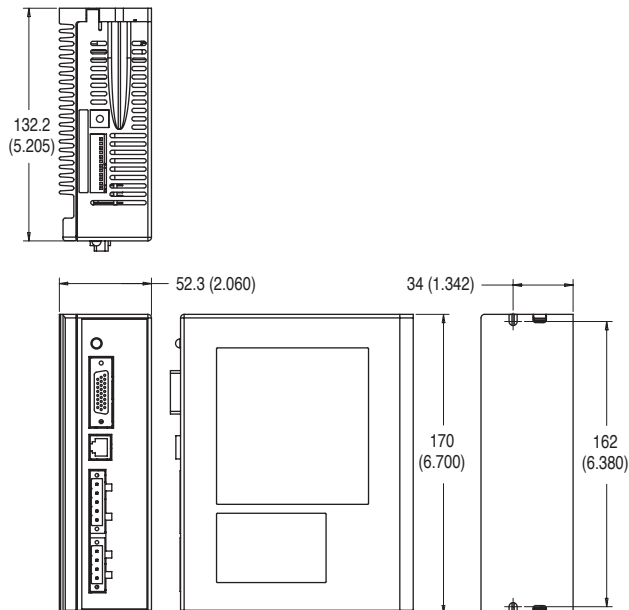
The P70360 is offered in two standard versions. The P70360-SDN is designed with a conventional step and direction interface. Dedicated inputs are available for Jog+/-, enable and Step/direction control. The user provides the pulse train to rotate the motor. The P70360-PNN adds a motion node indexing 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 P70360-PNN supports ModBus RTU protocol.



Agency Approval  
CUL, CE

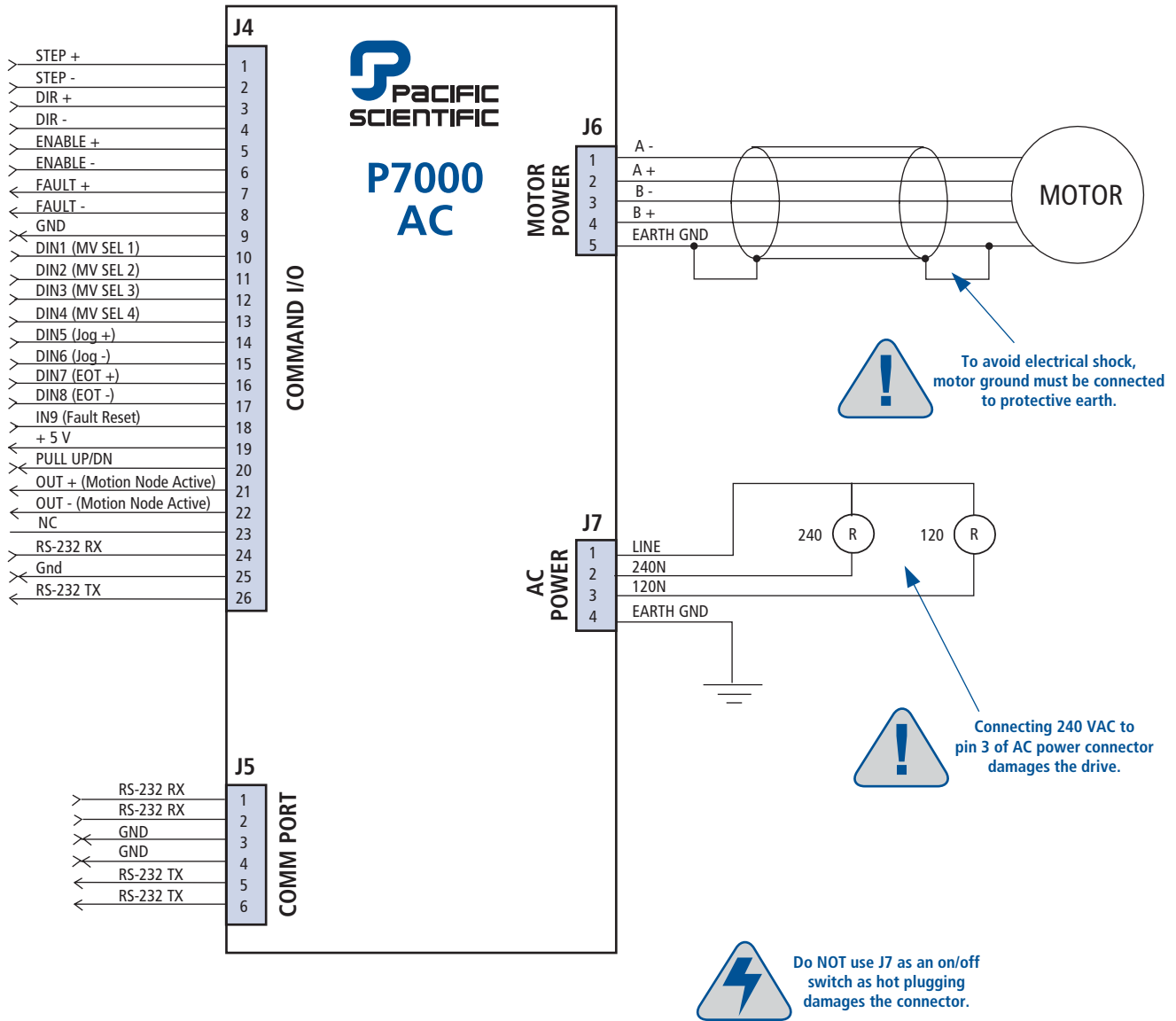


## P70360 Outline/Dimensions



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# P70360 Wiring Diagram

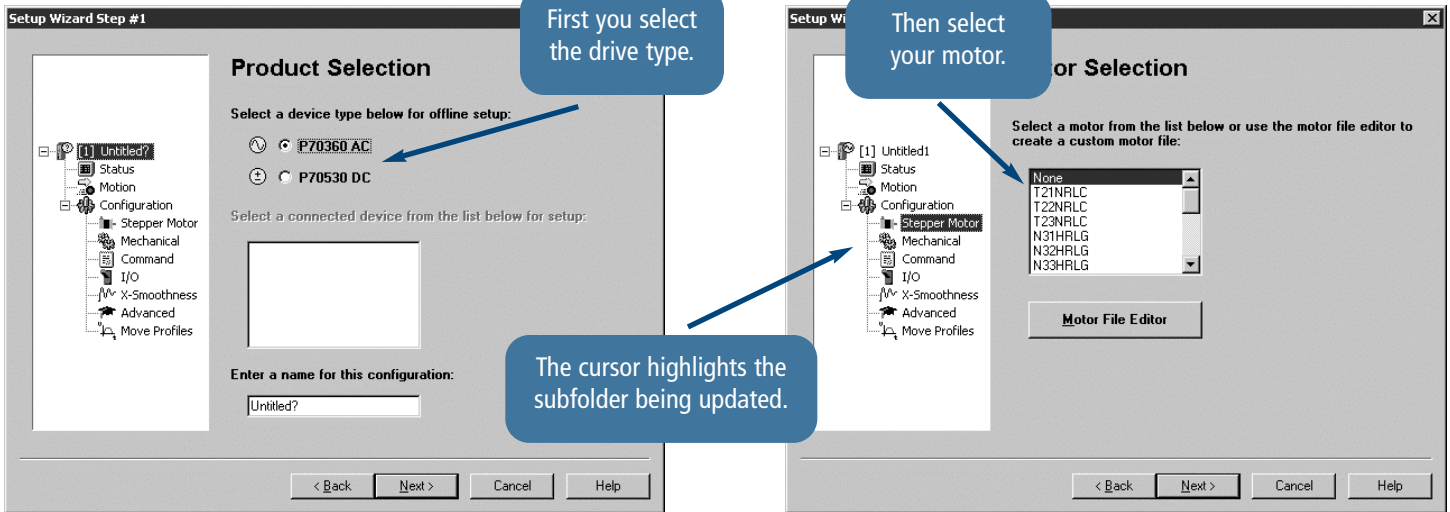


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## P7000Tools

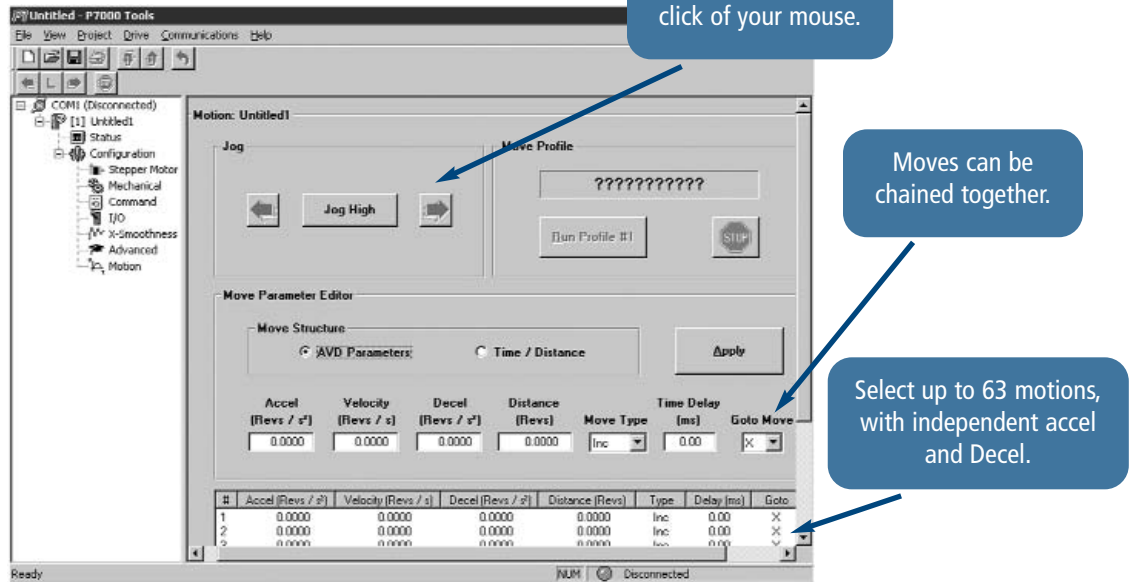
P7000Tools is Pacific Scientific's latest Graphical User Interface (GUI) to date. Whether you are an experienced Microsoft Windows user or not, this utility makes it easy to get your system up and running. In fact we believe it is so intuitive that you don't even need a manual. Just run the software and the Set Up Wizard will help you along.

## P7000 Set Up Wizard



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 you're ready to spin the motor. You can set up to 63 moves with the optional motion node.

## Motion Node

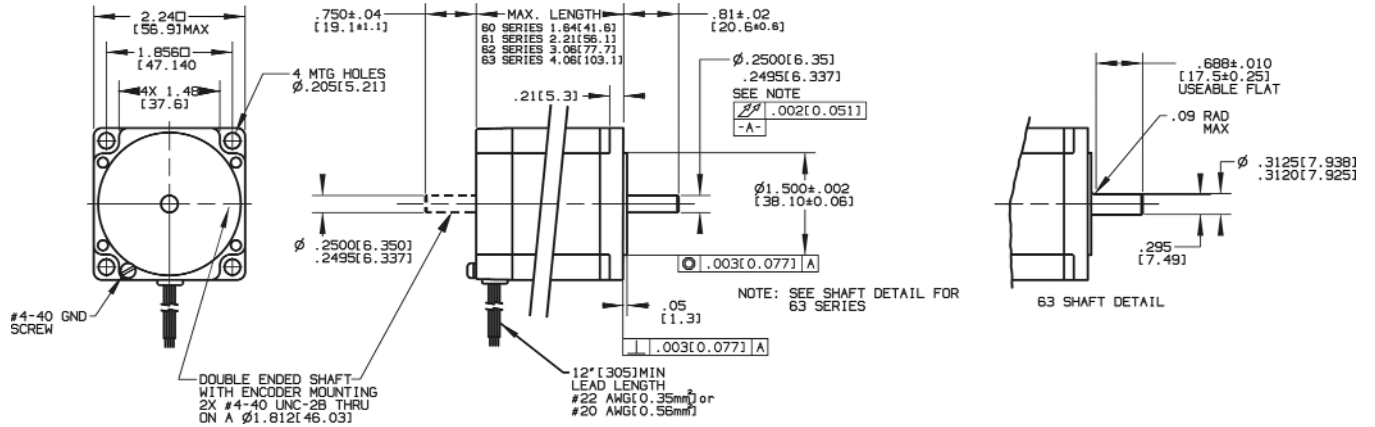


For experienced users the Wizard is easily turned off. There are a number of advanced features, which give you the ability to control the motor like no other drive in the industry.

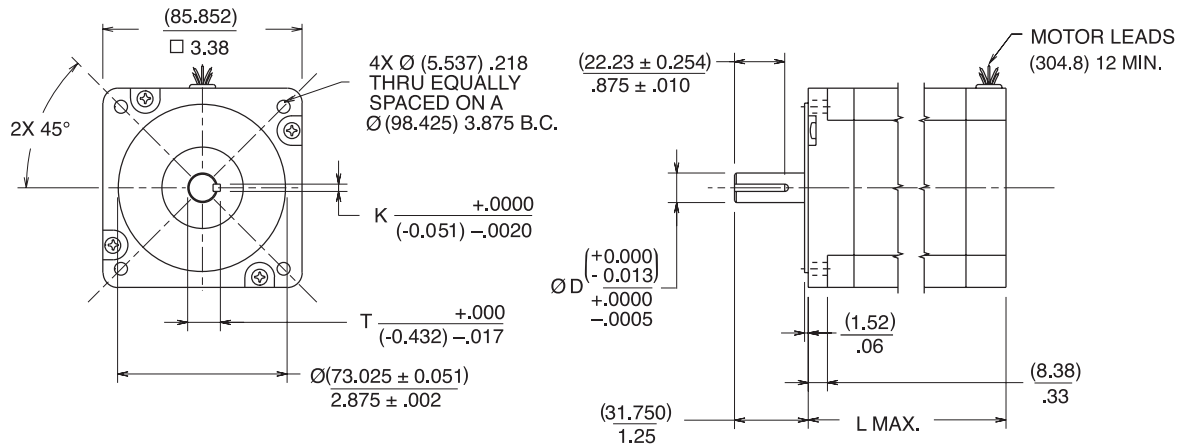
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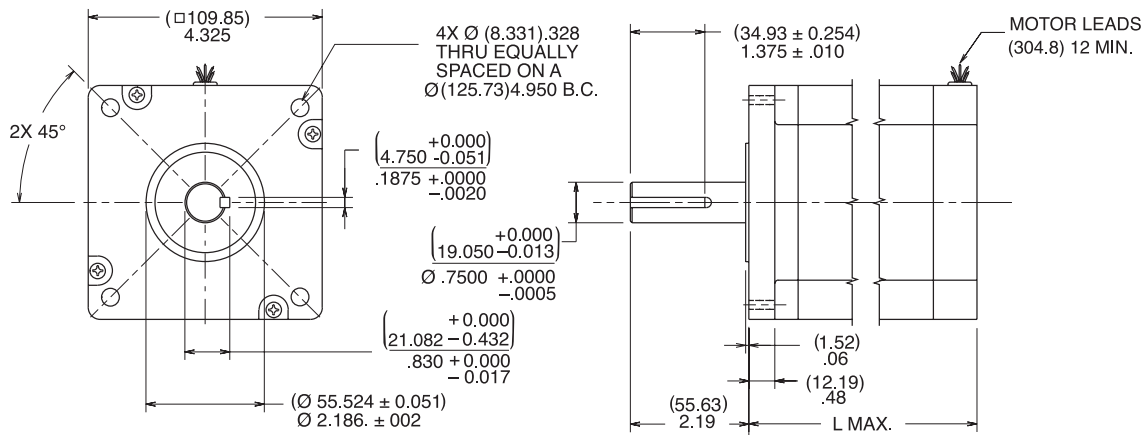
### T-SERIES NEMA 23 HIGH TORQUE MOTORS



### N&K SERIES NEMA 34 HIGH TORQUE MOTORS



### N&K SERIES NEMA 42 HIGH TORQUE MOTORS

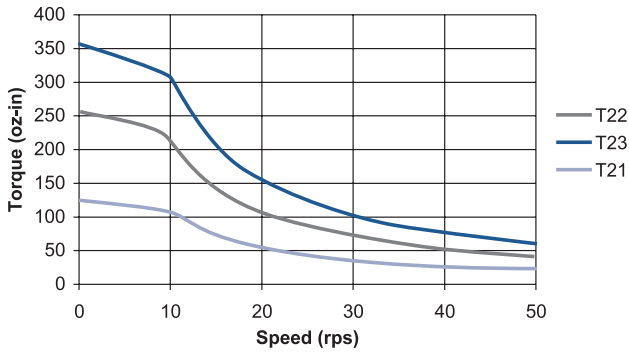


Motor	AMAX Length	Motor	D	K	T	LMAX	Motor	LMAX Length
T2H	1.64	31HR	0.5	0.125	0.555	3.13	41HR	5.2
T21	2.21	32HR	0.5	0.125	0.555	4.65	42HR	7.22
T22	3.06	33HR	0.625	0.1875	0.705	6.17		
T23	4.06	34HR	0.625	0.1875	0.705	7.68		

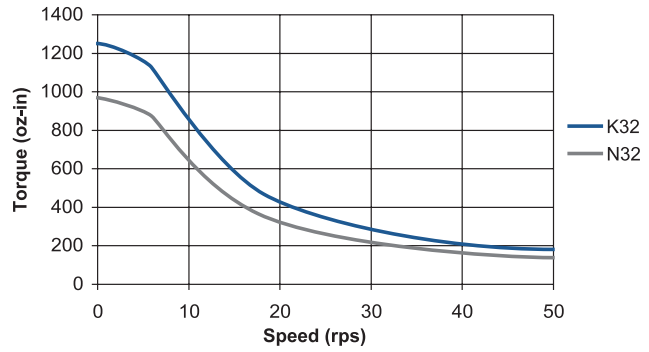
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# P70360 System Curves

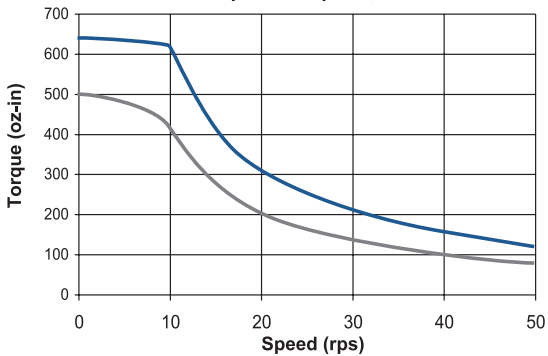
Speed Torque T21, 22, 23



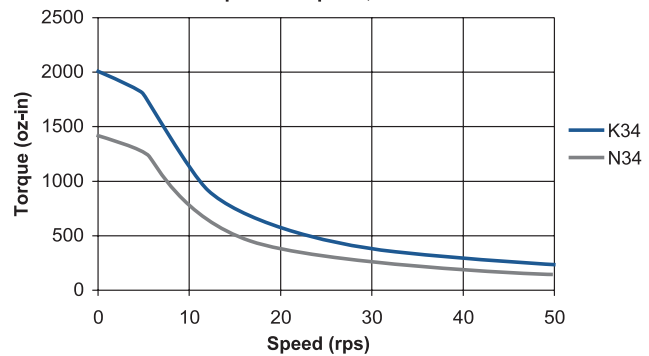
Speed Torque N, K 32



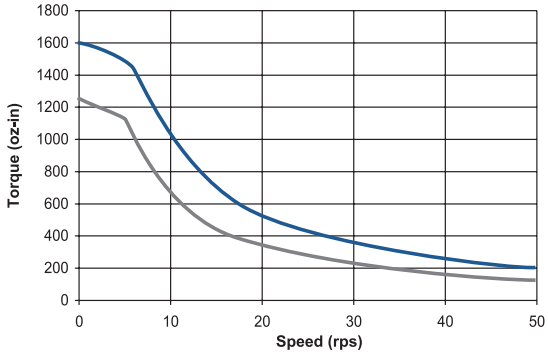
Speed Torque N, K 31



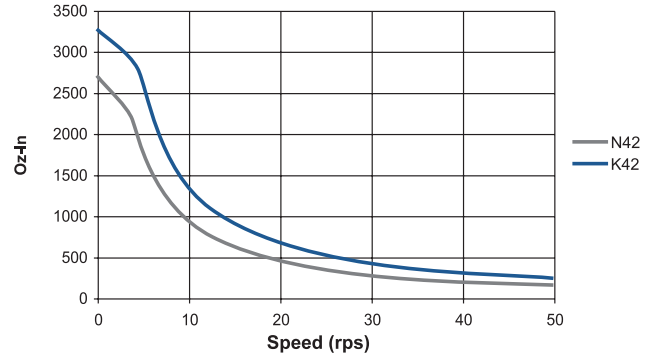
Speed Torque N, K 34



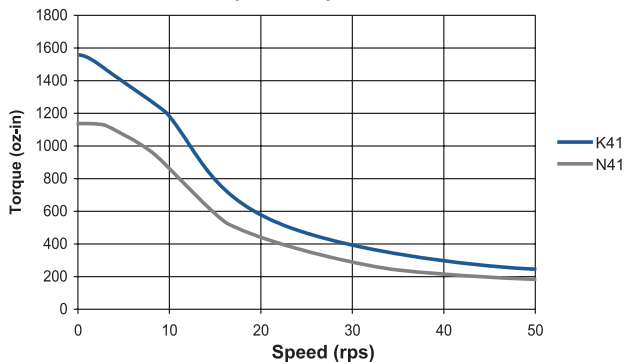
Speed Torque N, K 33



Speed Torque N, K 42



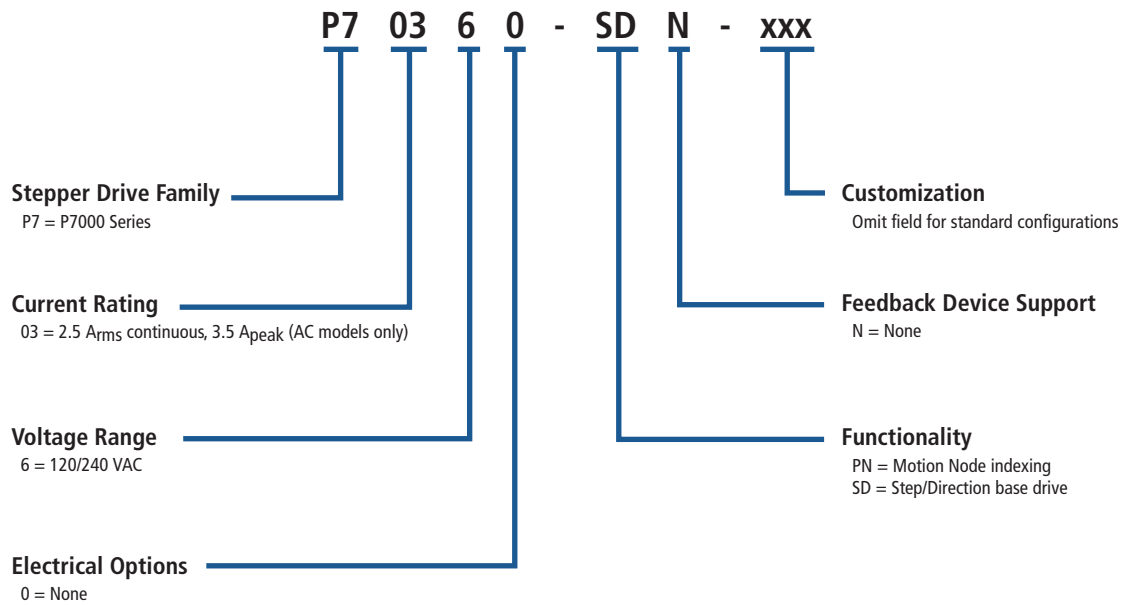
Speed Torque N, K 41



AC Drive	Motor Type
	<b>NEMA 23 T Series</b>
P70360-xxx	T21NRLC-LNN-NS-00
P70360-xxx	T22NRLC-LNN-NS-00
P70360-xxx	T23NRLC-LNF-NS-00
	<b>NEMA 34 N &amp; K</b>
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
	<b>NEMA 42 N &amp; K</b>
P70360-xxx	N41HRLG-LNK-NS-00
P70360-xxx	N42HRLG-LNK-NS-00
P70360-xxx	K41HRLG-LNK-NS-00
P70360-xxx	K42HRLG-LNK-NS-00

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## P7000 Model Number Scheme



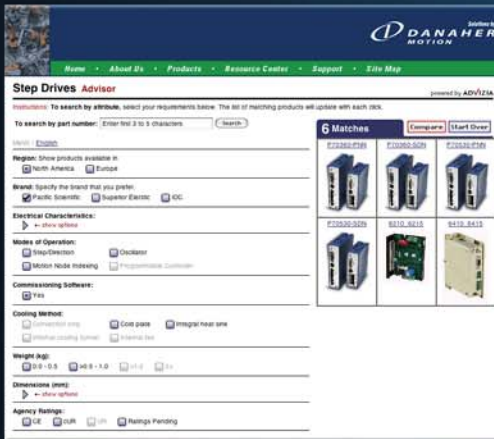
### Accessories

1. 106-113020-01 - Connector kit for P70360-SDN & P70360-PNN included in standard drive package at no additional cost
2. P752-232-9D - RS232 serial communication cable (DB-9 to Mod Jack) - 6 feet, sold separately
3. 768-026902-01 - Terminal Block adaptor for I/O connector, sold separately

## Find additional P7000 product information

DanaherMotion.com offers many new tools to help serve your needs. We've developed an intuitive Web-based system to increase your knowledge of motion control, search our vast product selection by product attribute (using our New Product Advisors), and easily locate your nearest Danaher Motion distributor or Sales office.

Visit [www.DanaherMotion.com](http://www.DanaherMotion.com) for more information and see our latest tools.



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