

Industrial Devices' TB Series rod-type cylinders are ideally suited for high acceleration, very high load and duty cycle automated motion applications. The TB Series features a brushless servo motor as the mechanical power source. The B7000 Servo Drives are designed to optimize the performance of this system. Customer supplied position servo controls can be easily interfaced to the B7000 drives through several choices of command input.

These rod-type cylinders incorporate a 6 pitch (6 turns per inch) acme screw, or a 1 or 4 pitch ball bearing screw to provide a variety of speed and thrust capabilities. Ball screw models are used in applications that require higher speed and duty cycles. Acme screw models generally perform best in applications with up to 60% duty cycle, and where backdrive is not acceptable. The life expectancy of a ball screw is generally better than an acme screw.

Timing belt and gear reductions between the motor and the lead screw widen the range of TB Series model speed and thrust performance.

TB Series Cylinders are available with a holding brake and a dual rod-end bearing to increase side load capacity. Industrial Devices will also discuss unique modifications at the customer's request.

## TB CYLINDER FEATURES

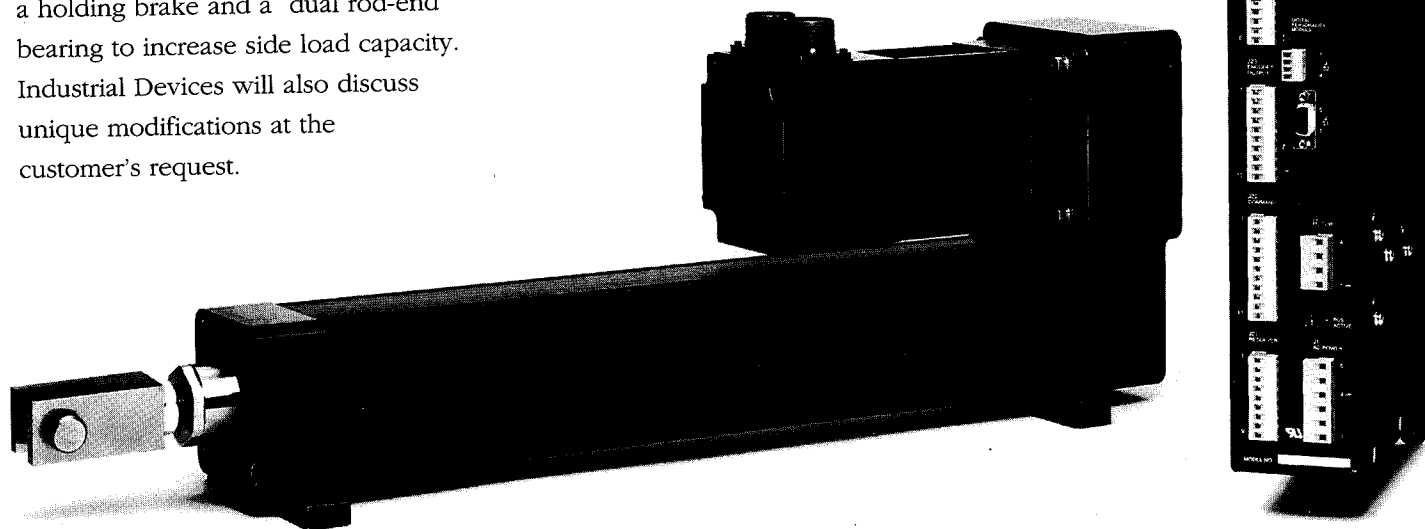
- Rare earth permanent magnet brushless servo motor for high performance
- Up to 100% duty cycle with ball screw models
- Brushless resolver feedback for harsh environments
- Speed to 40 inches per second
- Thrust to 2400 lbs
- Nine standard travel lengths to 60 inches. Custom lengths available.
- Six NFPA style mounting configurations provide direct replacement for hydraulic or pneumatic cylinders
- Four rod end couplings facilitate a variety of loads
- Choice of parallel or in-line models to optimize installation space.
- Hard-coat anodized external surfaces, stainless steel thrust tube provide corrosion protection
- Acme and ball screw models for application flexibility
- Optimized for use with Industrial Devices' B7000 Series brushless servo drive

## B7000 DRIVE FEATURES

- Integral power supply
- Personality modules simplify set up
- Accept analog (velocity/torque) signal or digital step and direction or quadrature position input
- Quadrature encoder signal output derived from resolver.
- UL recognition
- Excellent circuit protection and visual indication of error conditions
- Ideally suited for use with customer-supplied position servo controls

### Also Available

- Brushless servo motors with N and R Series cylinders: NB and RB
  - Compatible with B7000 servo drives
  - Contact your local Industrial Devices distributor or the factory for details



# TB SERIES CYLINDERS

## COMMON SPECIFICATIONS

Thrust Load	2400 lbs max
Speed	40 in/sec at no load
System Backlash	0.015 inch
Thrust Tube	
Side Load Moment	See side load capacity curves on page 257
Rotation	Does not rotate. Note: applying a rotation torque to the thrust tube may damage unit
Standard Travel Lengths	4, 6, 8, 12, 18, 24, 36, 48 and 60 inches

## CONSTRUCTION MATERIALS

Bearing Housings	6061 T-6 aluminum, hard-coat anodized
Cylinder Housing	6063 T-6 aluminum, hard-coated anodized and teflon impregnated
Thrust Tube	Type 304 stainless steel, 1/4 hard, ground and polished
Wiper Seal	Polyurethane
Lead Screw	
Support Bearings	Angular contact, high thrust ball bearing
Acme Screw; drive nut	1.0 inch diameter, alloy steel screw; lubricated bronze drive nut
Ball Screw; drive nut	1.0 inch diameter, hardened alloy steel screw; alloy steel, heat treated ball nut

## WEIGHT

(approximate, without options)

6 inch stroke unit	34 lbs, add 0.75 lbs per additional inch of stroke
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## MOTOR SPECIFICATIONS

Type	Brushless servo motor, rare earth magnets, IP65 construction
Inductance (line-line)	53 mH
Resistance (line-line)	10-15 Ohms
Torque Constant	10.8 in-lbs/Amp
Voltage Constant	128 V/K rpm
Torque	
Peak	66 in-lbs
Continuous	33 in-lbs
Inertia	0.0018 in-lb-sec <sup>2</sup>
Connections	MS-type motor and resolver connections, 12 foot motor and resolver cables included

## ENVIRONMENTAL OPERATION

For applications beyond standard allowable environmental conditions, see the Options and Accessories section.

Temperature Range	-20° to 140°F, -F sub-freezing option required to operate acme screw models below 32°F.
Moisture	Humid, but not direct moisture contact -W water resistant option allows some direct contact
Contaminants	Non-corrosive, non-abrasive



## INDIVIDUAL MODEL SPECIFICATIONS—BALL SCREW MODELS

	TB4991B	TB4101B	TB4151B	TB4201B	TB4501B	TB41001B	TB4994B	TB4104B	TB4154B	TB4204B	TB4504B	TB41004B
Drive Type	In-Line Timing Belt	In-Line Timing Belt	Timing Belt	Timing Belt	Helical Gear	Helical Gear	In-Line Timing Belt	In-Line Timing Belt	Timing Belt	Timing Belt	Helical Gear	Helical Gear
Drive Ratio (motor:screw)	1:1	1:1	1.5:1	2:1	5:1	10:1	1:1	1:1	1.5:1	2:1	5:1	10:1
Screw Pitch (rev/inch)	1	1	1	1	1	1	4	4	4	4	4	4
Load Before Back Driving (lbs)	15	15	20	20	50	100	75	75	85	90	225	450

\* Note: For Models TB4101 and TB4991B, firm system response is more difficult to achieve due to large inertial load. Consult factory to review your application if you plan to use these models.

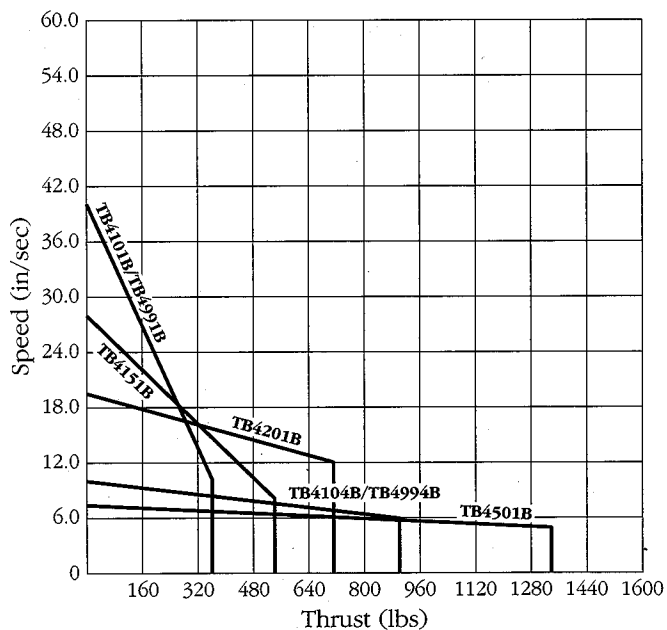
## SYSTEM PERFORMANCE USING B7000 SERVO DRIVES

Maximum acceleration with a 6 inch stroke, unloaded actuator.

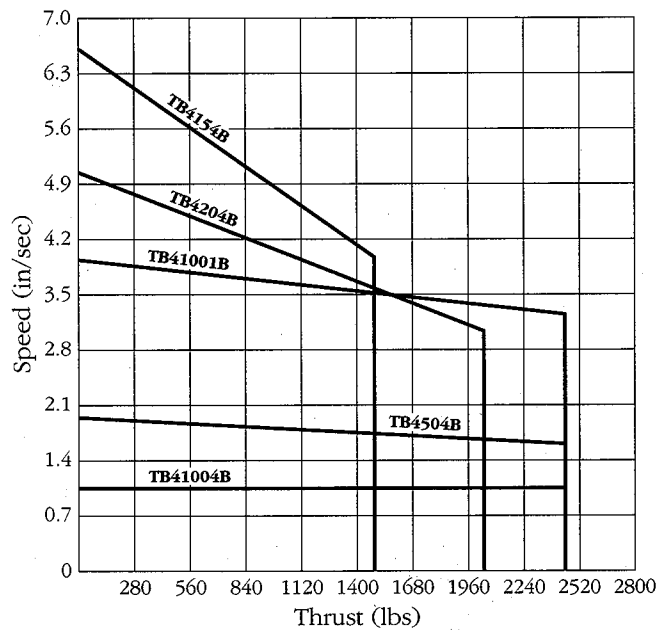
(ips <sup>2</sup> at no load)	1130	1030	880	410	210	370	340	290	140	72	
Stroke (in)											
Maximum Speed	6-36	40	27	20	8	4	10	6.7	5	2	1
Speed	48	35	27	20	8	4	9	6.7	5	2	1
	60	23	23	20	8	4	6	6	5	2	1
Maximum Thrust (lbs)	350	525	700	1300	2400	1000	1500	2000	2400	2400	
Repeatability (inches)	± 0.001	± 0.001	± 0.001	± 0.001	± 0.001	± 0.001	± 0.001	± 0.001	± 0.001	± 0.001	

## A COMPARISON OF SPEED VS THRUST PERFORMANCE

For duty cycle limitations, see the individual model performance curves on page 218.



HIGHER SPEED MODELS



HIGHER THRUST MODELS

# TB SERIES CYLINDERS

## INDIVIDUAL MODEL SPECIFICATIONS—ACME SCREW MODELS

TB4996A	TB4106A	TB4156A	TB4206A	TB4506A	TB41006A
In-Line Flex Coupled	Timing Belt	Timing Belt	Timing Belt	Helical Gear	Helical Gear
1:1	1:1	1.5:1	2:1	5:1	10:1
6	6	6	6	6	6
2400	2400	2400	2400	2400	2400

## SYSTEM PERFORMANCE USING B7000 SERVO DRIVES

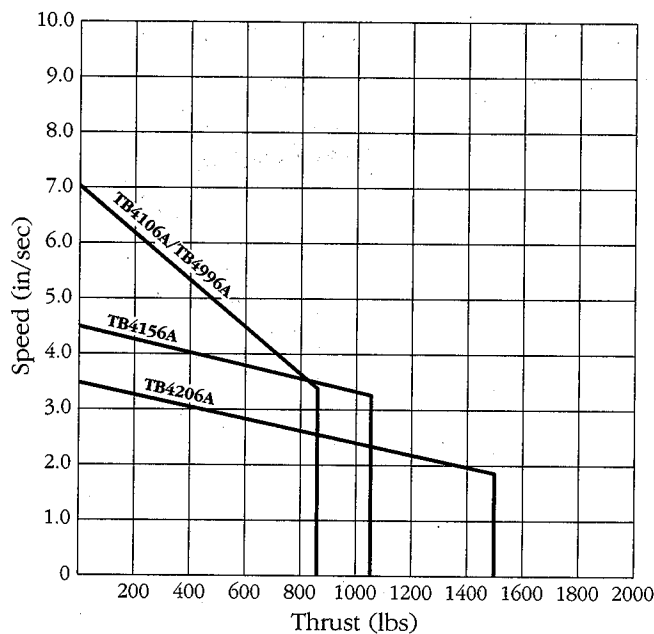
	370	370	340	290	140	72
<i>Stroke</i>						
6-36 in	7	7	4.5	3.5	1.5	0.75
48	<b>5.5</b>	<b>5.5</b>	4.5	3.5	1.5	0.75
60	<b>4</b>	<b>4</b>	4	3.5	1.5	0.75

*When applying TB cylinders with greater than 36 inch stroke, maximum speed may be limited by critical screw speed, as shown here in bold. The individual model performance curves shown on the following pages have been qualified (horizontal black lines) for critical speed limitations in longer lengths.*

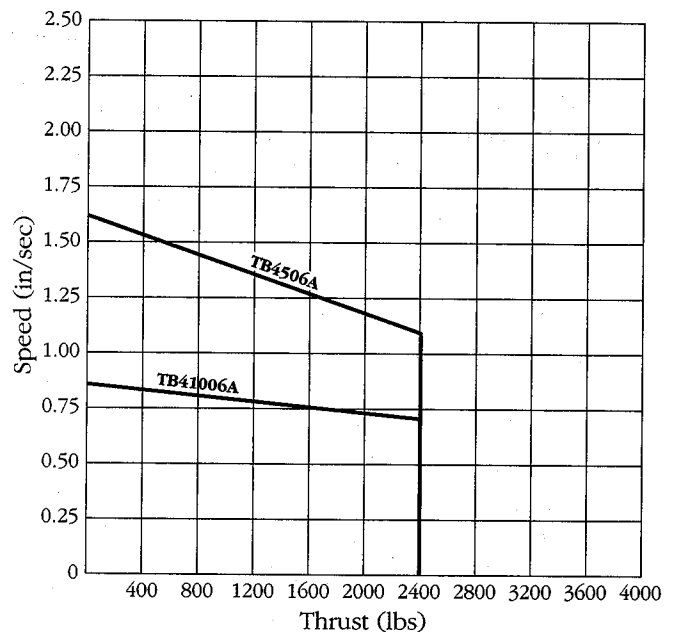
Maximum Thrust (lbs)	850	850	1050	1525	2400	2400
Repeatability (inches)	± 0.001	± 0.001	± 0.001	± 0.001	± 0.001	± 0.001

## A COMPARISON OF SPEED VS THRUST PERFORMANCE

For duty cycle limitations, see the individual model performance curves on page 219.



HIGHER SPEED MODELS



HIGHER THRUST MODELS

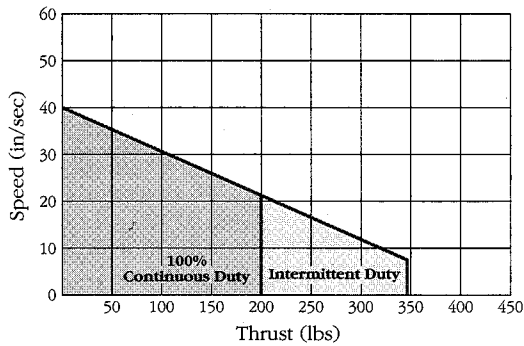
## THRUST VS. SPEED PERFORMANCE

Continuous duty region (max rms torque over any 10 minute interval)  
 Intermittent duty region (max 2 second duration)

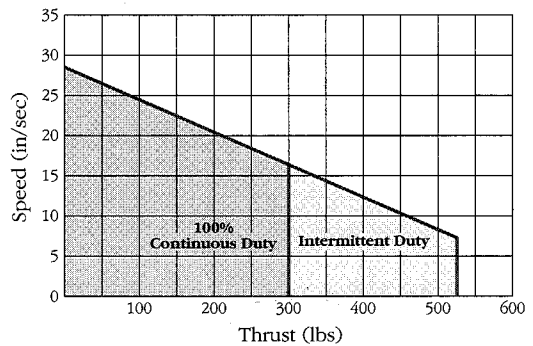
- Top speeds limited by critical screw velocity are shown as horizontal black lines.
- Rated speeds shown are for operation on 230 VAC, 3-phase supply.  
 Reduce to 70% for 230 VAC, 1-phase and to 40% for 115 VAC, 1-phase operation.

### BALL SCREW MODELS USING B7001 AND B7002 SERVO DRIVES

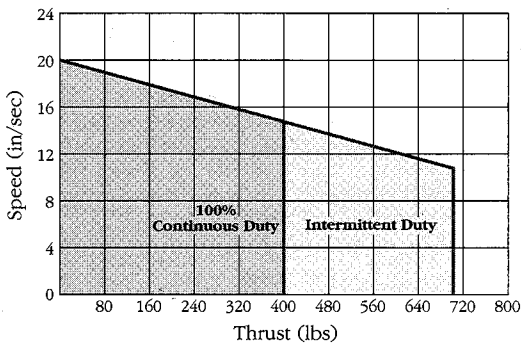
**TB4101B and TB4991B**



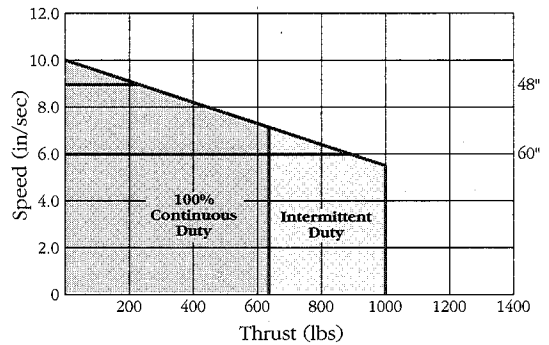
**TB4151B**



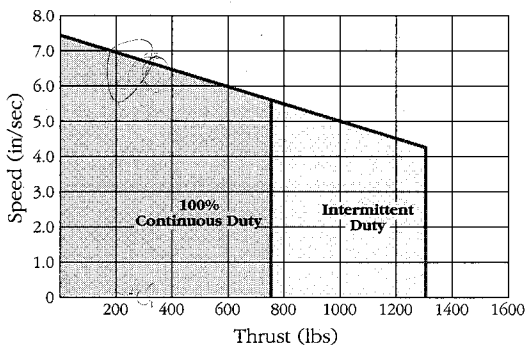
**TB4201B**



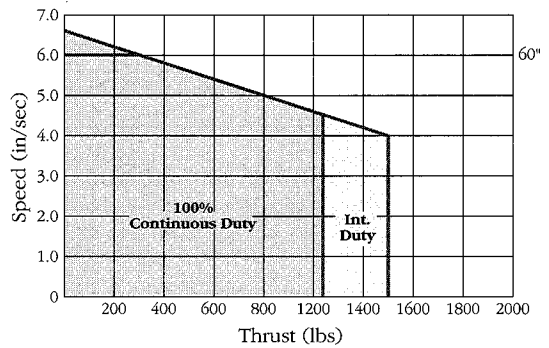
**TB4104B and TB4994B**



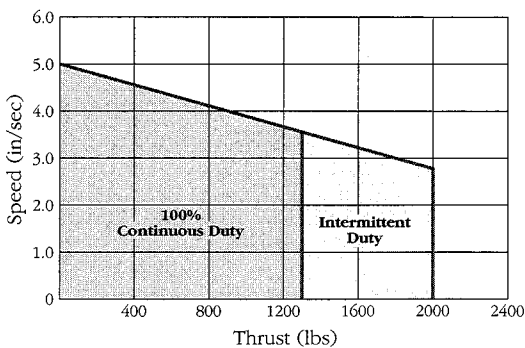
**TB4501B**



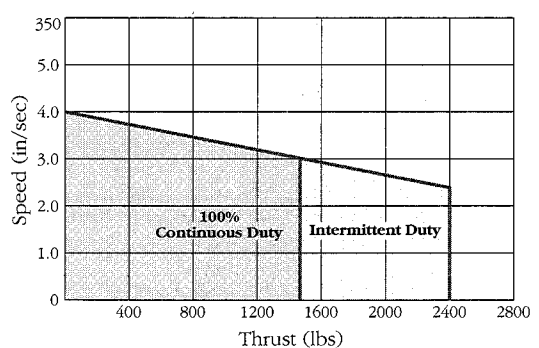
**TB4154B**



**TB4204B**



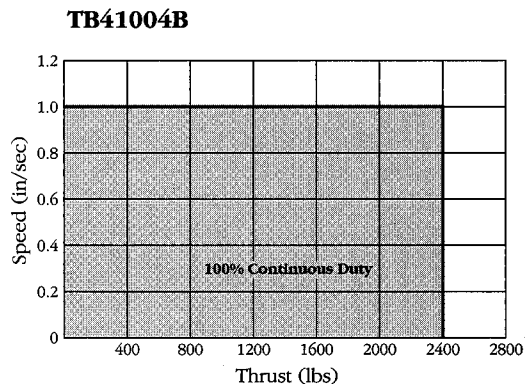
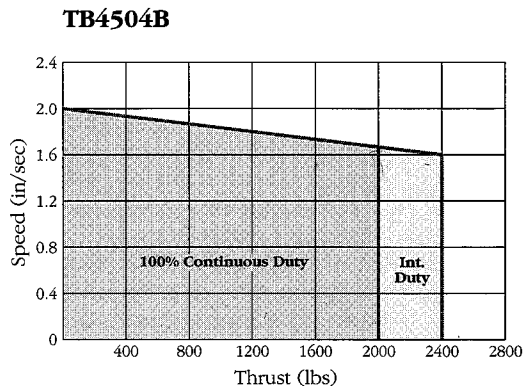
**TB41001B**



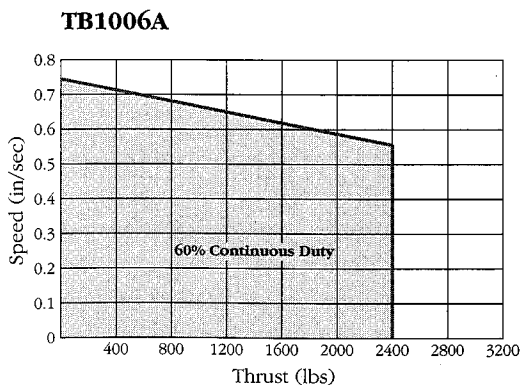
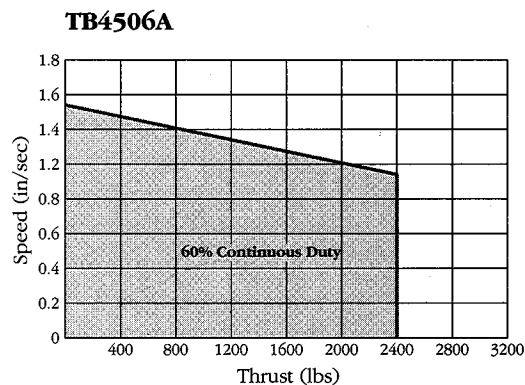
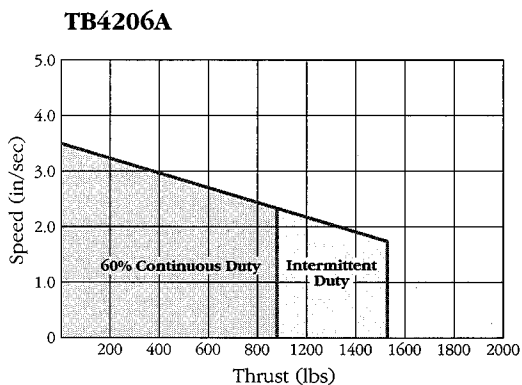
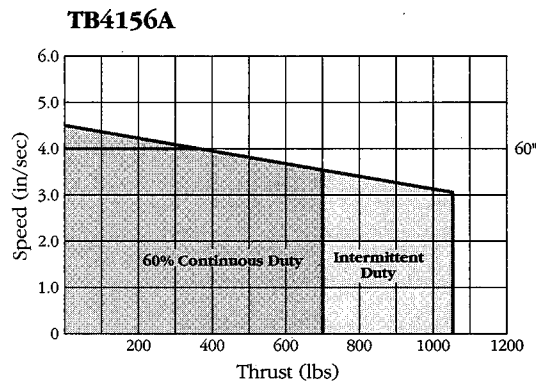
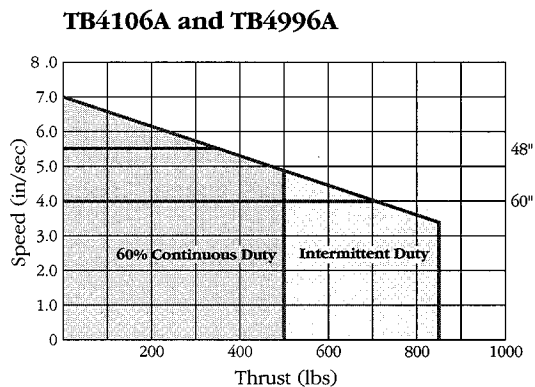


# TB SERIES CYLINDERS

## THRUST VS. SPEED PERFORMANCE BALL SCREW MODELS (CONTINUED)



## ACME SCREW MODELS USING B7001 AND B7002 SERVO DRIVES



## SEVEN STEPS TO ORDERING A COMPLETE TB SYSTEM

For help:

- Complete the Application Data Form on pages 26 and 27.
- Refer to the Engineering Section for selection assistance.
- Consult your local Industrial Devices distributor, or call the factory.

### 1. BASE MODEL NUMBER

Select the TB model which provides sufficient thrust and speed for the application, with a comfortable margin of safety. Available thrust will be consumed by acceleration, friction, pushing/pulling against an external force, and is the case of a vertical application, supporting the load against gravity. Refer to the TB Speed vs. Thrust curves in this section. When making this selection, be sure to consider duty cycle, side loading, back driving, and the other design considerations from the IDC Application Data Form.

TB cylinders with gear or timing belt drive reductions have the motor mounted parallel to the lead screw. With in-line units, the motor is always coupled directly to the screw shaft, with no reduction.

*For Models TB4101B and TB4991B, firm system response may be more difficult to achieve due to large inertial load. Be sure to consult our factory to review your application if you plan to use these models.*

### 2. STROKE LENGTH

Nine standard travel lengths are available from 4 to 60 inches. Custom in-between lengths are also available. Consult your IDC distributor or the factory for details.

To maximize cylinder life, the thrust tube should not impact either physical end of stroke during normal operation. Extra travel length is needed to decelerate the load to a stop when an end-of-travel limit switch is encountered. This extra travel distance depends on load and speed.

*Industrial Devices recommends the — DB option for all TB cylinders above 36 inch stroke when positioning an unguided load.*

① MODEL NUMBER				② STROKE LENGTH	③ CYLINDER MOUNTING	④ ROD END	⑤ OPTIONS																																																																																																																																																
Rod-Type Cylinder	B4 Series Motor	Drive Ratio	Screw Pitch, Type																																																																																																																																																				
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