



Industrial Devices' TH Series rod-type cylinders are ideally suited for very high load and duty cycle automated motion applications. The TH Series can answer a variety of motion control needs, including simple extend-retract positioning, compound motion profiling, in-position holding, PLC or computer interfacing, and multi-operation programs, using a simple operator interface.

As a replacement for troublesome hydraulic and pneumatics, TH Series systems are cleaner and easier to maintain, and are often less expensive.

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 with a 160 volt DC motor as the mechanical power source. 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. Acme screws also provide faster stopping because of their frictional damping qualities. Because they are self locking, no movement occurs when an external force is applied. The life expectancy of a ball screw is generally better than an acme screw.

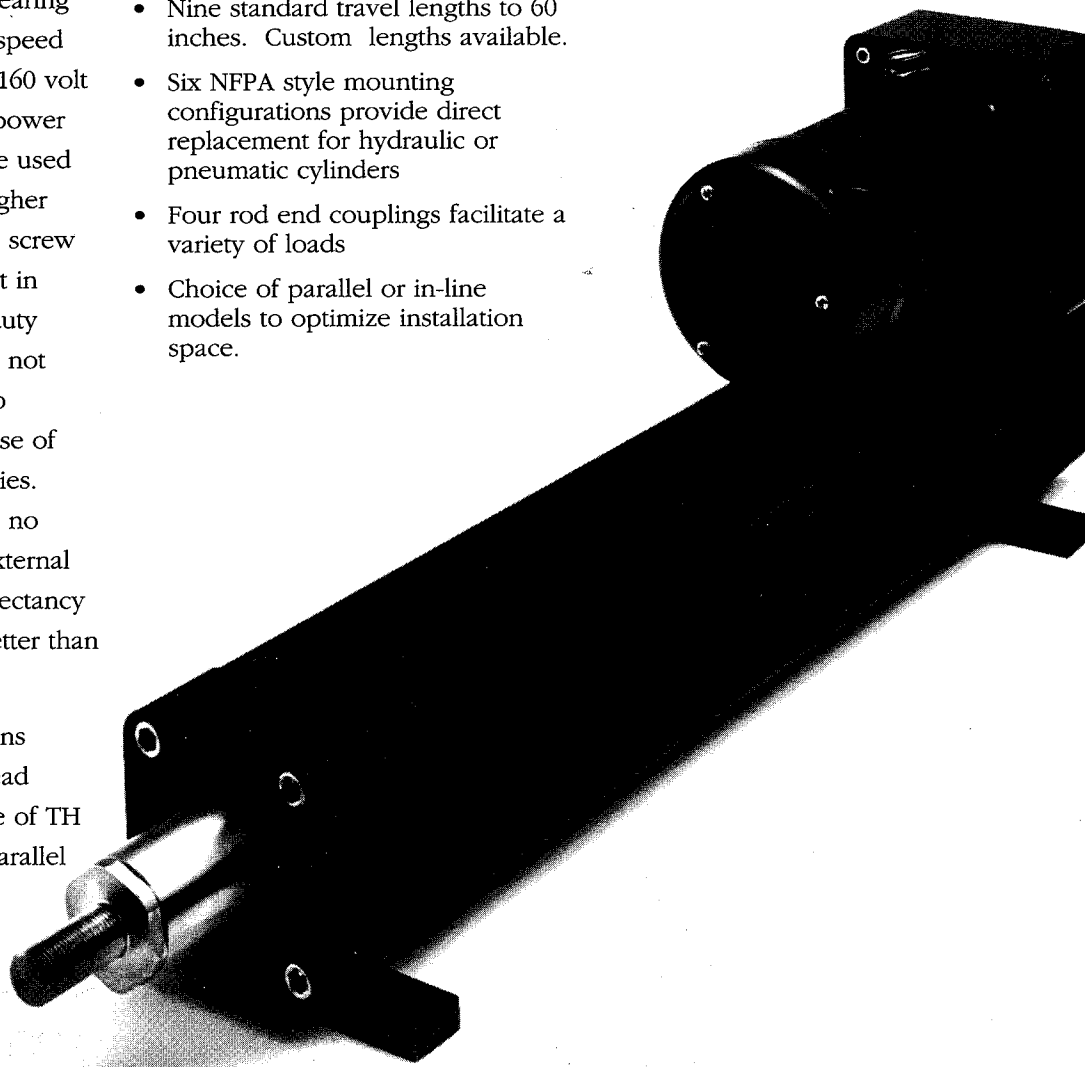
Timing belt and gear reductions between the motor and the lead screw further widen the range of TH Series model performance. Parallel

motor mounted models can have many ratios, while in-line models are always direct driven, with the motor directly coupled to the screw.

TH Series cylinders are available with several time proven options for application in industrial environments. Options include a holding brake, an encoder for position feedback, and a dual rod-end bearing to increase side load capacity. Industrial Devices will also discuss unique modifications at the customer's request.

FEATURES

- Up to 100% duty cycle with ball screw models
- 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
- 160 volt permanent magnet DC motor for high performance
- Rated motor brush life of 5 million cycles
- Optimized for use with H4951 servo control, offering:
 - encoder based positioning
 - repeatability to ± 0.001 inches
 - simple keypad programming
 - integral operator interface
 - see control specifications on page 121.



TH 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 load 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
--------------------	--

MOTOR SPECIFICATIONS

Type	Permanent magnet 2-pole, 160 volt DC motor; replaceable brushes
Inductance	12 mH
Terminal Resistance	1.5 ohms \pm 20%
HIPOT breakdown	500 VAC
Current	
Continuous	5 A max
Peak	15 A max
Torque Constant	67 oz-in/Amp
Voltage Constant	49 V/Krpm
Operating Voltage	160V max
No Load Speed	3,200 rpm (H4951 control limits speed to 2400 rpm max)
Connections	Quick Disconnect: 3 contact receptacle, including case ground, in anodized aluminum shell, includes 12 ft cable with molded plug on one end.
Anticipated life of brushes	5,000,000 cycles
Temperature	180°F (82°C) Maximum allowable motor case temperature Actual motor case temperature is ambient, duty cycle, speed and load dependent. Refer to speed vs. thrust performance curves for system duty ratings.

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
Contaminants	Non-corrosive, non-abrasive



INDIVIDUAL MODEL SPECIFICATIONS—BALL SCREW MODELS

	TH4991B	TH4101B	TH4151B	TH4201B	TH4501B	TH4994B	TH4104B	TH4154B	TH4204B	TH4504B	TH41004B
Drive Type	In-Line Timing Belt	In-Line Timing Belt	Timing Belt	Timing Belt	Helical Gear	Helical Gear	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	1.5:1	2:1	5:1	10:1
Screw Pitch (rev/inch)	1	1	1	1	1	1	4	4	4	4	4
Load Before Back Driving (lbs)	15	15	20	20	50	100	75	85	90	225	450

SYSTEM PERFORMANCE USING H4951 CONTROL

Maximum Acceleration with a 6" stroke actuator.

(ips ² at no load)	280	232	194	87	44	70	58	48	22	11
-------------------------------	-----	-----	-----	----	----	----	----	----	----	----

Stroke	TH4101B	TH4151B	TH4201B	TH4501B	TH4104B	TH4154B	TH4204B	TH4504B	TH41004B
Maximum 6-36 in	40	27	20	8	4	10	6.7	5	2
Speed	48	35	27	20	8	4	9	6.7	5
	60	23	23	20	8	4	6	6	5

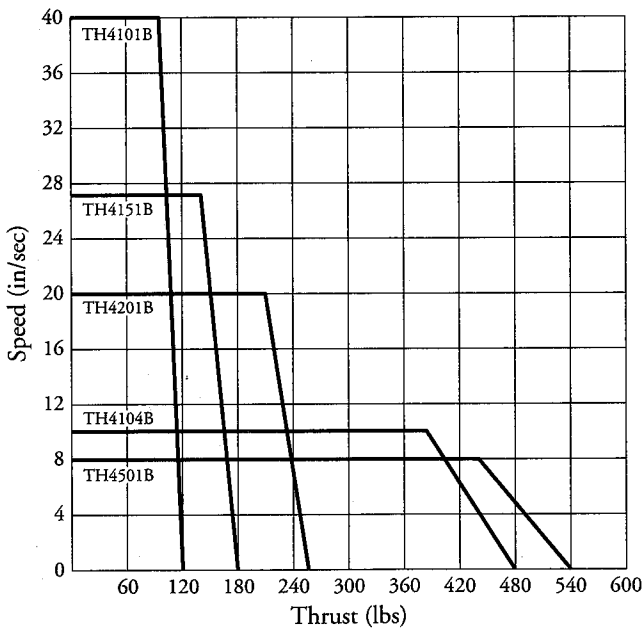
When applying TH cylinders with greater than 36 inch stroke, maximum speed may be limited by critical screw speed, as shown here in bold. The individual model performance curves shown on the following pages have been qualified (horizontal black lines) for critical speed limitations in longer lengths.

Maximum Thrust (lbs)	120	180	260	540	1,080	480	720	1,040	2,160	2,400
----------------------	-----	-----	-----	-----	-------	-----	-----	-------	-------	-------

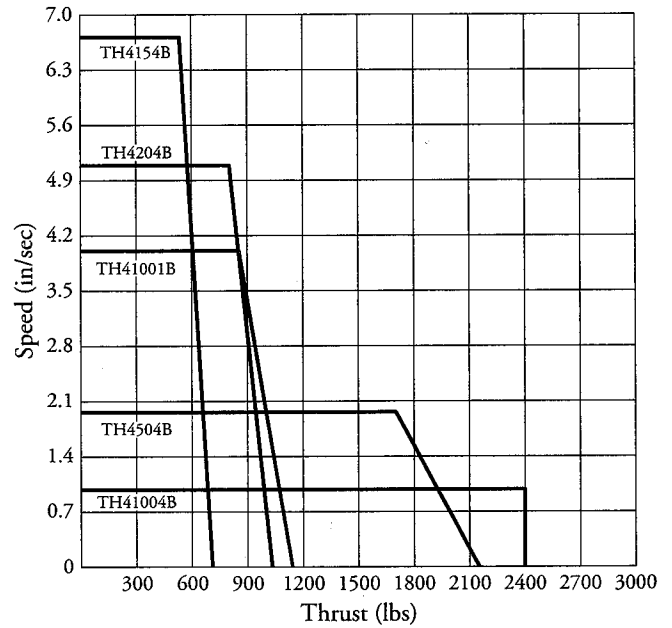
Repeatability (inches)	± 0.001	± 0.001	± 0.001	± 0.001	± 0.001	± 0.001	± 0.001	± 0.001	± 0.001	± 0.001
------------------------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------

A COMPARISON OF SPEED VS THRUST PERFORMANCE

For duty cycle limitations, see the individual model performance curves on page 96.



HIGHER SPEED MODELS



HIGHER THRUST MODELS

TH SERIES CYLINDERS

INDIVIDUAL MODEL SPECIFICATIONS—ACME SCREW MODELS

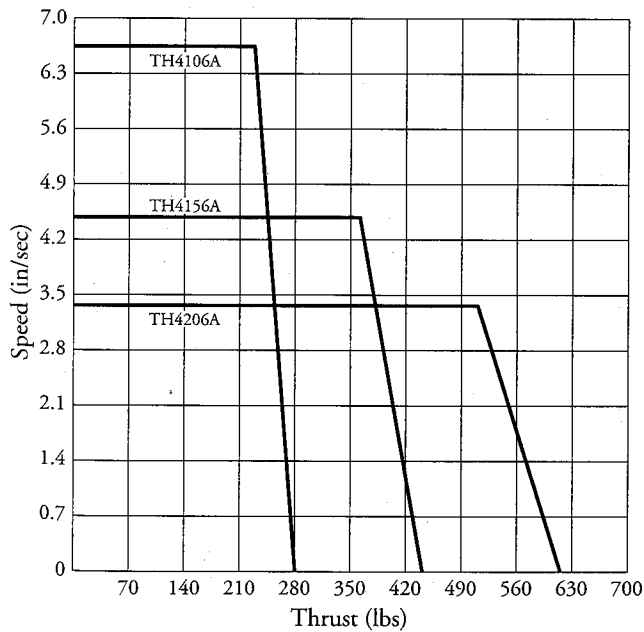
	TH4996A	TH4106A	TH4156A	TH4206A	TH4506A	TH41006A
Drive Type	In-Line Flex Coupled	Timing Belt	Timing Belt	Timing Belt	Helical Gear	Helical Gear
Drive Ratio (motor:screw)	1:1	1:1	1.5:1	2:1	5:1	10:1
Screw Pitch (rev/inch)	6	6	6	6	6	6
Load Before Back Driving (lbs)	2400	2400	2400	2400	2400	2400

SYSTEM PERFORMANCE USING H4951 CONTROL

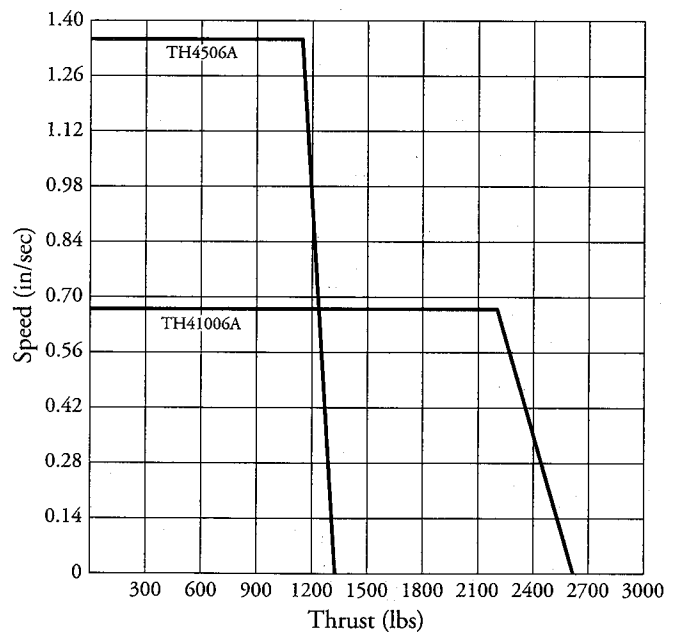
Maximum Acceleration With a 6" stroke actuator: (ips ² at no load)						
	46	46	39	32	14	7
<i>Stroke</i>						
Maximum 6-36 in Speed	6.7	6.7	4.4	3.3	1.3	0.67
	48	5.5	4.4	3.3	1.3	0.67
	60	4	4	3.3	1.3	0.67
<i>When applying TH cylinders with greater than 36 inch stroke, maximum speed may be limited by critical 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.</i>						
Maximum Thrust (lbs)	280	280	440	640	1,333	2,400
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 97.



HIGHER SPEED MODELS



HIGHER THRUST MODELS

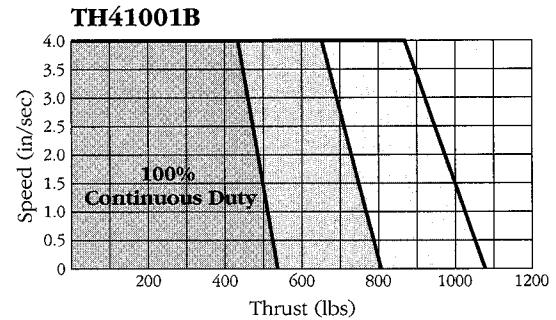
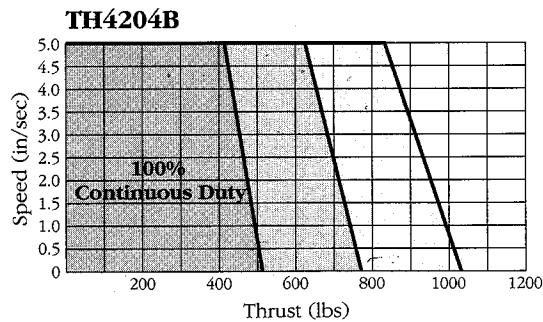
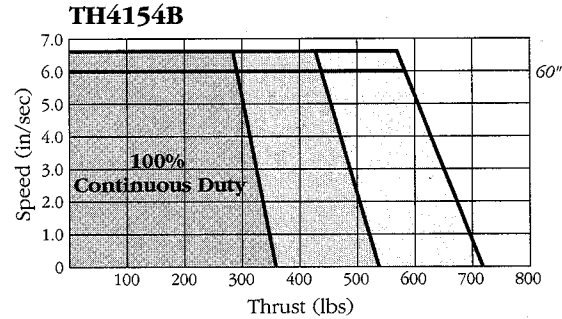
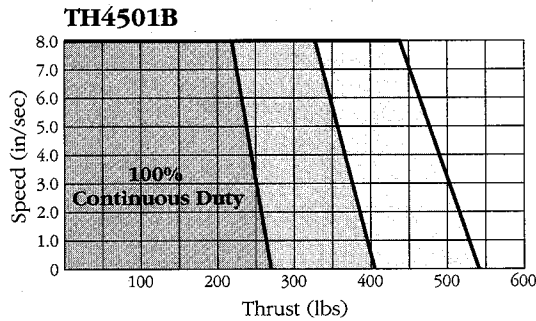
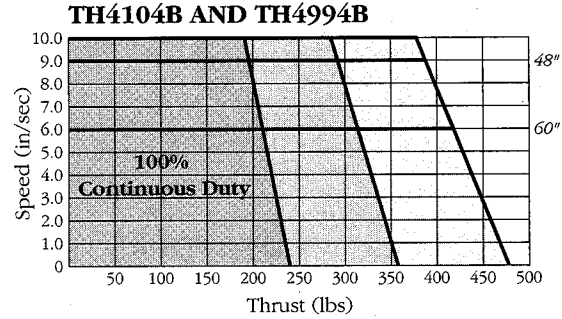
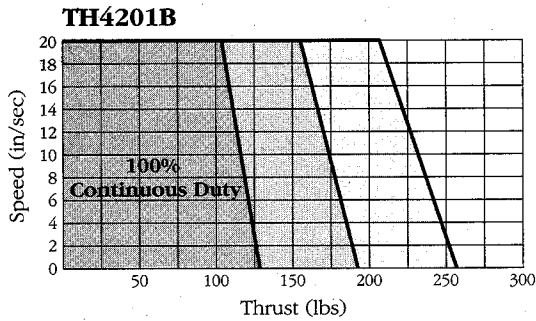
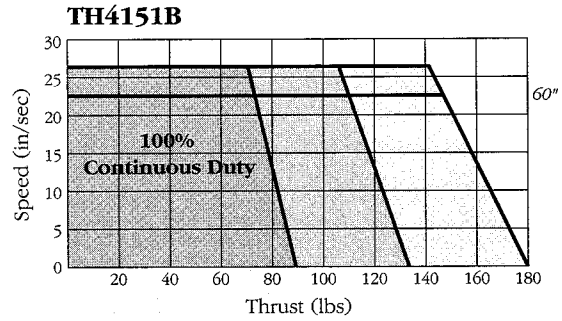
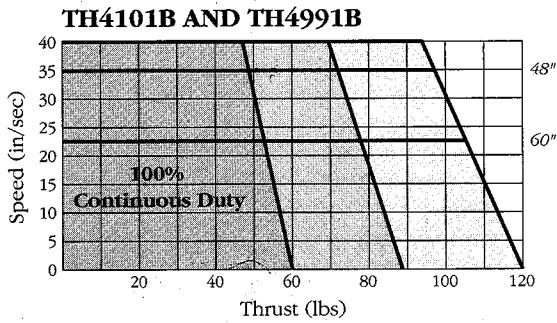
THRUST VS. SPEED PERFORMANCE

Performance using H4951 Control.

- Duty cycle percentage of "on time" is shown on each performance curve. For operation above the continuous region, motor temperature rise due to load, speed, number of acceleration/decelerations, and ambient temperature require consideration.
- Longer travel length cylinders: Top speeds limited by critical screw velocity are shown as horizontal black lines.

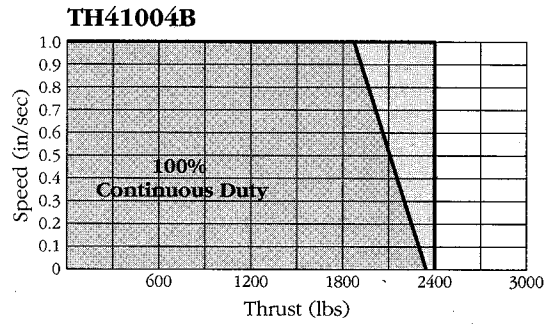
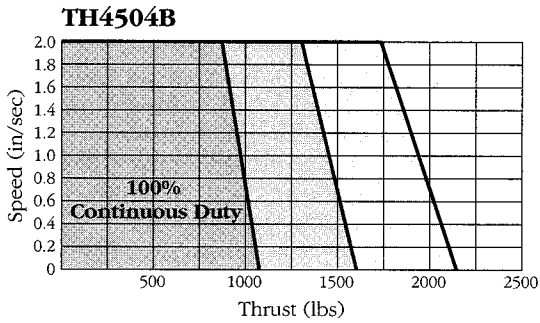
BALL SCREW MODELS

Continuous duty region (max rms torque, over any 10 minute interval)
 50% duty max region (5 minute on time max)
 Peak region (max 2 second duration)

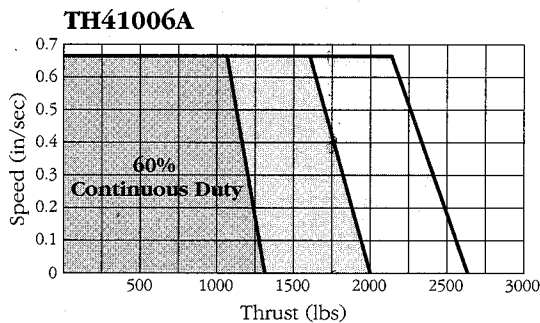
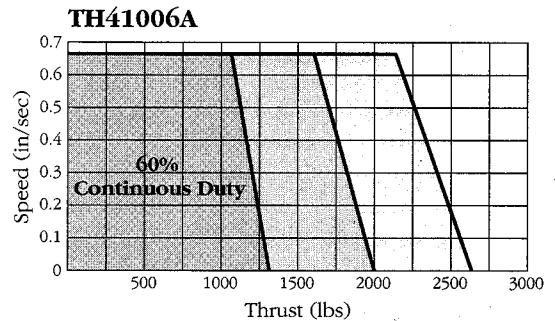
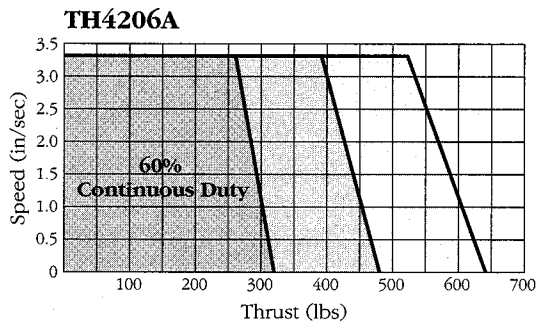
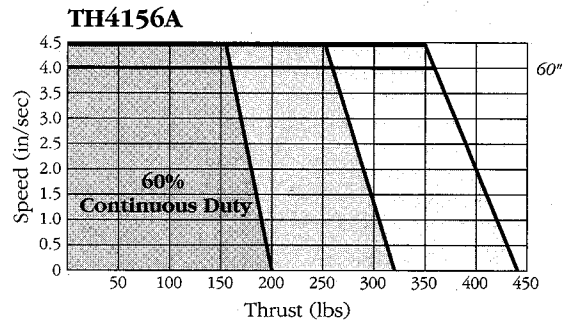
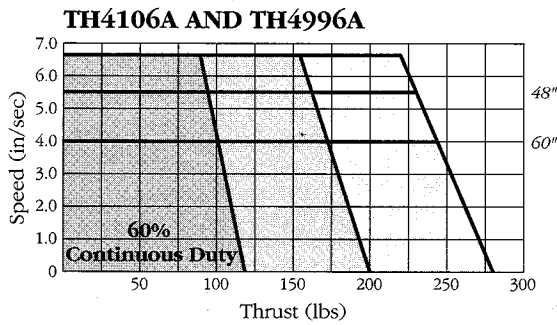


TH SERIES CYLINDERS

THRUST VS. SPEED PERFORMANCE BALL SCREW MODELS (CONTINUED)



ACME SCREW MODELS



SEVEN STEPS TO ORDERING A COMPLETE TH SYSTEM

The following steps will guide you to a complete TH Series system for your application.

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 TH 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 TH 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.

TH 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.

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 TH cylinders above 36 inch stroke when positioning an unguided load.

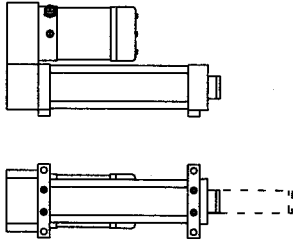
① MODEL NUMBER		② STROKE LENGTH		③ CYLINDER MOUNTING		④ ROD END		⑤ OPTIONS	
Rod-Type Cylinder	H 4 Series Motor	Drive Ratio	Screw Pitch, Type						
T	H4	<input type="checkbox"/>	<input type="checkbox"/>	—	<input type="checkbox"/>	—	<input type="checkbox"/>	—	<input type="checkbox"/>
Parallel Models Ball Screw Acme Screw TH4101B TH4106A TH4151B TH4156A TH4201B TH4206A TH4501B TH4506A TH41001B TH41006A TH4104B TH4154B TH4204B TH4504B TH41004B		1 1.5 2 5 10 99*	1B 4B 6A	4 6 8 12 18 24 36 48 60 Custom lengths available	MS2 Side Lugs MS6 Side tapped holes MP2 Rear Clevis MP3 Pivot Base MF1 Front Flange MF2 Rear Flange MF3 Front and Rear Flange MT2 Trunnion (In-line models only)	MT1 Male thread FT1 female thread FS2 Spherical joint FC2 Clevis	-BS -EM -DB -F (Acme models only) -W -Z* -ZH*	*Z or -ZH required for use with H4951 control.	
In-Line Models TH4991B TH4996A TH4994B									

3. CYLINDER MOUNTING

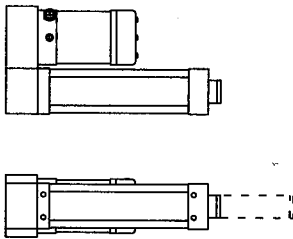
Specify any one of these cylinder mounting options. See page 100 for dimensional drawings.

Cylinder base mount options -MP1, -MF2, -MF3 cannot be ordered with in-line models.

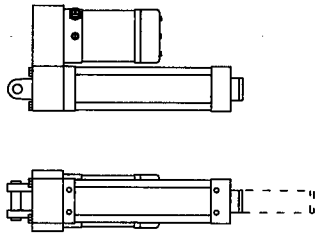
MS2 Side Lugs



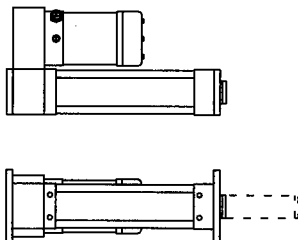
MS6 Side Tapped Holes



MP2 Rear Clevis

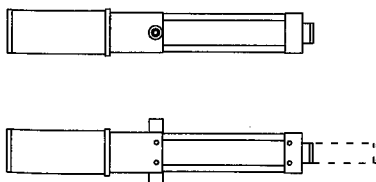


MF1,2,3 Rectangular Flange



MF1 Front Flange
MF2 Rear Flange
MF3 Both FLanges

MT2 Trunnion (In-line Models Only).



4. ROD ENDS

IDC offers 4 rod end options for TH Series cylinders. Carefully consider the best method of attaching the load to provide optimum performance and long life, by preventing excessive backlash, side load moments, rod end rotation, and misalignment. To determine overall cylinder length, be sure to include the rod end dimensions, see page 100.

- FT1 Female thread
- MT1 Male thread
- FS2 Spherical joint
- FC2 Clevis

5. OPTIONS

Industrial Devices offers several TH Series cylinder options to satisfy unique application requirements.

See the Options and Accessories section for complete specifications of these options.

- BS Holding Brake
75 in-lb holding brake mounted on the rear lead screw shaft extension. *Not available on in-line models or with cylinder base mount options (-MF2, -MF3, -MP2).*
- DB Dual Rod End Bearing
Dual rod-end bearings increase side moment load rating to 3000 in-lbs. *This option reduces actual stroke length by 1.5 inches.*
- EM Encoder
500 line incremental encoder mounted on the rear shaft of the motor. Order -Z or -ZH instead of -EM when using cylinders with H4951 control.
- F Sub-Freezing Environment
Increased acme nut clearances allow contraction when operating an acme screw model below 32°F. Recommended operating range with -F option is -20°F to 105°F. *Increases system backlash to 0.025 inches max.*

- Q Motor Quick Disconnect
Male quick disconnect receptacle installed in the motor housing, includes a 12 ft. motor cable with molded quick disconnect plug.
- W Water Resistant Option
provides protection from light moisture contact with cylinder.
- Z and -ZH Encoder and Home Position Sensor
Required for TH cylinders using the H4951 control.
- Z Combines -EM encoder with one RPS-1 normally open reed switch, tested at factory as a system. -ZH combines -EM with one RP1, normally open Hall effect switch.

6. ACCESSORIES

Accessories are ordered as separate items, with separate model numbers. **Details can be found in the Options and Accessories section.**

Magnetic Position Sensors

Position sensors are available for stopping position indication, for changing direction or speed, and more.

The H4951 control uses a normally open switch (RP1 or RPS-1) for home positioning, and a normally closed switch (RP2 or RPS-2) for end-of-travel limit sensing. **To maximize cylinder life, IDC recommends the use of end-of-travel limit switches with all cylinders.**

- RP1 Normally open Hall-effect switch
- RP2 Normally closed Hall-effect switch
- RPS-1 Normally open reed contact switch
- RPS-2 Normally closed reed contact switch

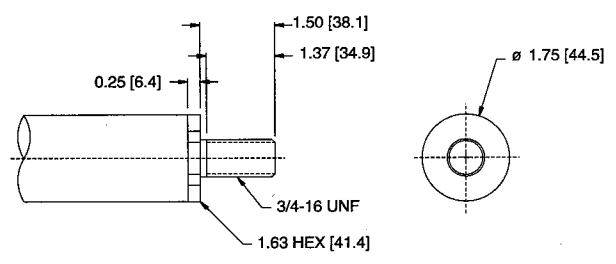
7. H4000 SERIES CONTROLS

To complete the system, IDC offers controls which are optimized to run TH Series cylinders.

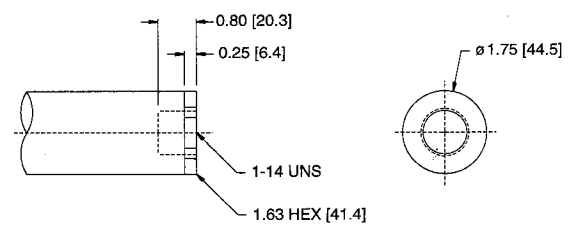
Details of the H4951 Control begin on page 121.

ROD END DIMENSIONS

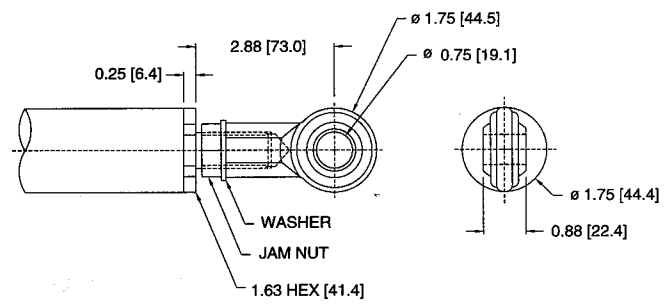
MTI



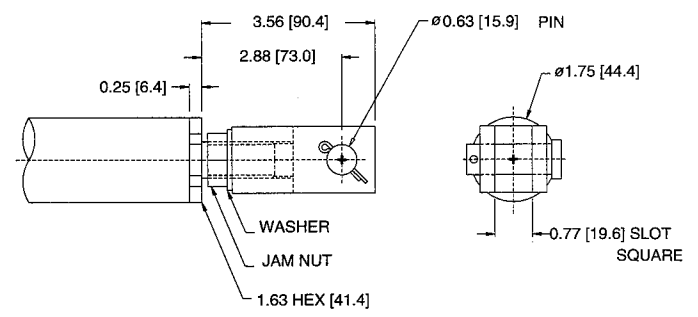
FTI



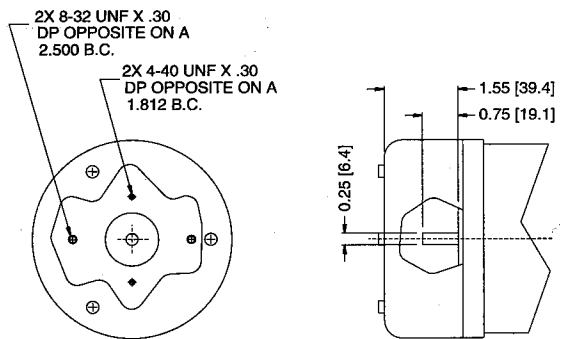
FS2



FC2



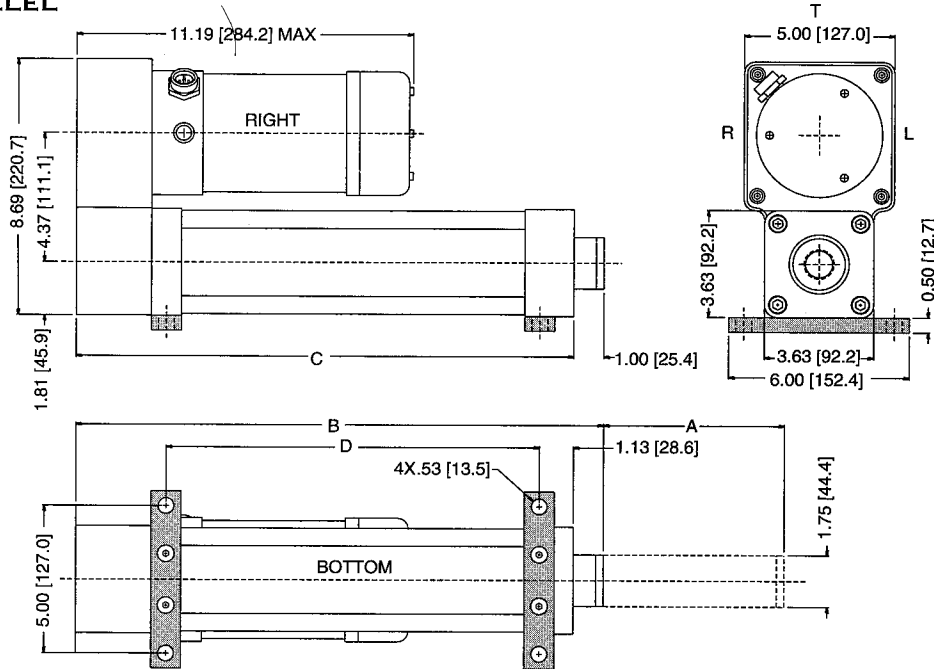
MOTOR DETAILS



TH SERIES CYLINDERS

MF2 SIDE LUGS

PARALLEL

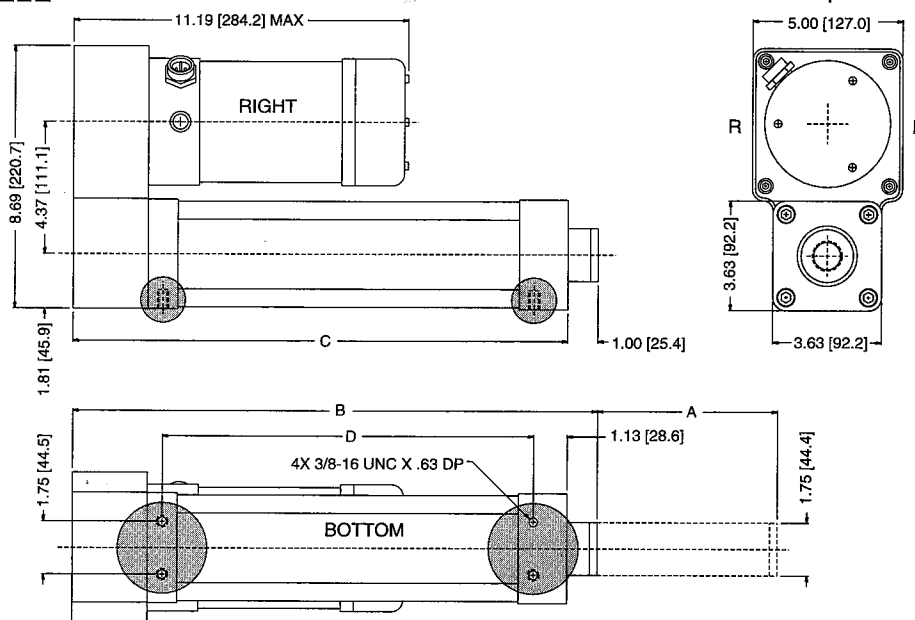


- CAD drawings available on diskette
- Include rod end dimensions, see page 100.

	Inches	(Metric)						
A Strokes	4.00	(101.6)	12.00	(304.8)	36.00	(914.4)	B Retract	stroke + 11.50 (292.1)
	6.00	(152.4)	18.00	(457.2)	48.00	(1,219.2)	C Mounting	stroke + 10.50 (266.7)
	8.00	(203.2)	24.00	(609.6)	60.00	(1,524.0)	D Centers	stroke + 6.37 (161.8)

MS6 SIDE TAPPED HOLES

PARALLEL

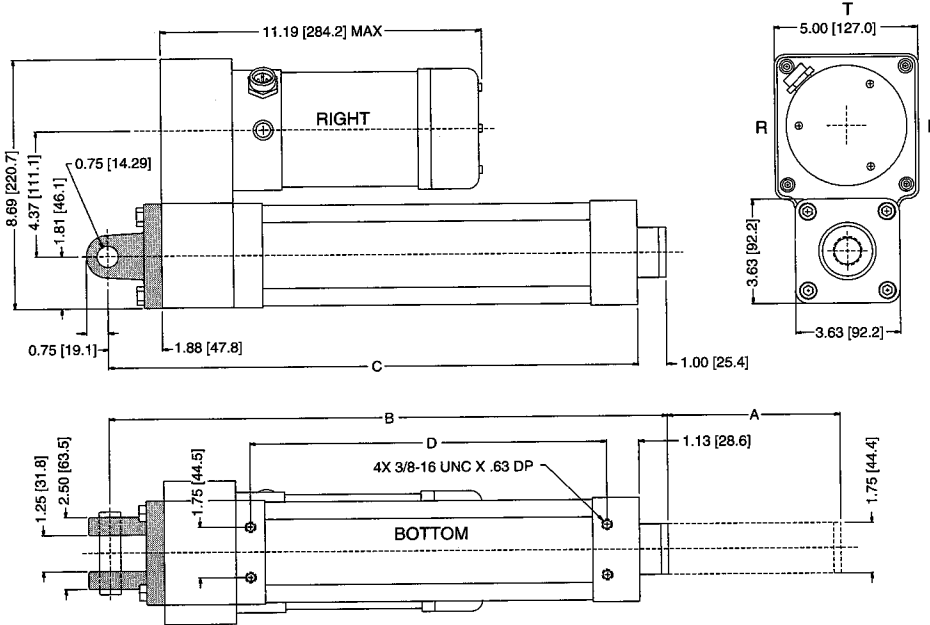


- CAD drawings available on diskette
- Include rod end dimensions, see page 100.

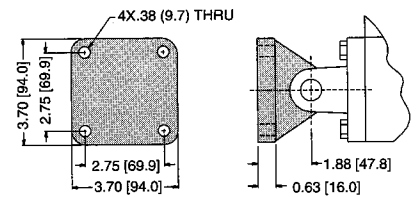
	Inches	(Metric)						
A Strokes	4.00	(101.6)	12.00	(304.8)	36.00	(914.4)	B Retract	stroke + 11.50 (292.1)
	6.00	(152.4)	18.00	(457.2)	48.00	(1,219.2)	C Mounting	stroke + 10.50 (266.7)
	8.00	(203.2)	24.00	(609.6)	60.00	(1,524.0)	D Centers	stroke + 6.37 (161.8)

MP2 REAR CLEVIS PARALLEL

- CAD drawings available on diskette
- Include rod end dimensions, see page 100.



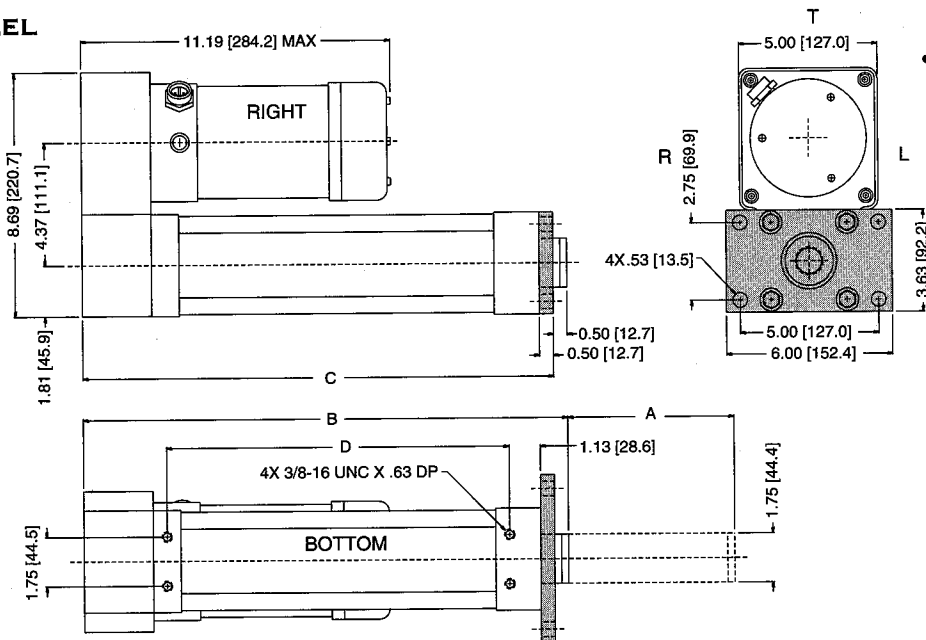
MP3 PIVOT BASE



	Inches	(Metric)					
A Strokes	4.00	(101.6)	12.00	(304.8)	36.00	(914.4)	B Retract stroke + 13.38 (339.9)
	6.00	(152.4)	18.00	(457.2)	48.00	(1,219.2)	C Mounting stroke + 12.38 (314.5)
	8.00	(203.2)	24.00	(609.6)	60.00	(1,524.0)	D Centers stroke + 6.37 (161.8)

MF1 FRONT RECTANGULAR FLANGE PARALLEL

- CAD drawings available on diskette
- Include rod end dimensions, see page 100.

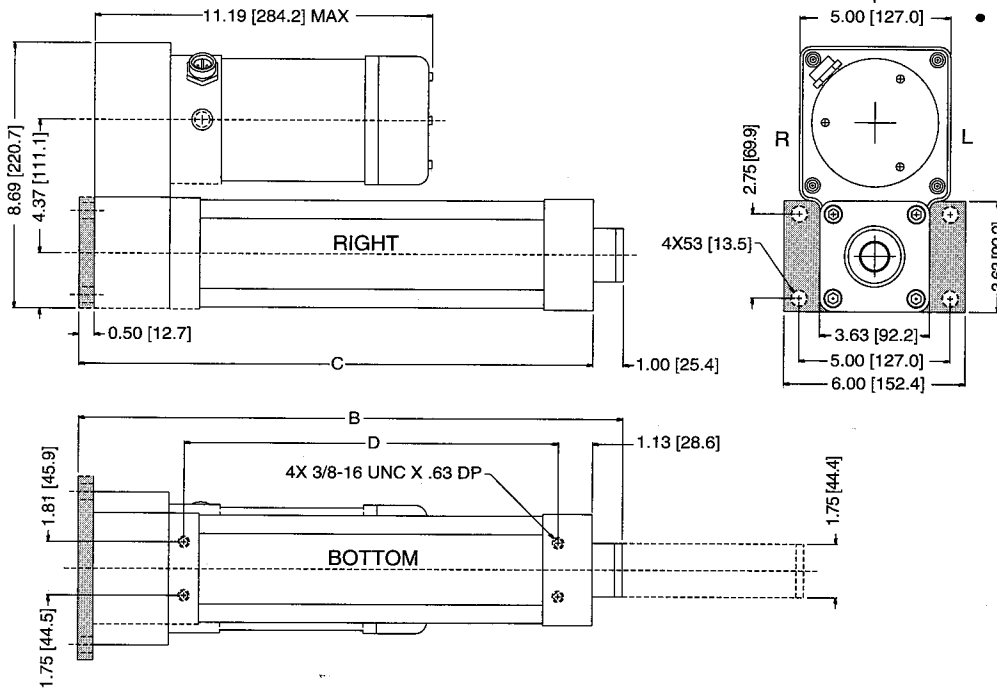


	Inches	(Metric)					
A Strokes	4.00	(101.6)	12.00	(304.8)	36.00	(914.4)	B Retract stroke + 11.50 (292.1)
	6.00	(152.4)	18.00	(457.2)	48.00	(1,219.2)	C Mounting stroke + 11.00 (279.4)
	8.00	(203.2)	24.00	(609.6)	60.00	(1,524.0)	D Centers stroke + 6.37 (161.8)

TH SERIES CYLINDERS

MF2 REAR RECTANGULAR FLANGE

PARALLEL

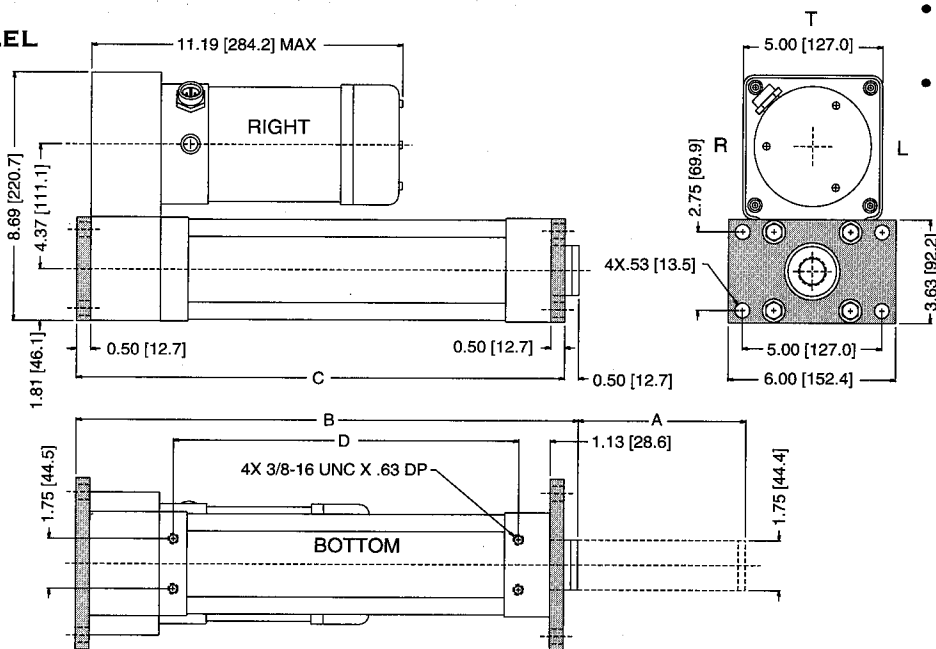


- CAD drawings available on diskette
- Include rod end dimensions, see page 100.

	Inches	(Metric)						
A Strokes	4.00	(101.6)	12.00	(304.8)	36.00	(914.4)	B Retract	stroke + 12.00 (304.8)
	6.00	(152.4)	18.00	(457.2)	48.00	(1,219.2)	C Mounting	stroke + 11.00 (279.4)
	8.00	(203.2)	24.00	(609.6)	60.00	(1,524.0)	D Centers	stroke + 6.37 (161.8)

MF3 FRONT AND REAR MOUNTING FLANGES

PARALLEL



- CAD drawings available on diskette
- Include rod end dimensions, see page 100.

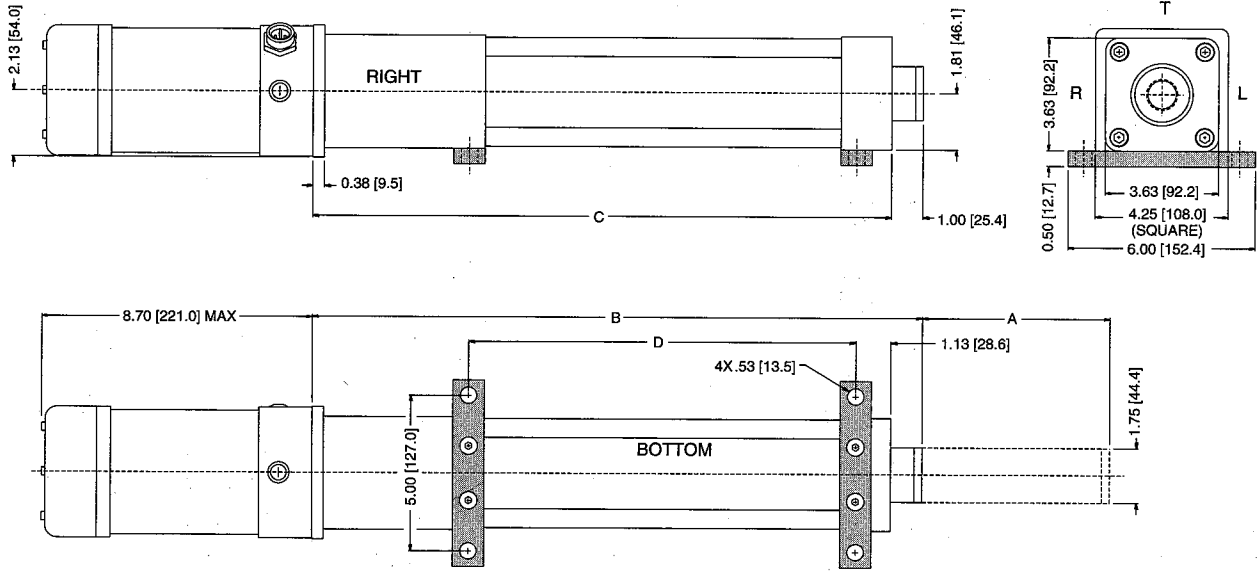
	Inches	(Metric)						
A Strokes	4.00	(101.6)	12.00	(304.8)	36.00	(914.4)	B Retract	stroke + 12.00 (304.8)
	6.00	(152.4)	18.00	(457.2)	48.00	(1,219.2)	C Mounting	stroke + 11.50 (292.1)
	8.00	(203.2)	24.00	(609.6)	60.00	(1,524.0)	D Centers	stroke + 6.37 (161.8)



MS2 SIDE LUGS

INLINE

- CAD drawings are available on diskette
- Include rod end dimensions, see page 100.

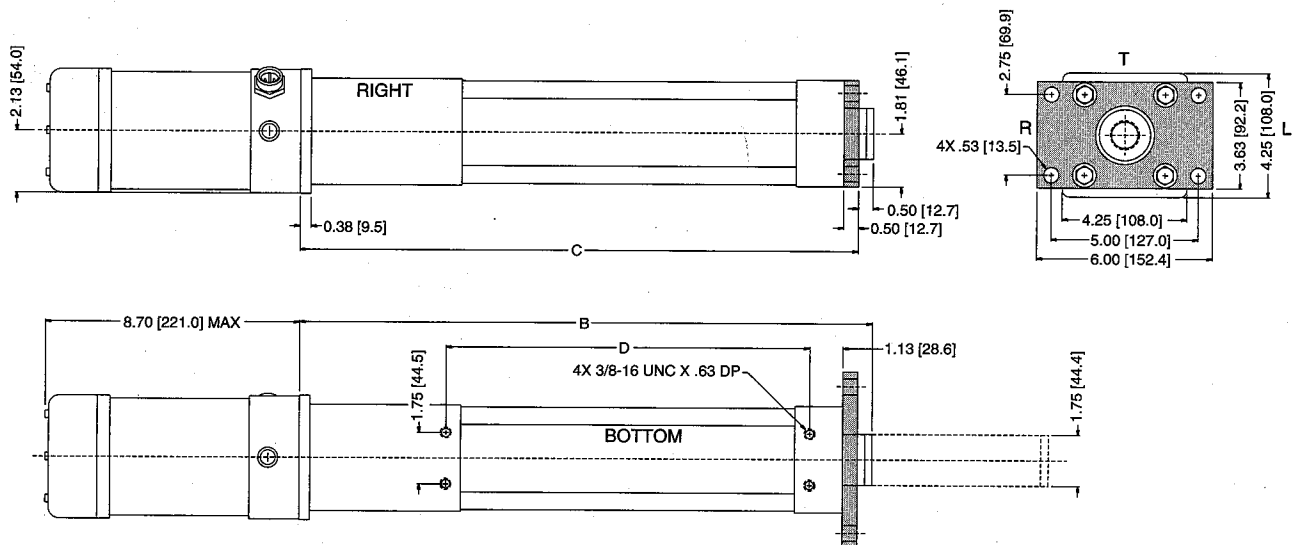


	Inches	(Metric)					
A Strokes	4.00	(101.6)	12.00	(304.8)	36.00	(914.4)	B Retract stroke + 13.50 (342.9)
	6.00	(152.4)	18.00	(457.2)	48.00	(1,219.2)	C Mounting stroke + 12.50 (317.5)
	8.00	(203.2)	24.00	(609.6)	60.00	(1,524.0)	D Centers stroke + 6.37 (161.8)

MF1 FRONT RECTANGULAR FLANGE

INLINE

- CAD drawings are available on diskette
- Include rod end dimensions, see page 100.



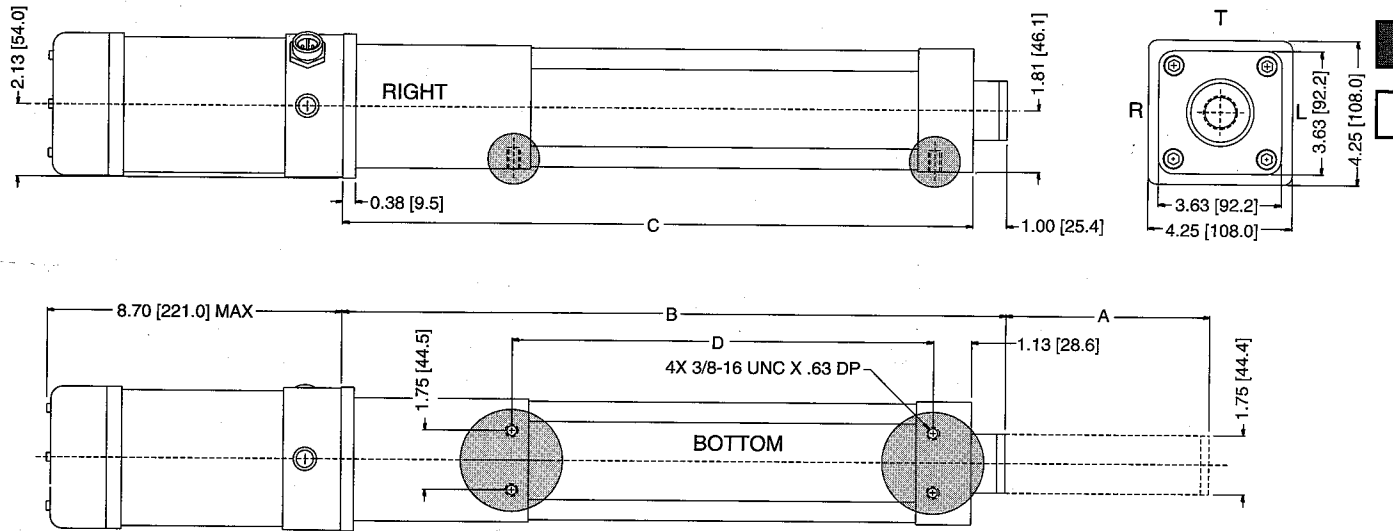
	Inches	(Metric)					
A Strokes	4.00	(101.6)	12.00	(304.8)	36.00	(914.4)	B Retract stroke + 13.50 (342.9)
	6.00	(152.4)	18.00	(457.2)	48.00	(1,219.2)	C Mounting stroke + 13.00 (330.2)
	8.00	(203.2)	24.00	(609.6)	60.00	(1,524.0)	D Centers stroke + 6.37 (161.8)

TH SERIES CYLINDERS

MS6 SIDE TAPPED HOLES

INLINE

- CAD drawings are available on diskette
- Include rod end dimensions, see page 100.

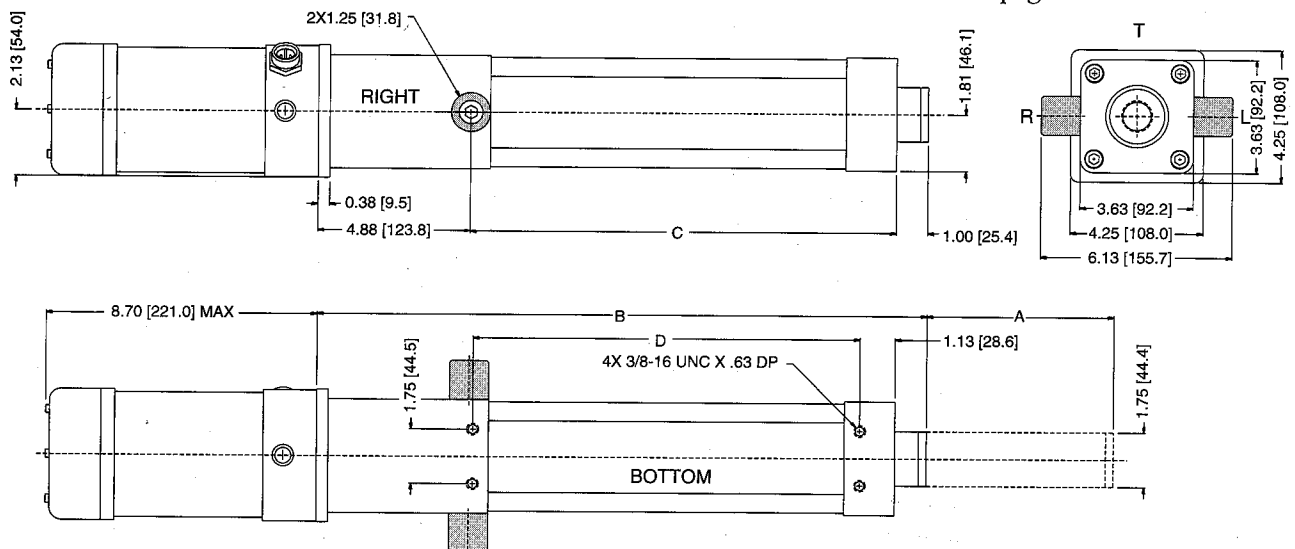


	Inches	(Metric)						
A Strokes	4.00	(101.6)	12.00	(304.8)	36.00	(914.4)	B Retract	stroke + 13.50 (342.9)
	6.00	(152.4)	18.00	(457.2)	48.00	(1,219.2)	C Mounting	stroke + 12.50 (317.5)
	8.00	(203.2)	24.00	(609.6)	60.00	(1,524.0)	D Centers	stroke + 6.37 (161.8)

MT2 TRUNNION MOUNTING

INLINE

- CAD drawings are available on diskette
- Include rod end dimensions, see page 100.



	Inches	(Metric)						
A Strokes	4.00	(101.6)	12.00	(304.8)	36.00	(914.4)	B Retract	stroke + 13.50 (342.9)
	6.00	(152.4)	18.00	(457.2)	48.00	(1,219.2)	C Mounting	stroke + 7.63 (193.8)
	8.00	(203.2)	24.00	(609.6)	60.00	(1,524.0)	D Centers	stroke + 6.37 (161.8)