

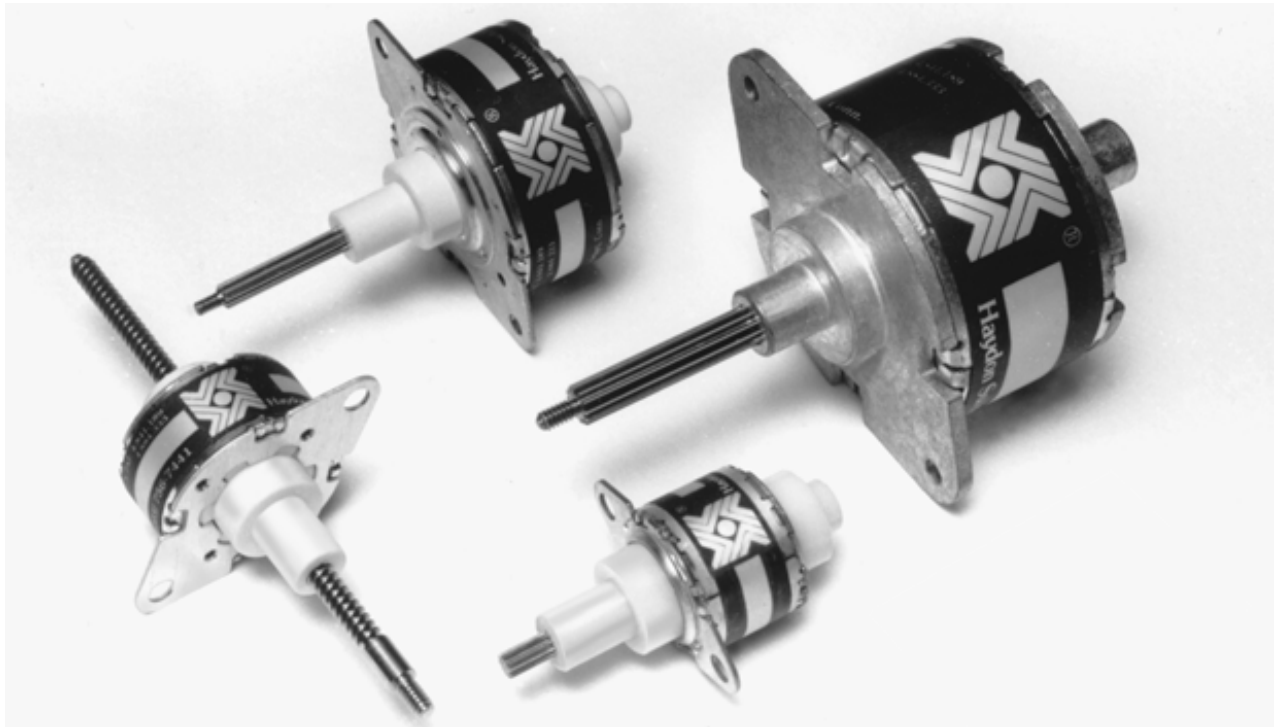
HSI Linear Actuators

HSI offers a complete family of linear motors. The HSI line of linear actuators provides both a broader range and, for a given size, significantly higher thrust than previously available from mini-steppers.

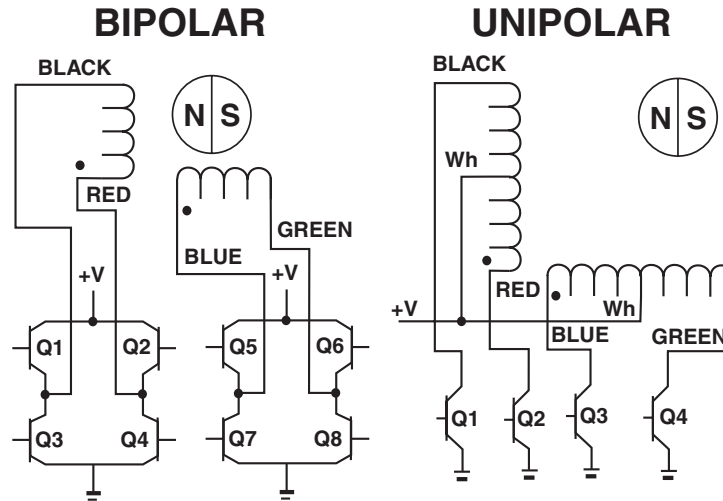
Five basic frame sizes are available, Ø 15 mm (.59"), Ø 20 mm (.79"), Ø 26 mm (1"), Ø 36 mm (1.4") and Ø 46 mm (1.8"). The motors incorporate a threaded rotor in conjunction with a (leadscrew) shaft to provide rapid linear movement in two directions (inward and outward). Available step increments vary with the motor frame sizes and are dependent on the basic step angle of the motor and the lead screw pitch. A captive or non-captive shaft (leadscrew) option can be supplied for every size except Ø 1/2" (15 mm) motor which is available with a captive shaft only. The captive shaft configuration features a built-in "anti-rotation" design. The non-captive shaft option requires the customer to provide external anti-rotation. Both unipolar and bipolar coil configurations are available.

HSI's patented design accepts a larger rotor than conventional units, improving efficiency and eliminating the need for massive heat sinks. Unique HSI features impart ruggedness and reliability that assure long life and consistent performance. Rare earth magnets are available for even higher thrust. All units are built with dual ball bearings for greater motion control, precise step accuracy and long life.

Applications include medical instrumentation, office equipment, machinery automation, robotics, sophisticated pumping systems and other automated devices which require precise remote controlled linear movement in a broad range of temperature environments.



Linear Actuators: Wiring Diagram



Linear Actuators: Stepping Sequence

	Bipolar	Q2-Q3	Q1-Q4	Q6-Q7	Q5-Q8	
Extend	Unipolar	Q1	Q2	Q3	Q4	Retract
	Step					
	1	ON	OFF	ON	OFF	
	2	OFF	ON	ON	OFF	
	3	OFF	ON	OFF	ON	
	4	ON	OFF	OFF	ON	
	5	ON	OFF	ON	OFF	

Note: Half stepping is accomplished by inserting an off state between transitioning phases.

Linear Actuators Step Movement Selector Chart

	15000 Series 15 mm (0.6") Ø	20000 Series 20 mm (0.79") Ø	26000 Series 26 mm (1.0") Ø	36000 Series 36 mm (1.4") Ø	46000 Series 46 mm (1.8") Ø	Z20000 Series 20 mm (0.79") Ø	Z26000 Series 26 mm (1.0") Ø
.000125"*				●			
.00025"*			●	●			
.0005"	●		●	●	●		●
.001"	●	●	●	●	●	●	●
.002"		●	●	●	●	●	●
.004"		●	●	●	●	●	●
.008"					●		
.016"					●		

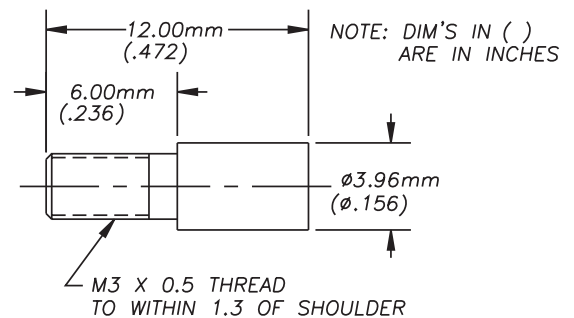
* Specialty and high resolution step movements

NOTE: All chopper drive curves were created with a 5 volt motor and a 40 volt power supply.

Threaded Adapter for Linear Actuators

Adapter is standard with non-captive motors.

All linear actuators can be assembled with shaft configurations that accommodate a #4-40 UNC-2A threaded adapter. An M3 adapter (pictured) can be supplied instead of the 4-40 adapter. When ordering, the M3 adapter must be specified as an option.



Identifying Part Numbers for Orders

A standard HSI motor part number consists of 7 digits – XXXXX-VV (excluding Big Inch Motors). The breakdown is as follows:

The **first and second** digits indicate the motor's series or diameter (in mm).

For instance:

15000 Series (15 mm)
20000 Series (20 mm)
26000 Series (26 mm)
36000 Series (36 mm)
46000 Series (46 mm)
43000 Series (43 mm)
57000 Series (57 mm)

Not all step increments are available for every frame size. See salient characteristics tables of each motor series for listings of what step increments are available for a given frame size.

The **third** digit indicates the motor's step angle

The **fourth** digit indicates the number of leads.

4 leads – bipolar
6 leads – unipolar

The **fifth** digit indicates the pitch of the leadscrew or the travel per step

1 = .001" (.0254 mm)
2 = .002" (.051 mm)
3 = .0005" (.013 mm)
4 = .004" (.102 mm)
7 = .000125" (.0032 mm)
8 = .008" (.203 mm)
9 = .00025" (.0064 mm)
G = .016" (.406 mm)

The **sixth and seventh** digits indicate the motor's voltage. Standard voltages are 5 (05) and 12 (12) volt. Custom voltages are available.

For assistance with building a part number or with a custom design, please consult the sales or applications department.

Screw Length Options:

- For non-captive shaft motors various screw lengths are available to accommodate almost any travel requirement.

Linear Actuator Series 20000, Ø 20 mm (3/4")



For production volume orders of 10,000 or more see Series Z20000.

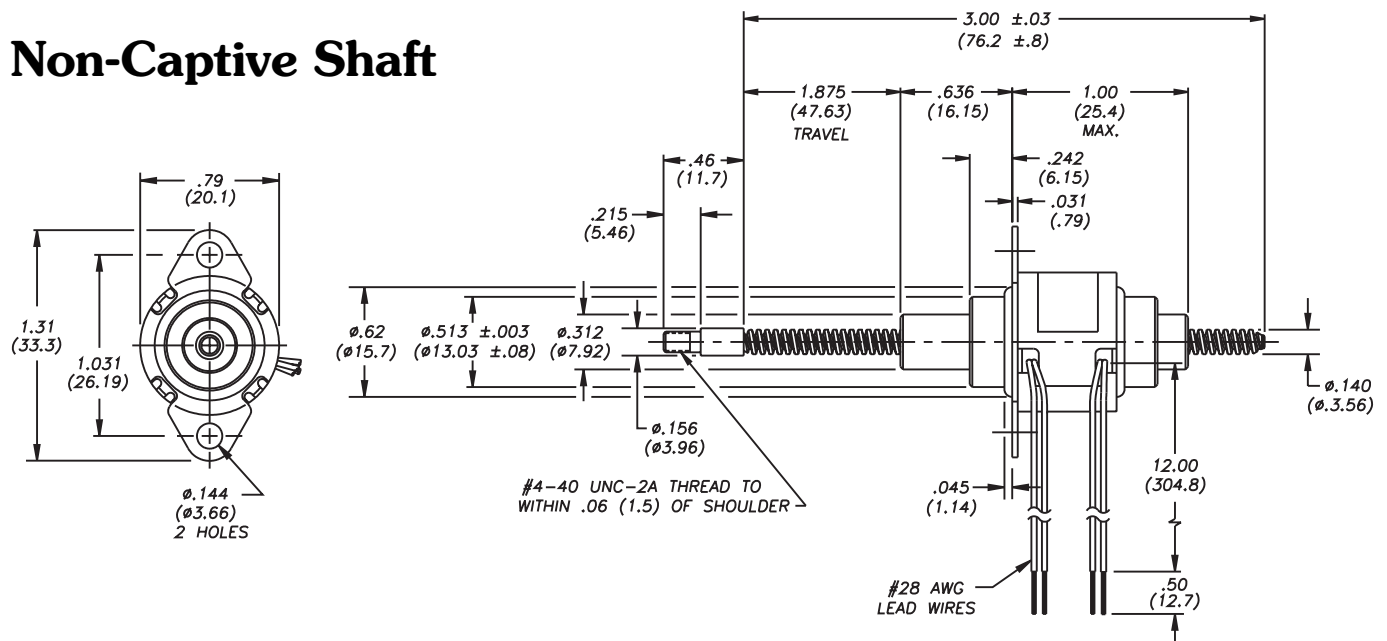
Salient Characteristics

Ø 20 mm (.79") motor		
Wiring		Bipolar
Part No.	Captive	2054X-V
	Non-captive	2084X-V
Step angle		15°
Travel/Step avail.		.001"*, .002", .004"
Operating voltage		5 VDC 12 VDC
Current/phase		270 mA 113 mA
Resistance/phase		18.5 Ω 106 Ω
Inductance/phase		5.5 mH 32 mH
Power consumption		2.7 W
Rotor inertia		0.5 gcm ²
Temperature rise		167°F (75°C)
Weight		1 oz (28 g)
Insulation resistance		20 MΩ

* Special drive considerations may be necessary when leaving shaft fully extended or fully retracted.

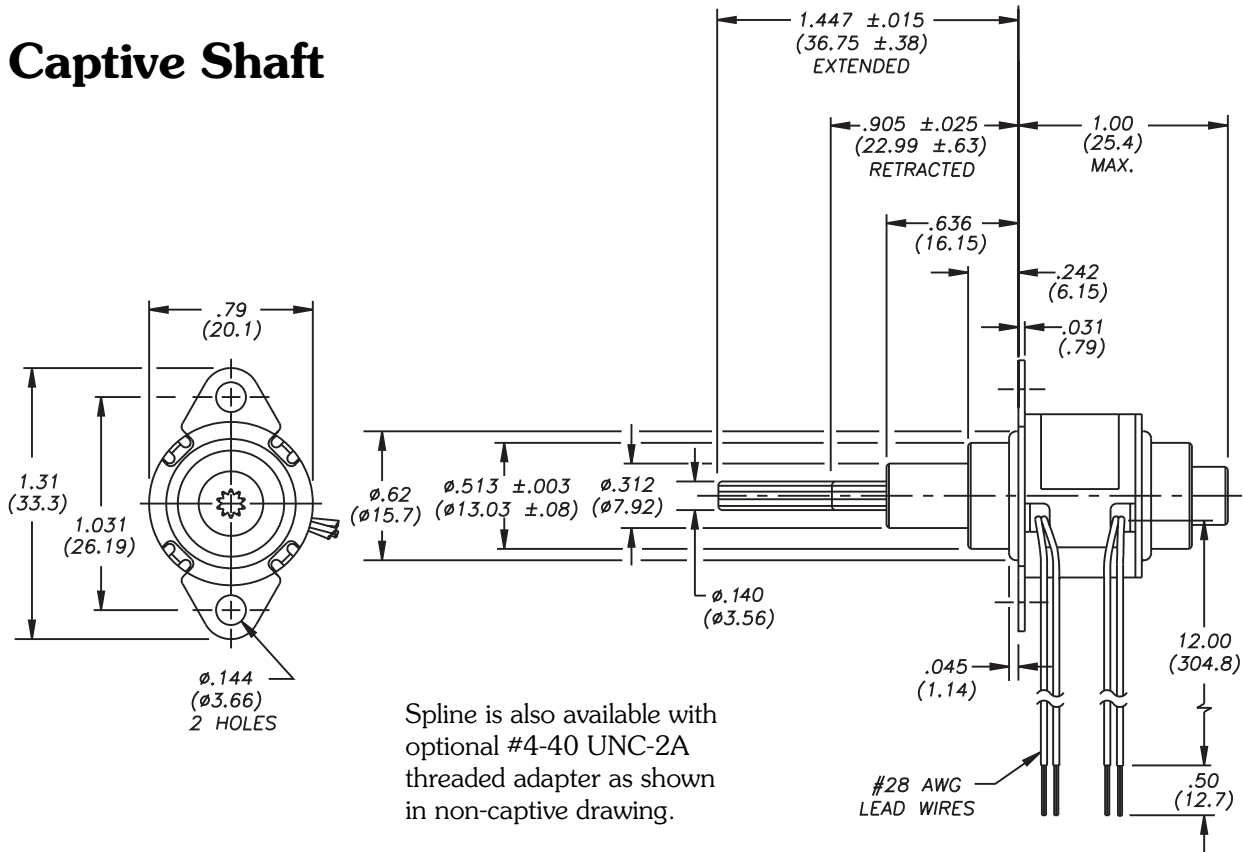
Linear Series 20000 Dimensional Drawings

Non-Captive Shaft



Linear Series 20000 Dimensional Drawings

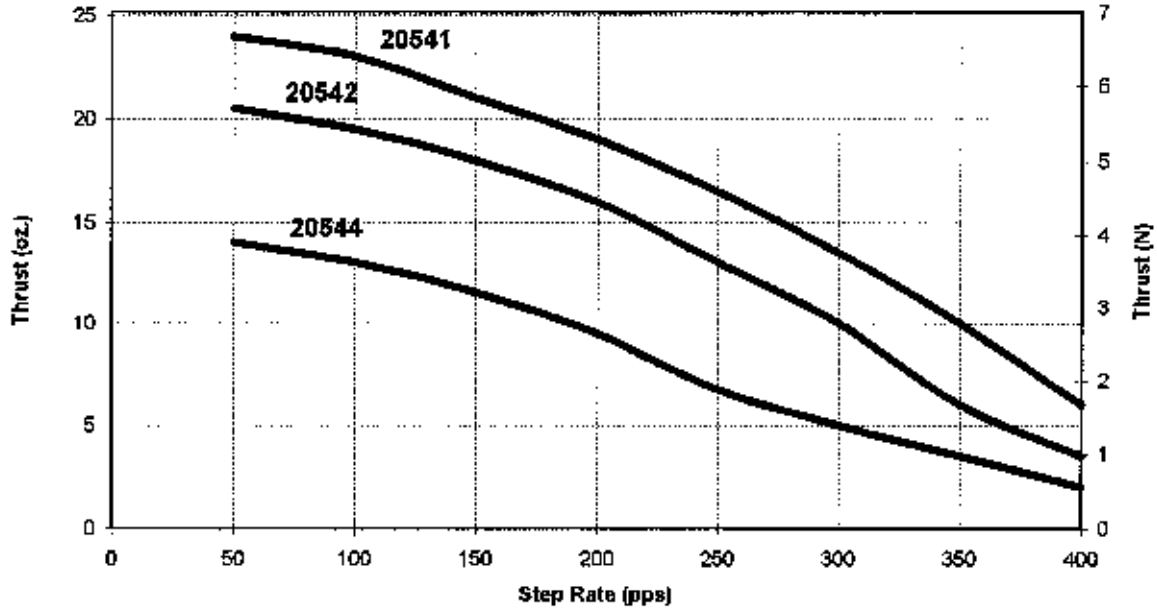
Captive Shaft



Spline is also available with optional #4-40 UNC-2A threaded adapter as shown in non-captive drawing.

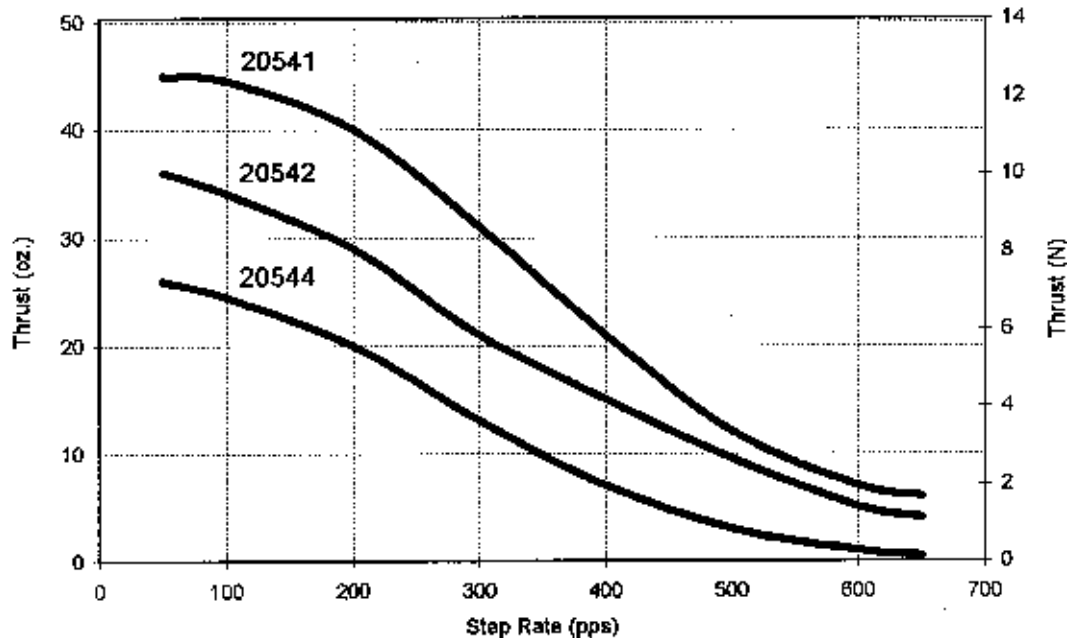
Linear Series 20000 Step Rate vs. Thrust Curves

Bipolar • L/R Drive • 100% Duty Cycle



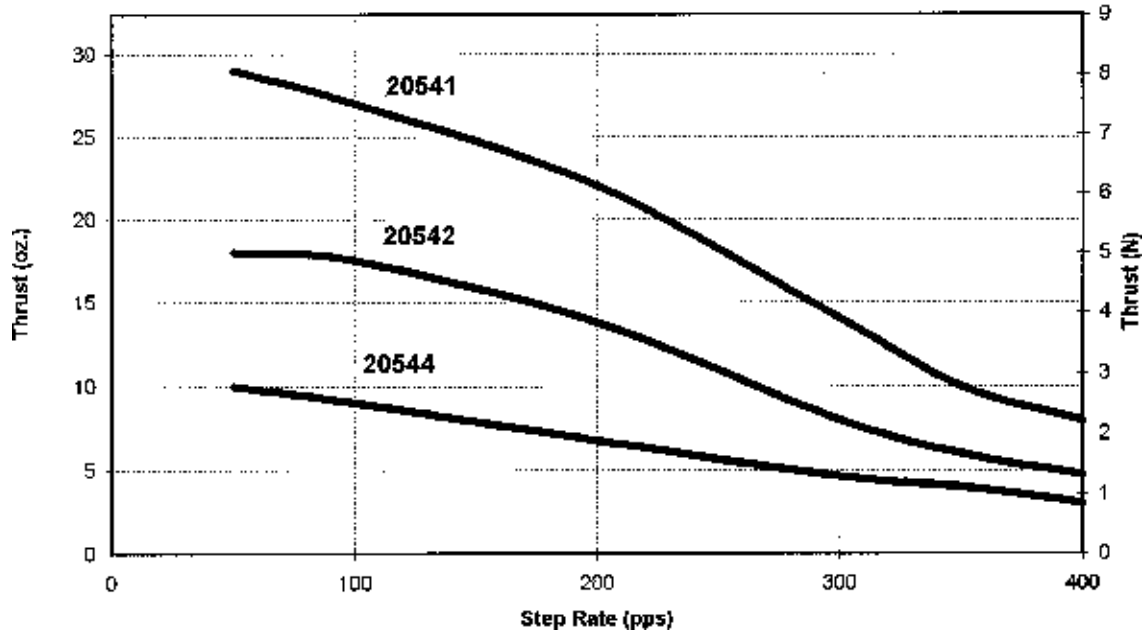
Bipolar • L/R Drive • 25% Duty Cycle

25% duty cycle is obtained by a special winding or by running a standard motor at double the rated voltage.



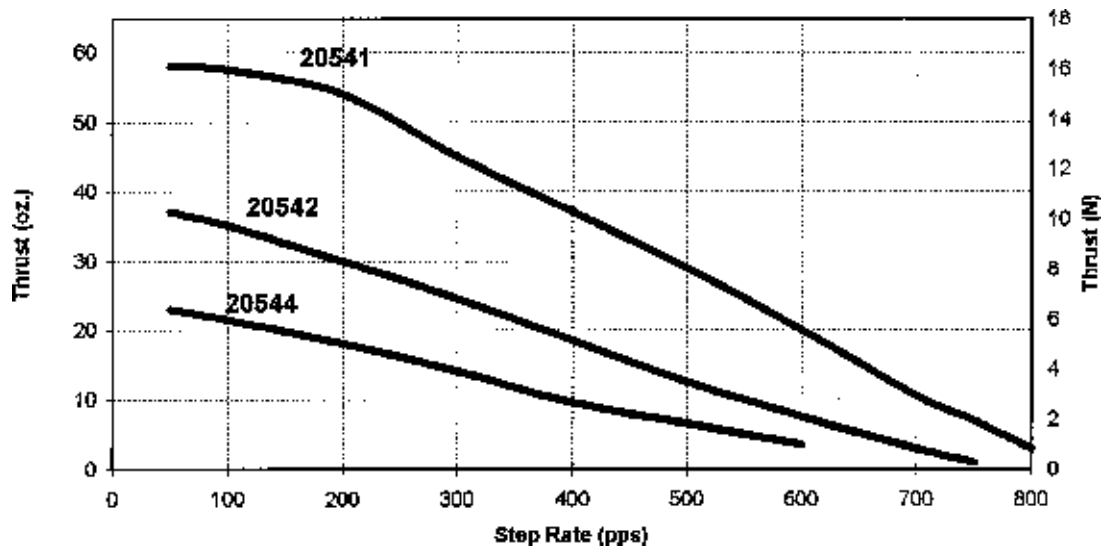
Linear Series 20000 Step Rate vs. Thrust Curves

Bipolar • Chopper Drive • 100% Duty Cycle



Bipolar • Chopper Drive • 25% Duty Cycle

25% duty cycle is obtained by running a standard motor at double the rated current.





Linear Actuator Series 26000

Ø 26 mm (1")

Salient Characteristics

For production volume orders of 10,000 or more see Series Z26000.

See high resolution section for specialty Series 26000 motors

Ø 26 mm (1") motor					
Wiring		Bipolar			
Part No.	Captive	2644X-V	2654X-V		
	Non-captive	2634X-V	2684X-V		
Step angle		7.5°	15°		
Travel/Step avail.		.0005"* , .001"		.002" , .004"	
Operating voltage		5 VDC	12 VDC	5 VDC	12 VDC
Current/phase		340 mA	140 mA	340 mA	140 mA
Resistance/phase		14.7 Ω	84 Ω	14.7 Ω	84 Ω
Inductance/phase		8.5 mH	55 mH	6.7 mH	44 mH
Power consumption		3.4 W			
Rotor inertia		1.2 gcm ²			
Temperature rise		167°F (75°C)			
Weight		1.2 oz (35 g)			
Insulation resistance		20 MΩ			

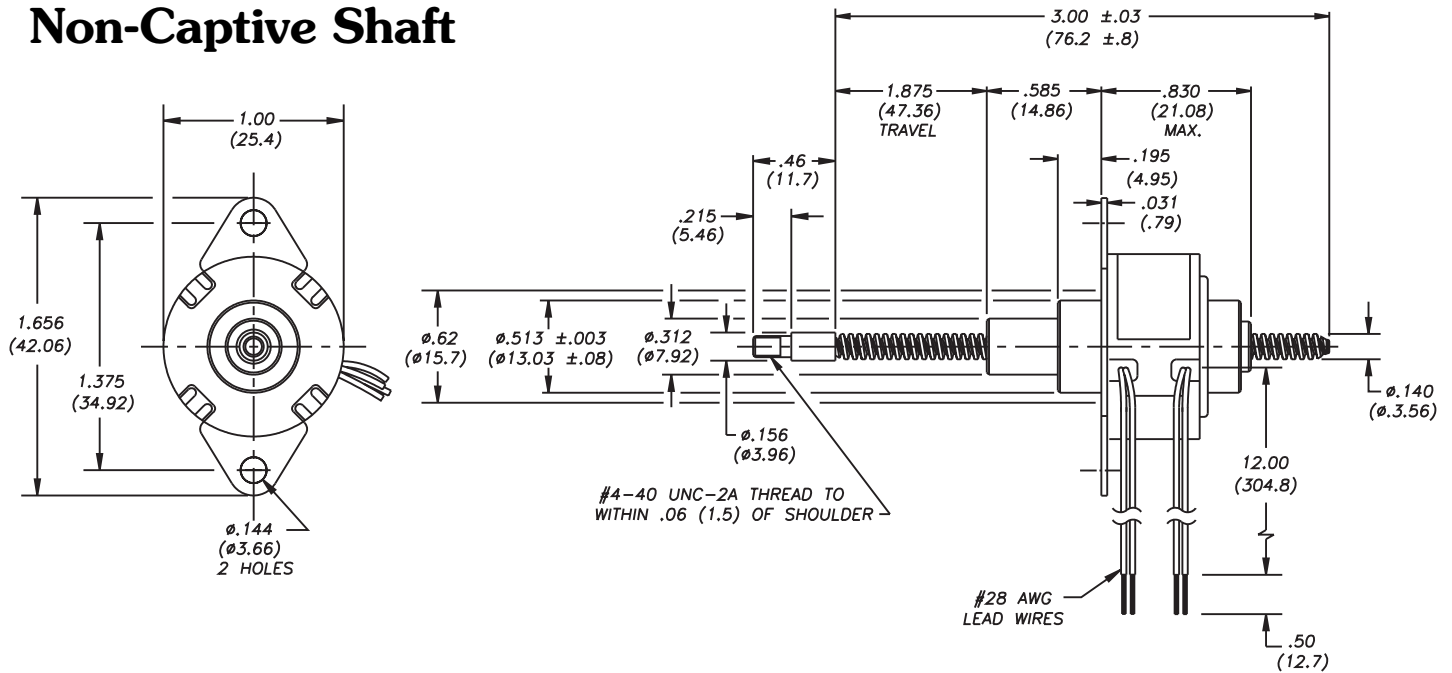
Ø 26 mm (1") motor					
Wiring		Unipolar**			
Part No.	Captive	2646X-V	2656X-V		
	Non-captive	2636X-V	2686X-V		
Step angle		7.5°	15°		
Travel/Step avail.		.0005"* , .001"		.002" , .004"	
Operating voltage		5 VDC	12 VDC	5 VDC	12 VDC
Current/phase		340 mA	140 mA	340 mA	140 mA
Resistance/phase		14.7 Ω	84 Ω	14.7 Ω	84 Ω
Inductance/phase		4.3 mH	24 mH	3.4 mH	19 mH
Power consumption		3.4 W			
Rotor inertia		1.2 gcm ²			
Temperature rise		167°F (75°C)			
Weight		1.2 oz (35 g)			
Insulation resistance		20 MΩ			

* Special drive considerations may be necessary when leaving shaft fully extended or fully retracted.

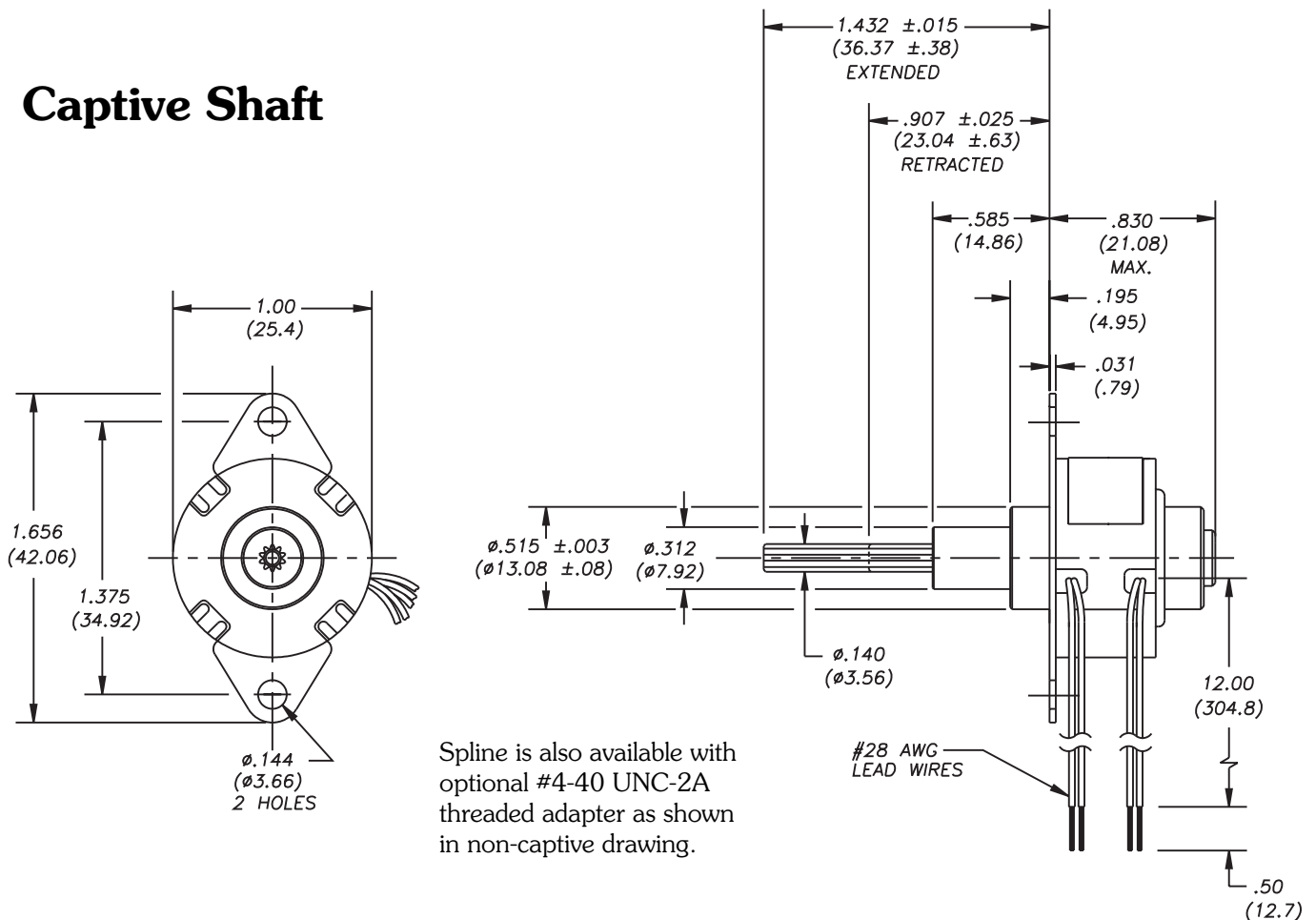
** Unipolar drive gives approximately 30% less thrust than bipolar drive.

Linear Series 26000 Dimensional Drawings

Non-Captive Shaft



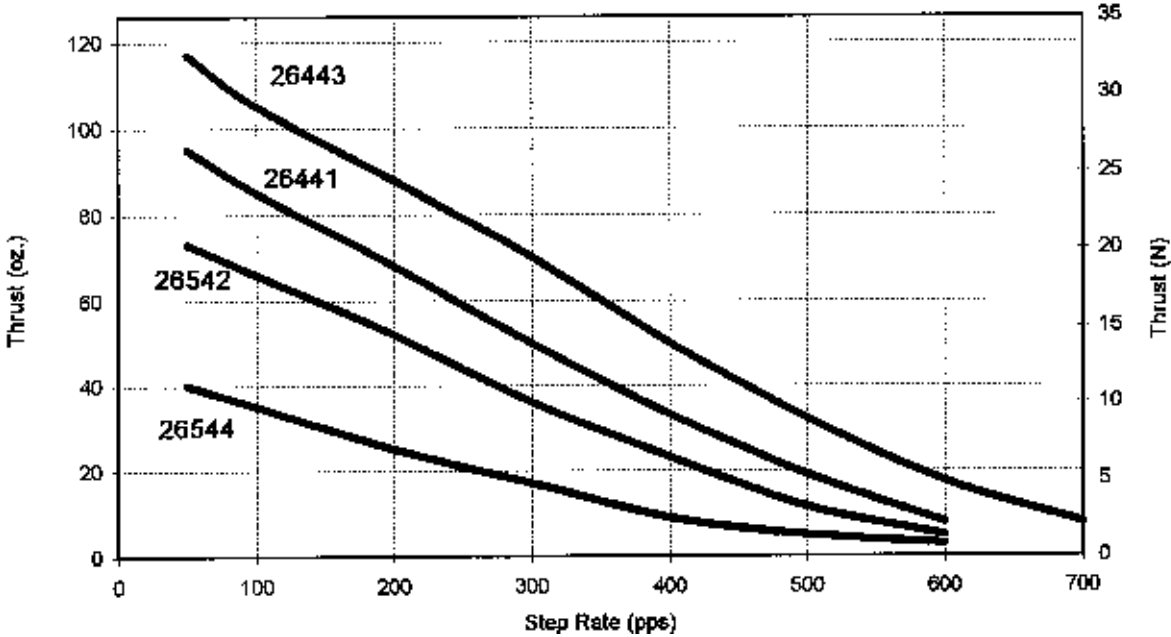
Captive Shaft



Spline is also available with optional #4-40 UNC-2A threaded adapter as shown in non-captive drawing.

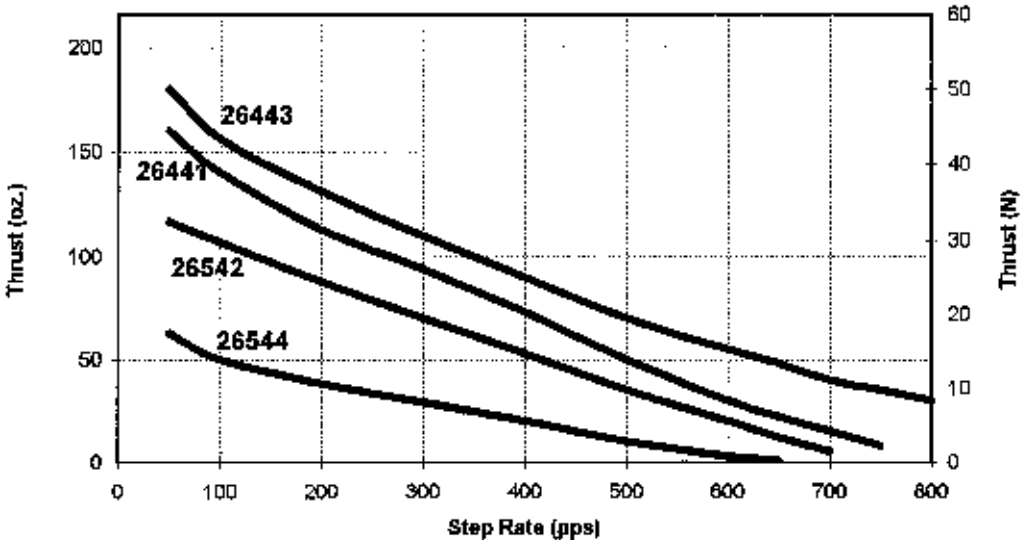
Linear Series 26000 Step Rate vs. Thrust Curves

Bipolar • L/R Drive • 100% Duty Cycle



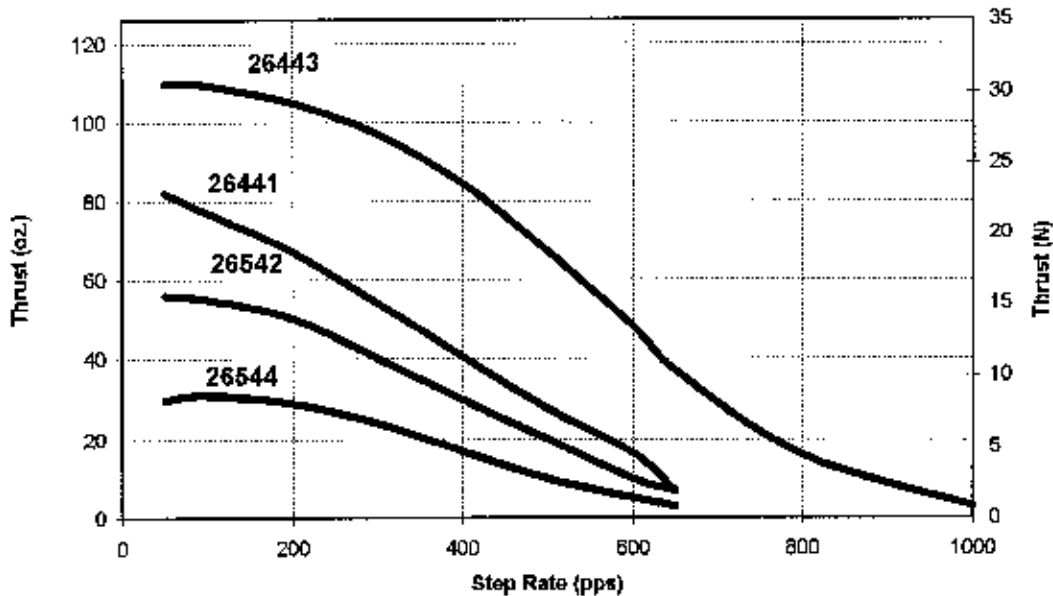
Bipolar • L/R Drive • 25% Duty Cycle

25% duty cycle is obtained by a special winding or by running a standard motor at double the rated voltage.



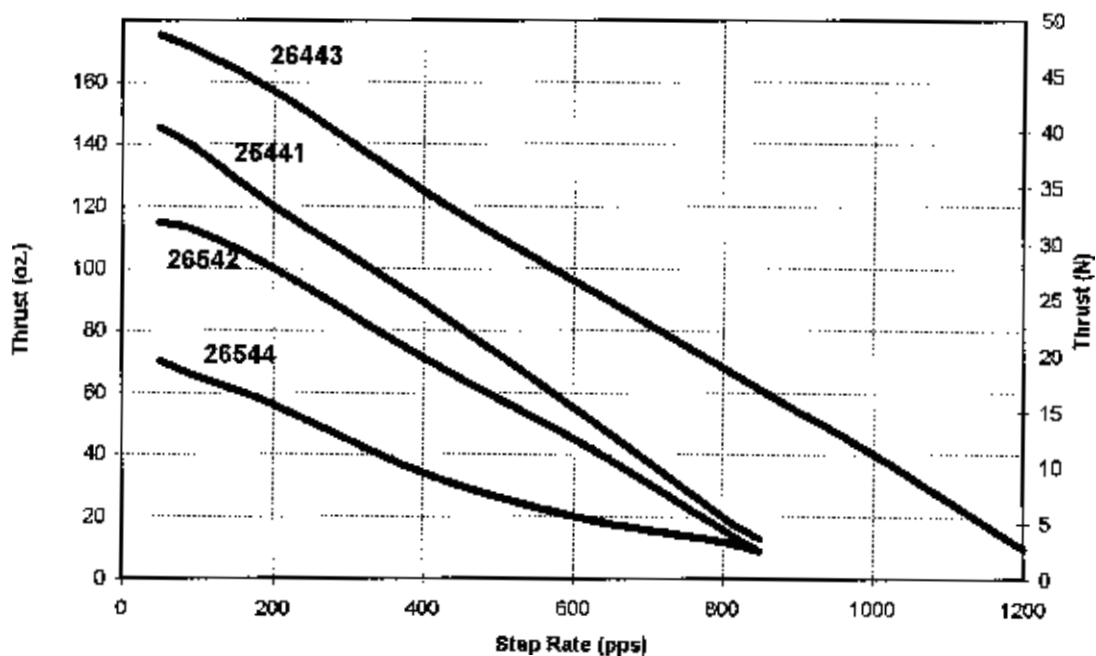
Linear Series 26000 Step Rate vs. Thrust Curves

Bipolar • Chopper Drive • 100% Duty Cycle



Bipolar • Chopper Drive • 25% Duty Cycle

25% duty cycle is obtained by running a standard motor at double the rated current.



Linear Actuator Series 36000 Ø 36 mm (1.4")



See high resolution section for specialty Series 36000 motors

Salient Characteristics

Ø 36 mm (1.4") motor					
Wiring		Bipolar			
Part No.	Captive	3644X-V	3654X-V		
	Non-captive	3634X-V	3684X-V		
Step angle		7.5°	15°		
Travel/Step avail.		.0005", .001", .002"		.004"	
Operating voltage		5 VDC	12 VDC	5 VDC	12 VDC
Current/phase		460 mA	190 mA	460 mA	190 mA
Resistance/phase		11 Ω	63 Ω	11 Ω	63 Ω
Inductance/phase		7.2 mH	45 mH	5.5 mH	35 mH
Power consumption		4.6 W			
Rotor inertia		10.5 gcm ²			
Temperature rise		167°F (75°C)			
Weight		3 oz (86 g)			
Insulation resistance		20 MΩ			

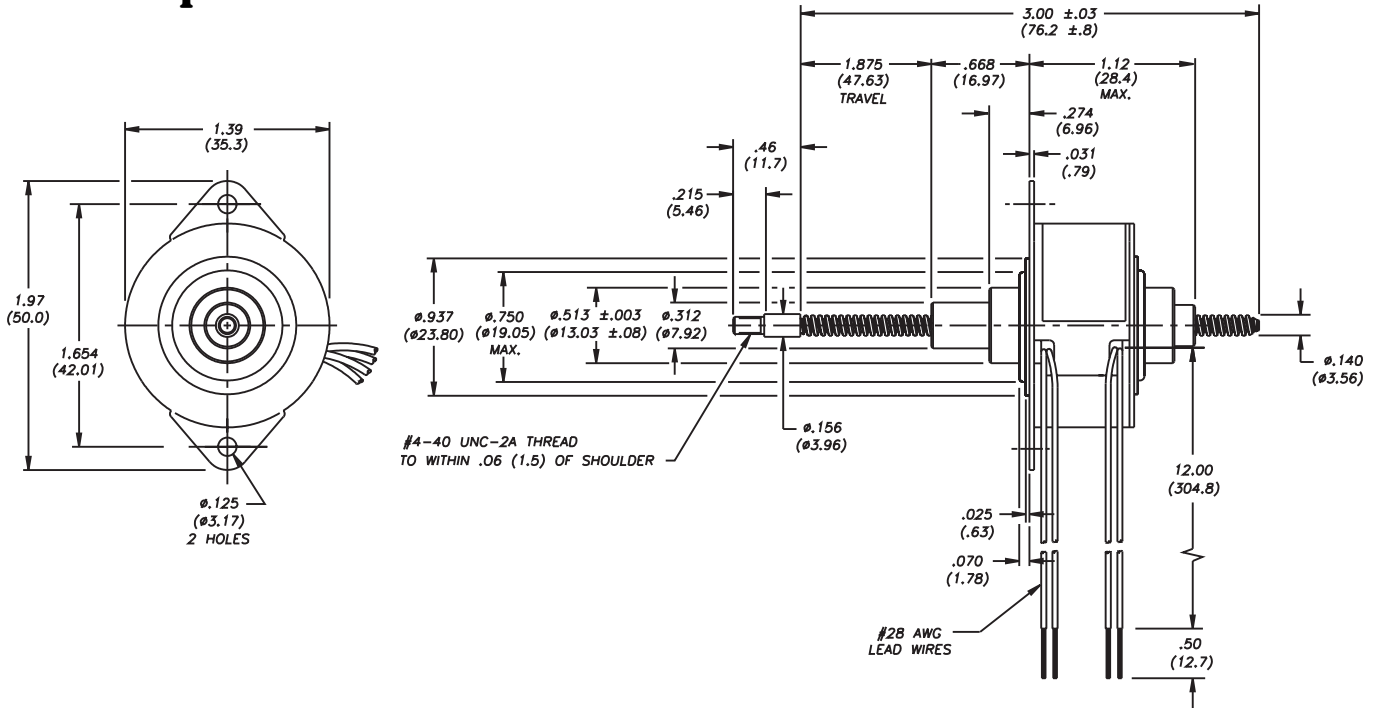
Ø 36 mm (1.4") motor					
Wiring		Unipolar**			
Part No.	Captive	3646X-V	3656X-V		
	Non-captive	3636X-V	3686X-V		
Step angle		7.5°	15°		
Travel/Step avail.		.0005", .001", .002"		.004"	
Operating voltage		5 VDC	12 VDC	5 VDC	12 VDC
Current/phase		460 mA	190 mA	460 mA	190 mA
Resistance/phase		11 Ω	63 Ω	11 Ω	63 Ω
Inductance/phase		3.8 mH	19 mH	3 mH	15 mH
Power consumption		4.6 W			
Rotor inertia		10.5 gcm ²			
Temperature rise		167°F (75°C)			
Weight		3 oz (86 g)			
Insulation resistance		20 MΩ			

* Special drive considerations may be necessary when leaving shaft fully extended or fully retracted.

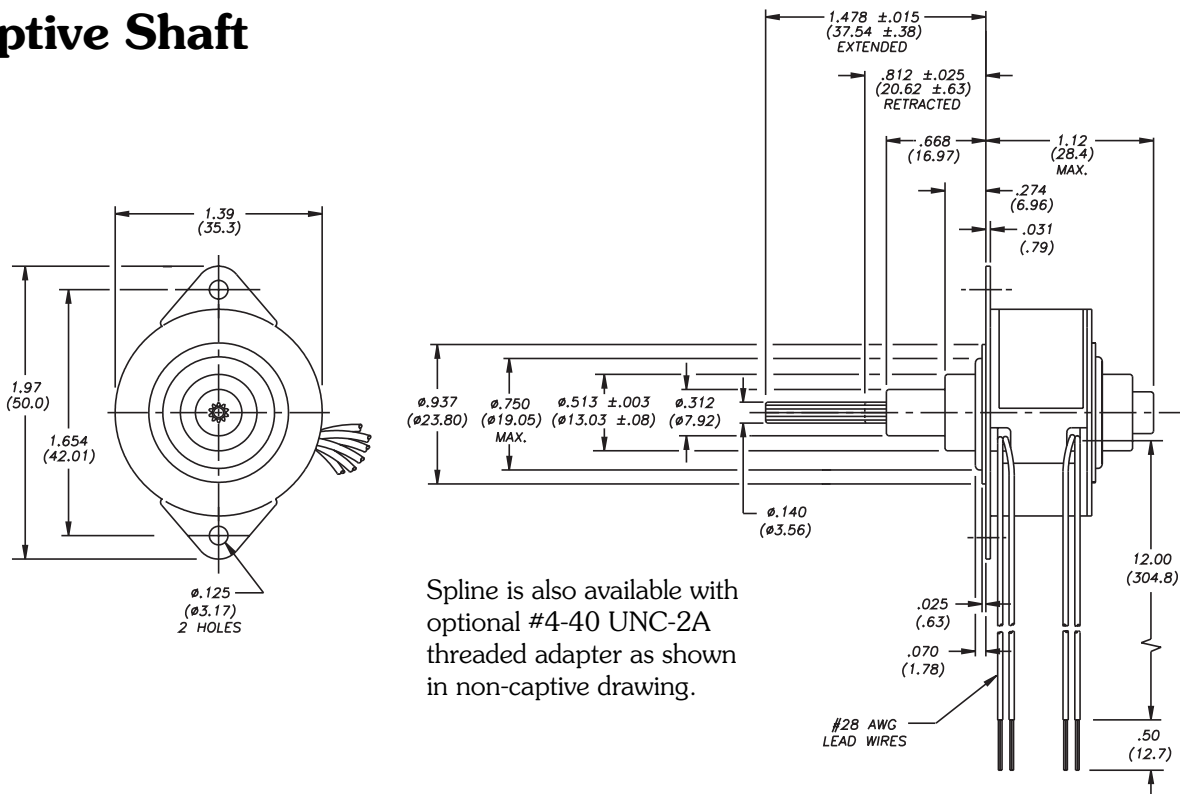
** Unipolar drive gives approximately 30% less thrust vs. bipolar drive.

Linear Series 36000 Dimensional Drawings

Non-Captive Shaft

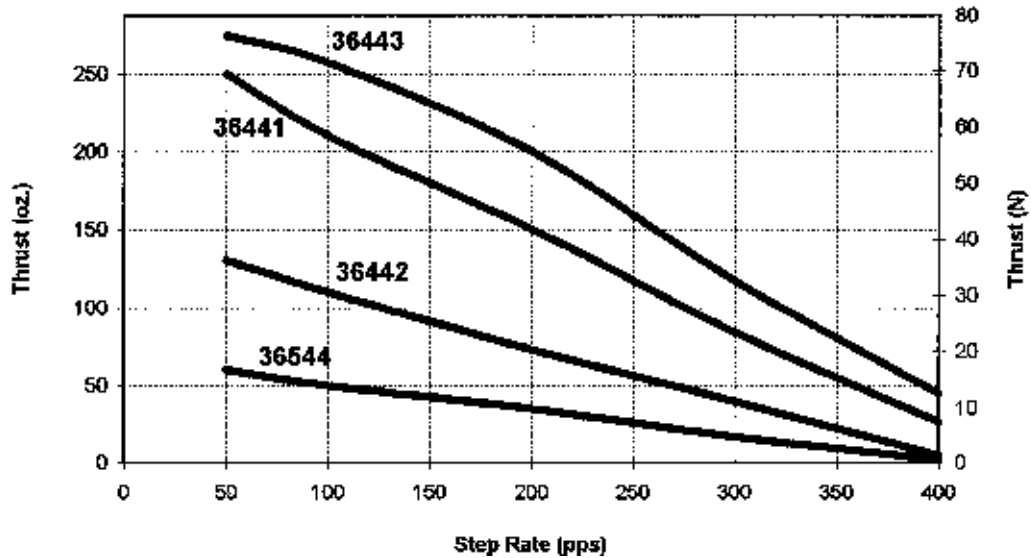


Captive Shaft



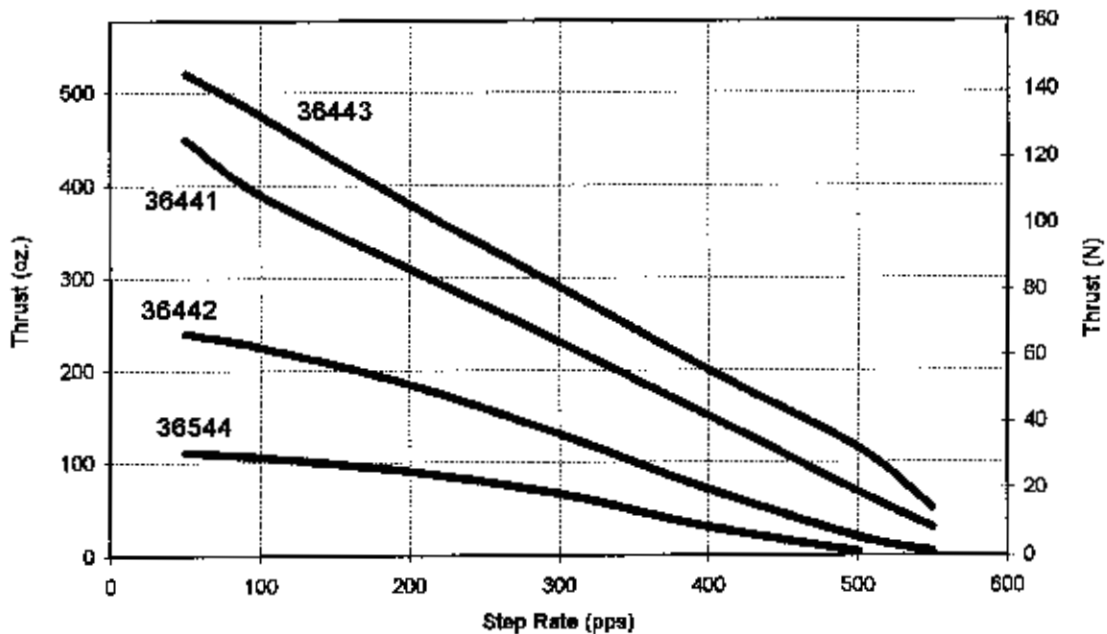
Linear Series 36000 Step Rate vs. Thrust Curves

Bipolar • L/R Drive • 100% Duty Cycle



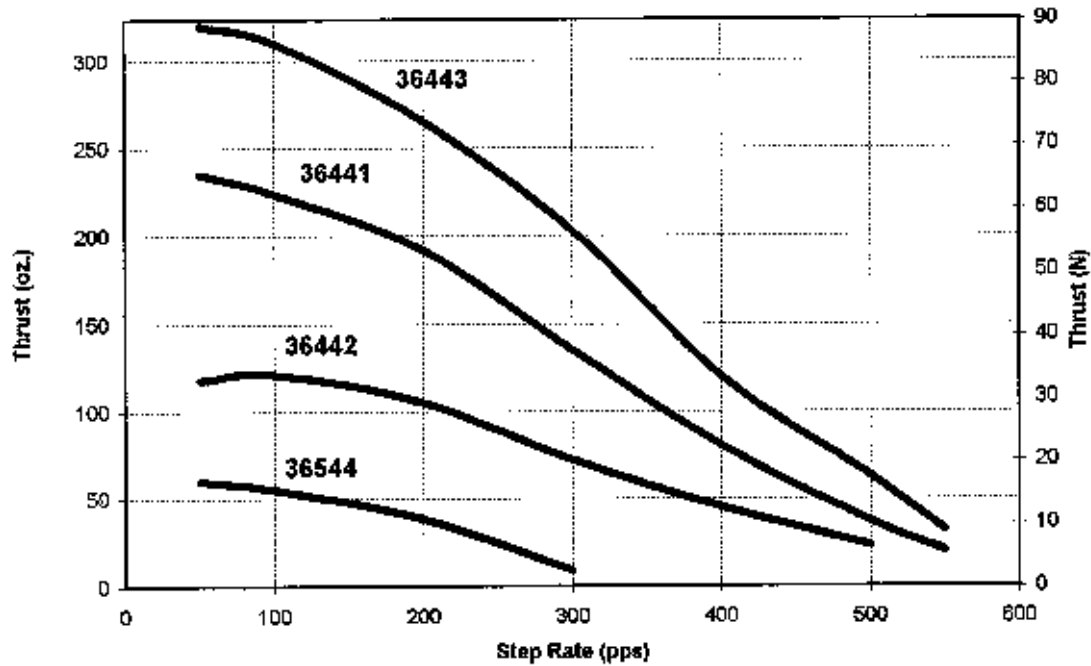
Bipolar • L/R Drive • 25% Duty Cycle

25% duty cycle is obtained by a special winding or by running a standard motor at double the rated voltage.



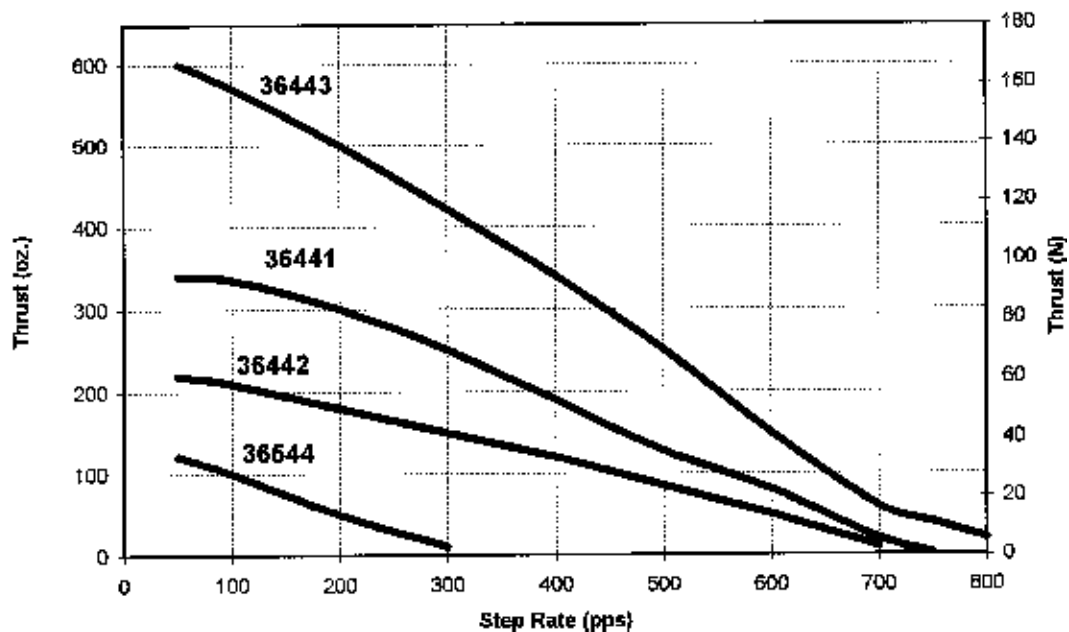
Linear Series 36000 Step Rate vs. Thrust Curves

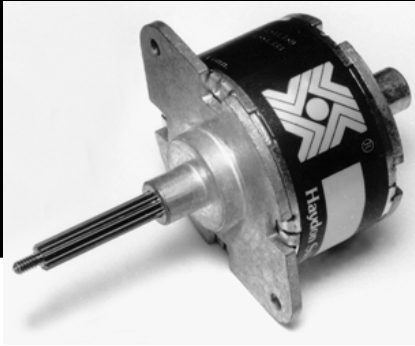
Bipolar • Chopper Drive • 100% Duty Cycle



Bipolar • Chopper Drive • 25% Duty Cycle

25% duty cycle is obtained by running a standard motor at double the rated current.





Linear Actuator Series 46000 Ø 46 mm (1.8")

See high resolution section for specialty Series 46000 motors & NEMA flanges

Salient Characteristics

Ø 46 mm (1.8") motor					
Wiring		Bipolar			
Part No.	Captive	4644X-V	4654X-V		
	Non-captive	4634X-V	4684X-V		
Step angle		7.5°	15°		
Travel/Step avail.		.0005", .001", .002", .004"		.008", .016"	
Operating voltage		5 VDC	12 VDC	5 VDC	12 VDC
Current/phase		1.0 A	.41 A	1.0 A	.41 A
Resistance/phase		5 Ω	29 Ω	5 Ω	29 Ω
Inductance/phase		9 mH	52 mH	7.1 mH	39 mH
Power consumption		10 W			
Rotor inertia		25.0 gcm ²			
Temperature rise		167°F (75°C)			
Weight		9.0 oz (255 g)			
Insulation resistance		20 MΩ			

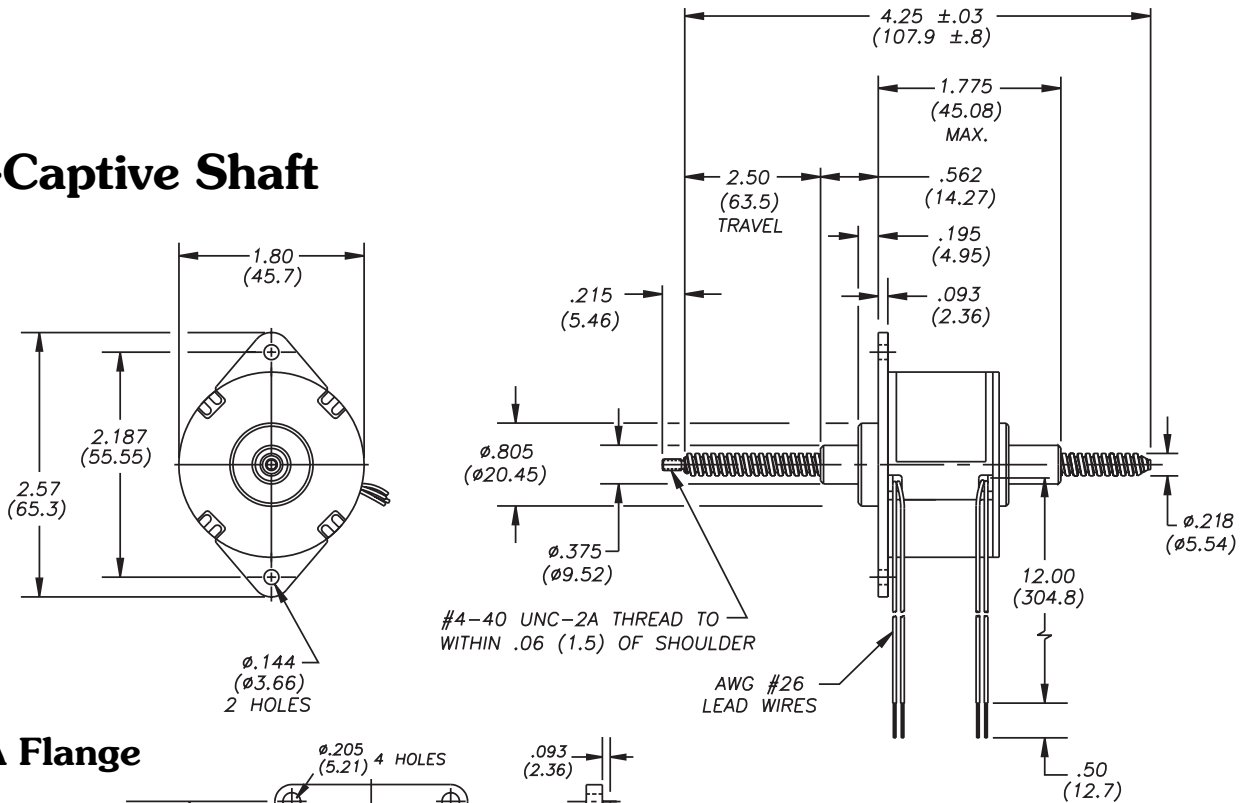
Ø 46 mm (1.8") motor					
Wiring		Unipolar**			
Part No.	Captive	4646X-V	4656X-V		
	Non-captive	4636X-V	4686X-V		
Step angle		7.5°	15°		
Travel/Step avail.		.0005", .001", .002", .004"		.008", .016"	
Operating voltage		5 VDC	12 VDC	5 VDC	12 VDC
Current/phase		1.0 A	.41 A	1.0 A	.41 A
Resistance/phase		5 Ω	29 Ω	5 Ω	29 Ω
Inductance/phase		4.5 mH	26 mH	3.5 mH	20 mH
Power consumption		10 W			
Rotor inertia		25.0 gcm ²			
Temperature rise		167°F (75°C)			
Weight		9.0 oz (255 g)			
Insulation resistance		20 MΩ			

* Special drive considerations may be necessary when leaving shaft fully extended or fully retracted.

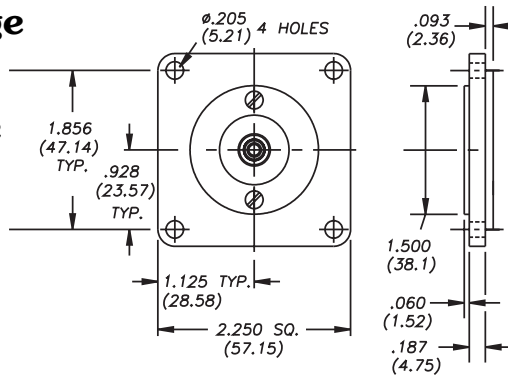
** Unipolar drive gives approximately 30% less thrust than bipolar drive.

Linear Series 46000 Dimensional Drawings

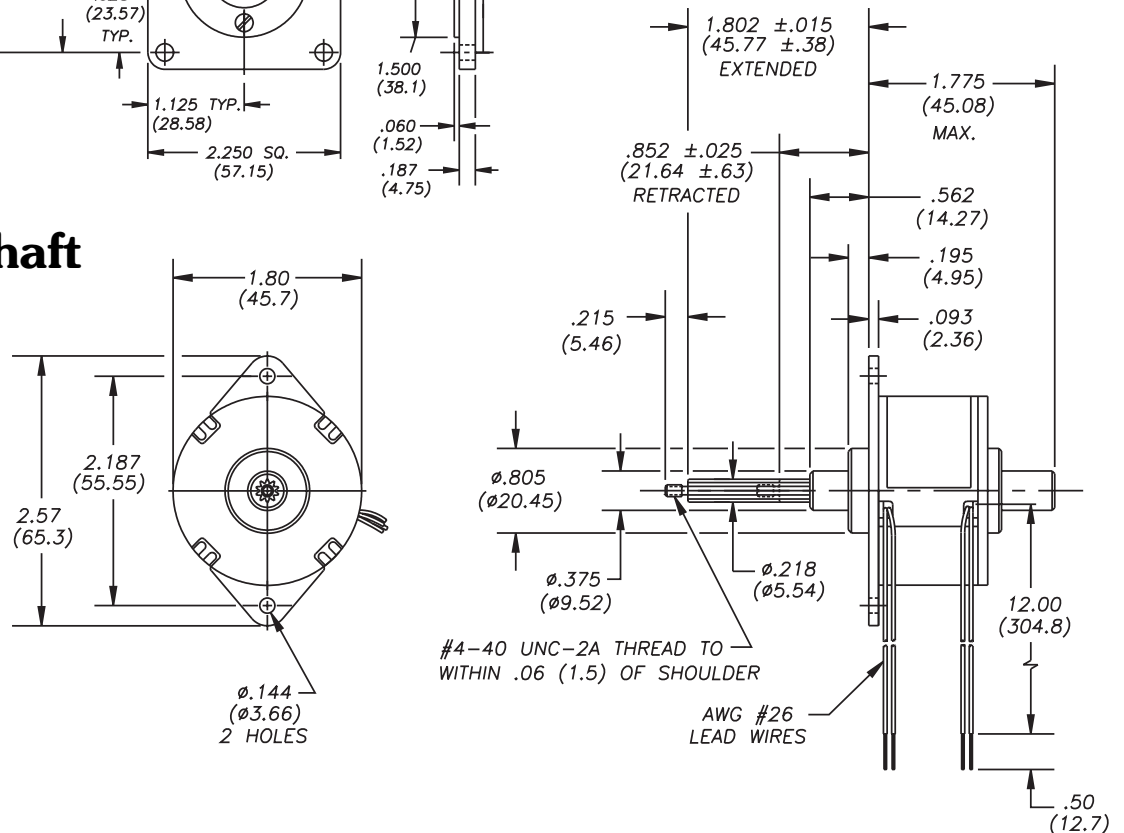
Non-Captive Shaft



NEMA Flange for Non-Captive Shaft

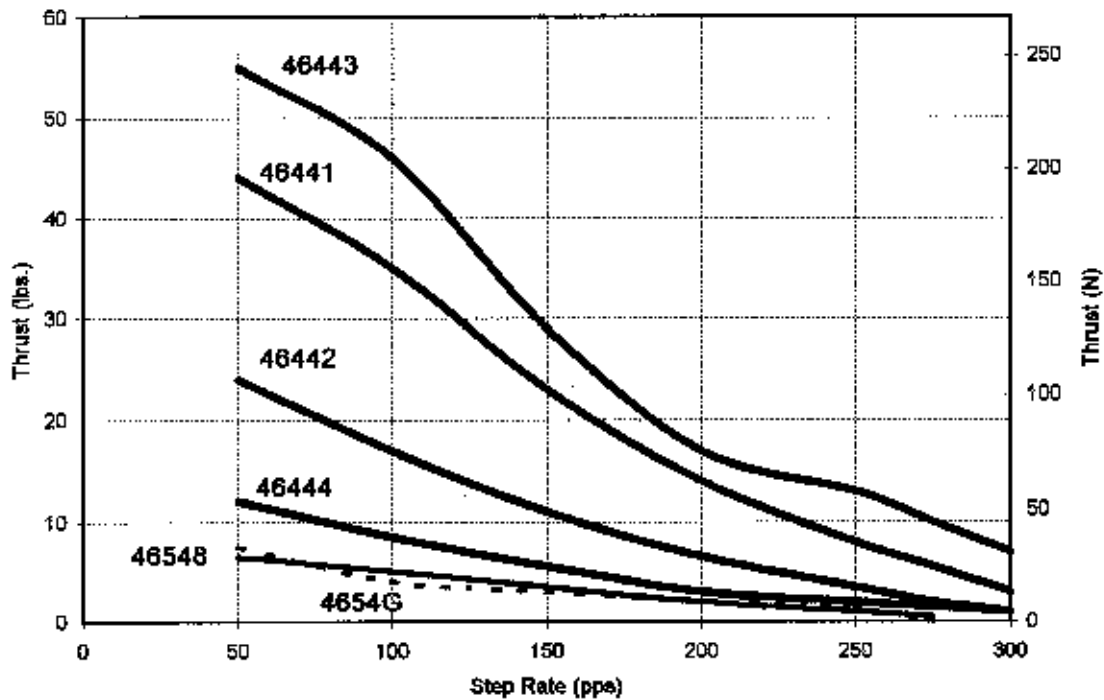


Captive Shaft



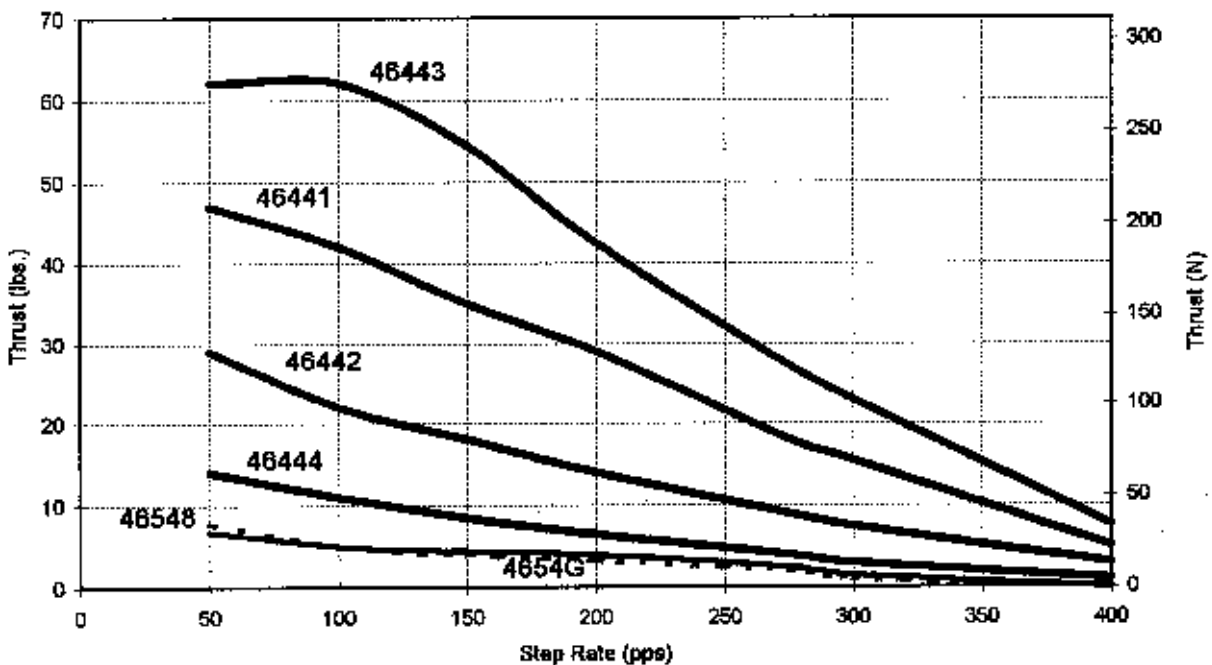
Linear Series 46000 Step Rate vs. Thrust Curves

Bipolar • L/R Drive • 100% Duty Cycle



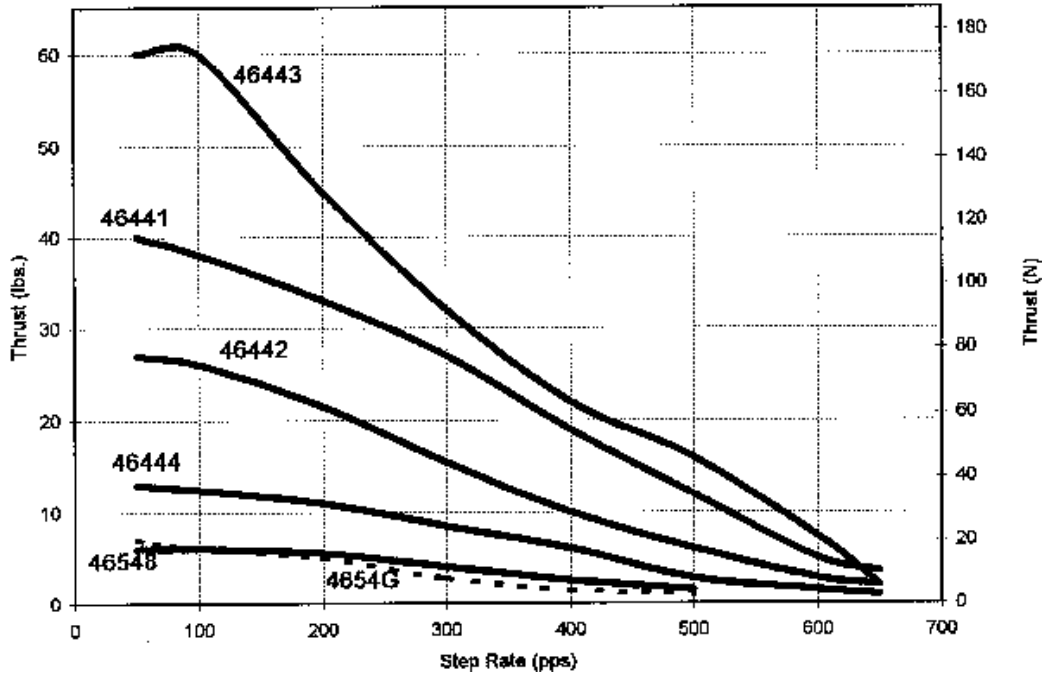
Bipolar • L/R Drive • 25% Duty Cycle

25% duty cycle is obtained by a special winding or by running a standard motor at double the rated voltage.



Linear Series 46000 Step Rate vs. Thrust Curves

Bipolar • Chopper Drive • 100% Duty Cycle



Bipolar • Chopper Drive • 25% Duty Cycle

25% duty cycle is obtained by running a standard motor at double the rated current.

