

## 21000 Series Size 8 Double Stack Hybrid Linear Actuators

Size 8 Double Stack Hybrid Stepper Motor Linear Actuators provide enhanced performance over a single stack.

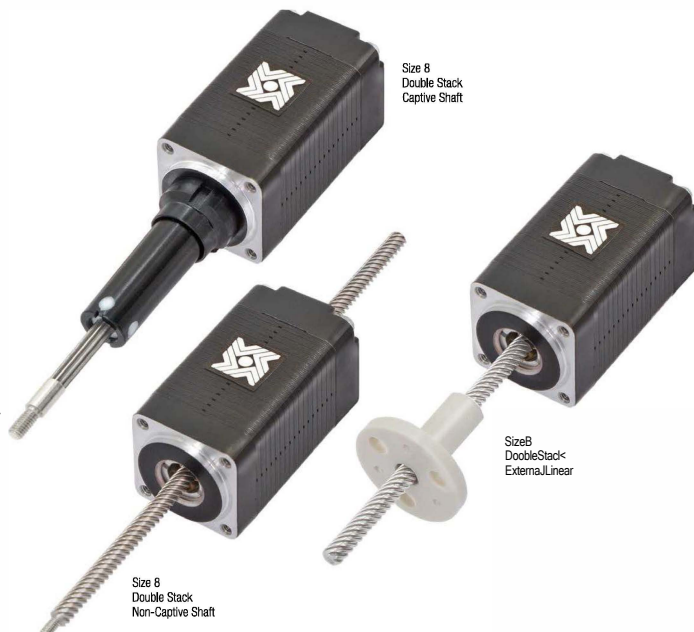
**Improved Performance & New Linear Motion Design Opportunities in a 20 mm Frame Size**

### 3 Available Designs

- Captive
- Non-Captive
- External Linear

The 21000 Series is available in a wide variety of resolutions - from 0.000098 in (.0025 mm) per step to 0.00157 in (0.04 mm) per step. The Size 8 actuator delivers thrust of up to 17 lbs. (75 N).

Assembly options include: Incremental encoders, proximity sensors (captive types only), anti-backlash and custom nuts, and TFE coated lead screws.



### Specifications

Size 8 Double Stack: 21 mm (0.8-in) Hybrid Linear Actuator (1.8° Step Angle)			
Part No.	Captive	21M4 - - - t	
	Non-Captive	21L4 - - - t	
	External Linear	E21M4 - - - t	
Wiring	Bipolar		
Winding Voltage	2.5 VDC	5VDC	7.5 VDC
Gurren! (RMS)/phase	1.32A	.65A	.43A
Resistance/phase	1.9 !1	7.7 !1	17.3 !1
Inductance/phase	0.8 mH	3.2 mH	6.1 mH
Power Consumption	6.5 WTotal		
Rotor Inertia	2.6 gcm <sup>2</sup>		
Insulation Class	Class B (Class F available)		
Weight	2.4 oz (43 g)		
Insulation Resistance	20 M!1		

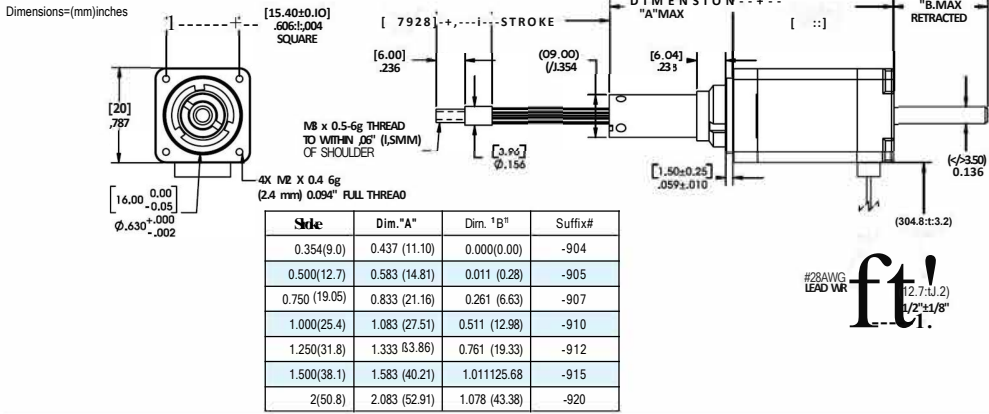
tPart num, Wiring information on page 84.

Linear Travel / Step		Order Code I.D.
Screw 0.14-in (3.56mm)		
inches	mm	
.000098.	.0025	AA
.00012	.0030*	N
.00019'	.005	AB
.00024	.DOW	K
.00039*	0.01	AC
.00048	.0121.	J
.00078.	.02	AD
.0015r	.04	Pf
.00157	.04	Pf

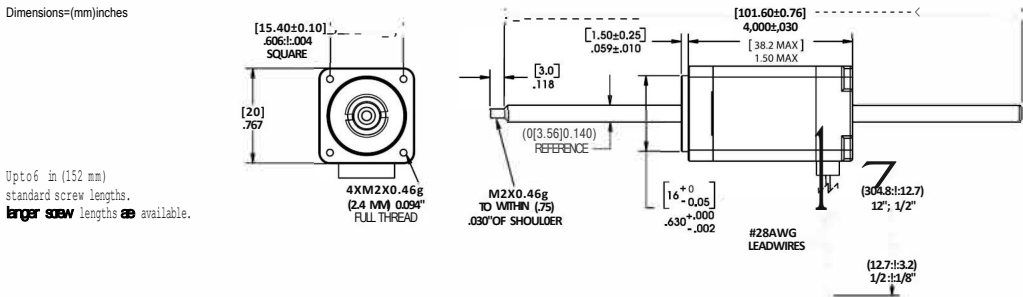
-Values truncated  
Standard motors are Class B rated for maximum temperature of 130 C.

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

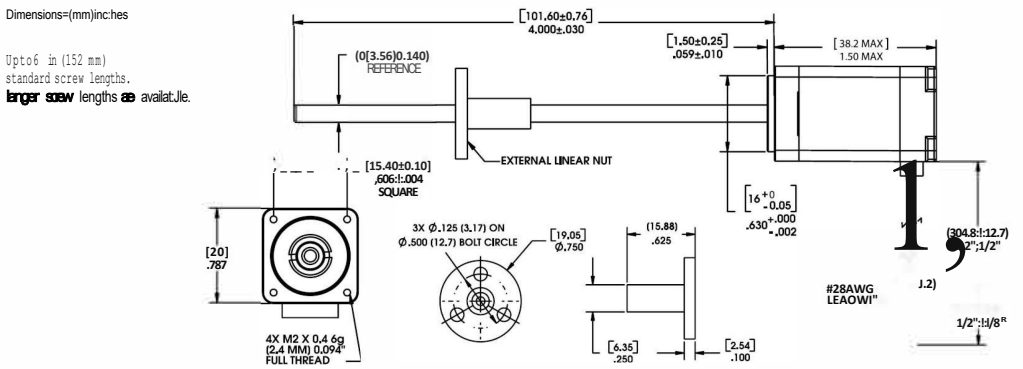
**Captive Lead Screw**



**Non-Captive Lead Screw**

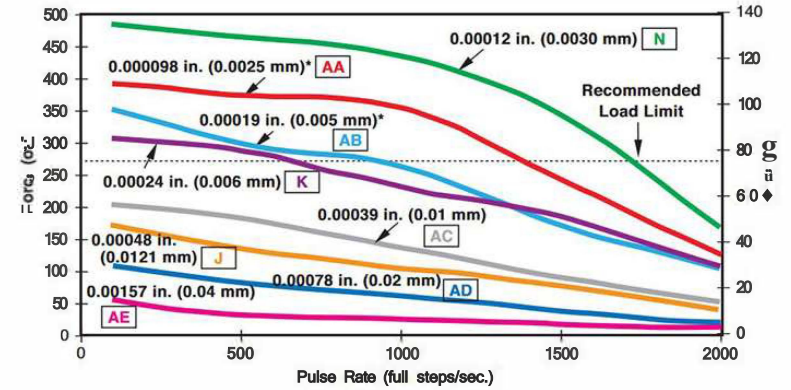


**External Linear**



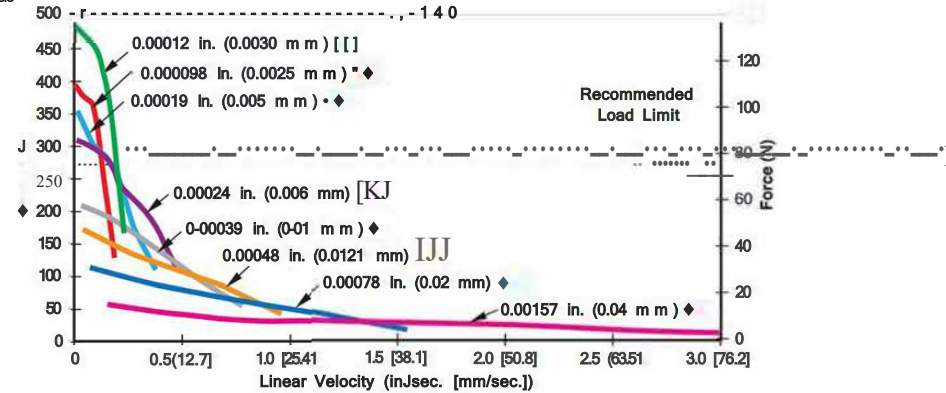
**FORCE vs. PULSE RATE**

- Chopper
- Bipolar
- 100% Duty Cycle
- 0.14 (3.56) Lead Screw
- 8:1 Motor Coil to Drive Supply Voltage



**FORCE vs. LINEAR VELOCITY**

- Chopper
- Bipolar
- 100% Duty Cycle
- 0.14 (3.56) Lead Screw
- 8:1 Motor Coil to Drive Supply Voltage



\*Care should be taken when utilizing these screw pitches to ensure that the pitch will allow the motor to accelerate up to speed faster. Please consult the factory for advice in selecting the proper pitch for your application.

Ramping can increase the performance of a motor either by increasing the top speed or getting a heavier load accelerated up to speed faster. Also, deceleration can be used to stop a motor without overshoot.

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

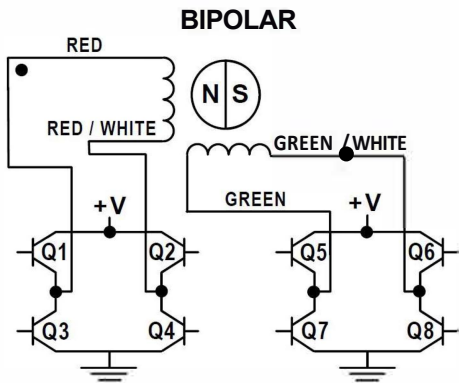
With 1/2" drives peak force and speeds are reduced, using a bipolar drive will yield a further 30% force reduction.

Identifying the Hybrid Part Number Codes when Ordering

E	21	M	4	N	2.5	910
Prefix (include only when using the following) A=ACoil S=AC Synchroous Dataseet E = External K = External with 40° thread form P = Proximity Sensor	Series Number Designation <b>21 = 21000</b> (Series numbers represent approximate width of motor body)	style L = 1.8° Non-captive <b>M = 1.8° Captive or External</b> (use "E" or "K" Prefix for External version)	Coils 4 = Bipolar (4wire)	Code D Resolution Travel/Step AA= .00098-in (.0025) N = .00012-in (.0030) AB= .00019-in (.005) K = .00024-in (.006) AC= .00039-in (.01) J = .00048-in (.0121) AD= .00078-in (.02) AE = .00157-in (.04) TF=Notavailable	<b>Voltage</b> 2.5 = 2.5 VDC 05=5VDC 7.5 = 7.5 VDC Custom/Vavailable	Suffix <b>stroke</b> Example:-910 = 1-in (Refer to Stroked 7 or Non-Captive motor series product page.) Suffix also represents: -800 = Metric -900 = External Linear with grease and flanged nut -XXX = Proprietary suffix assigned to a specific customer application. The identifier can apply to either a standard or custom part.

NOTE: Dashes must be included if Part Number (-) as shown above. For assistance can our Engineering Team at 203 756 7441.

Hybrids: Wiring



Hybrids: Stepping Sequence

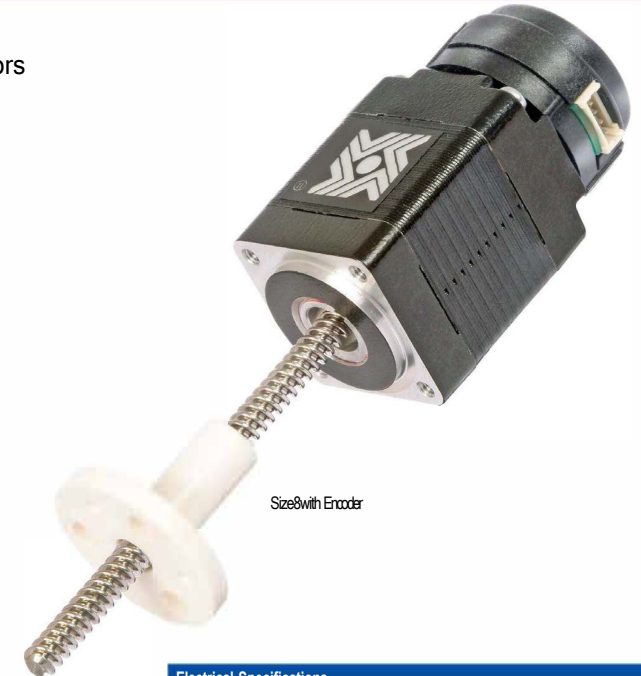
Bipolar	Q2-Q3	Q1-Q4	Q6-Q7	Q5-Q8
Step				
1	ON	OFF	ON	OFF
2	OFF	ON	ON	OFF
3	OFF	ON	OFF	ON
4	ON	OFF	OFF	ON
1	ON	OFF	ON	OFF

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

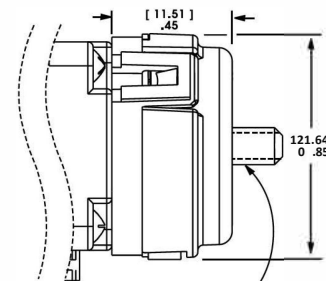
Encoders Designed for All Sizes of Hybrid Linear Actuators

All Haydon Hybrid Linear Actuators are available with specifically designed encoders for applications that require feedback. The compact optical incremental encoder design is available with two channel quadrature TTL squarewave outputs. An optional index is also available as a 3rd channel. The Size 8 Encoder provides resolutions for applications that require 250 and 300 counts per revolution. Encoders are available for all motor configurations - captive, non-captive and external linear.

Simplicity and low cost make Encoders ideal for both high and low volume motion control applications. The internal monolithic electronic module converts the real-time shaft angle, speed, and direction into TTL compatible outputs. The encoder module incorporates a lensed LED light source and monolithic photo-detector array with signal shaping electronics to produce the two channel bounceless TTL outputs.



21 mm 21000 Series Size B



NOTE: Lead Screw extends beyond encoder on specific captive and non-captive motors. External linear shaft extension is available upon request.

Electrical Specifications				
	Minimum	Typical	Maximum	Units
Input Voltage	4.5	5.0	5.5	VDC
Output Signals	4.5	5.0	5.5	VDC

2 channel quadrature squarewave outputs.  
Channel B leads A for a clockwise rotation of the rotor viewed from the encoder cover.  
Tracks at speeds of 0 to 100,000 cycles/sec.  
Optional index available as a 3rd channel (one pulse per revolution).

Operating Temperature		
Size 8	Minimum	Maximum
	-10° C (W F)	85° C (185° F)

Mechanical Specifications	
Acceleration	1 Maximum 250,000 rad/sec <sup>2</sup>
Vibration (5 Hz to 2 KHz)	1 20 g

Resolution			
4 Standard Cycles Per Revolution (CPR) or Pulses Per Revolution (PPR)			
Size 8	CPR	250	300
	PPR	1000	1200