Haydon kerk Motion Solutions / PITTMAN

AMETEK

NEW

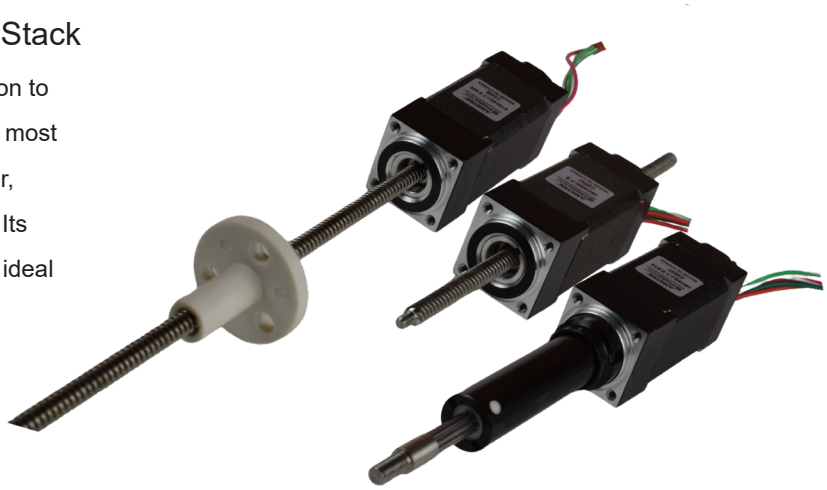
HKP Size 6, Double Stack 16mm Hybrid Stepper Linear Actuator

Provides Superior Force Output vs. a Single Stack

The 16000 series, size 6 double stack, is the latest addition to our award-winning miniature motor line and marks HKP's most compact hybrid linear actuator. As equipment gets samller, engineers must deliver high performance in tight spaces. Its compact 16mm frame offers enhanced force and motion, ideal for pipetting, fluid handling, optics, and photonics.

Available in three designs:
- Captive
- Non-Captive
- External Linear

- Resolutions offered ranging from 0.00254mm (0.0001 in) to 0.0667mm (0.002625 in) per step
- Delivers force of up to 17 lbs-f (75N)



Size 6 Double Stack: 16mm (.6 in)
Hybrid Linear Actuator
(3° Step Angle)

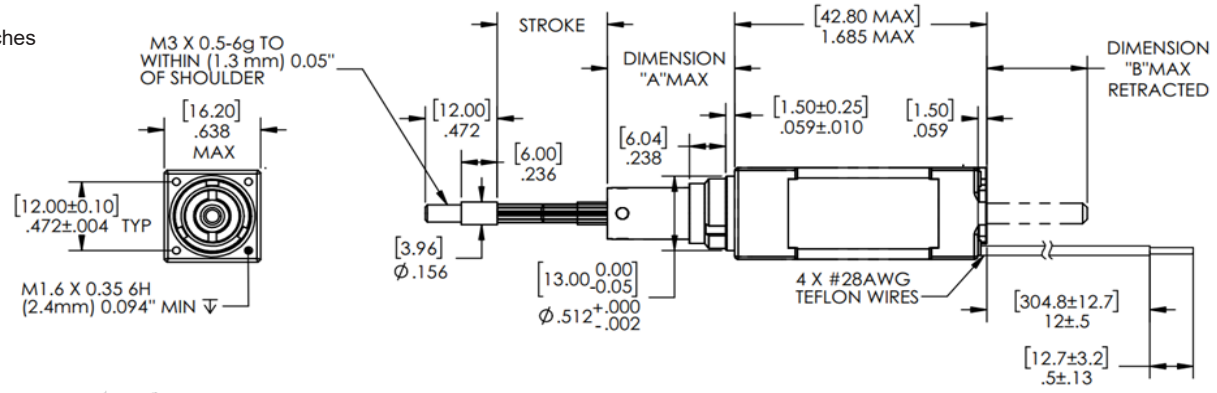
Size 6 Double Stack: 16 mm (0.6-in) Hybrid Linear Actuator (3° Step Angle)			
Part No.	Captive	16D4 ☐ – ☐☐ – ☐☐☐	
	Non-Captive	16C4 ☐ – ☐☐ – ☐☐☐	
	External	E16D4 ☐ – ☐☐ – ☐☐☐	
Wiring	Bipolar		
Winding Voltage	5 VDC	7.5 VDC	12 VDC
Current (RMS)/phase	0.71 A	0.48 A	0.3 A
Resistance/phase	7 Ω	15.6 Ω	40 Ω
Inductance/phase	1.35 mH	2.65 mH	7.9 mH
Power Consumption	7.2 W Total		
Rotor Inertia	1.56 gcm^2		
Insulation Class	Class H		
Weight	2.11 oz (60 g)		
Insulation Resistance	20 MΩ		

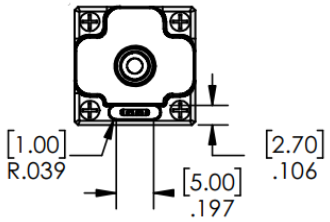
Note: Standard motors are Class H rated for a maximum temperature of 180°C.

Linear Travel/Step Screw Φ .14 in, 3.56mm		Order Code ID
inches	mm	
0.0001	0.00254	GE**
0.0002	0.00508	GF
0.0004	0.01016	DZ
0.0008	0.02032	CT
0.000164	0.004167	GG**
0.000328	0.008333	GH
0.000656	0.016667	GJ
0.001312	0.033333	GK
0.002625	0.066667	GL

**TFE Coating not available

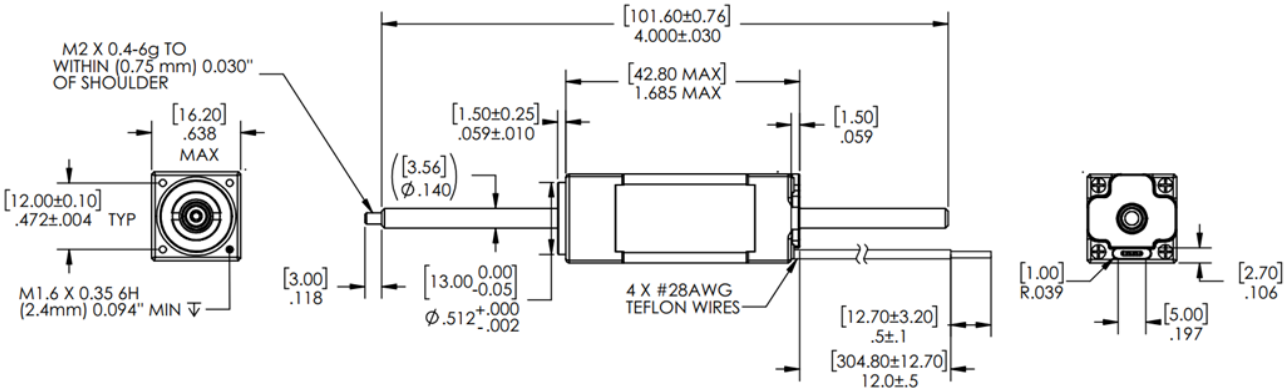
Captive Lead Screw
Dimensions = (mm) inches



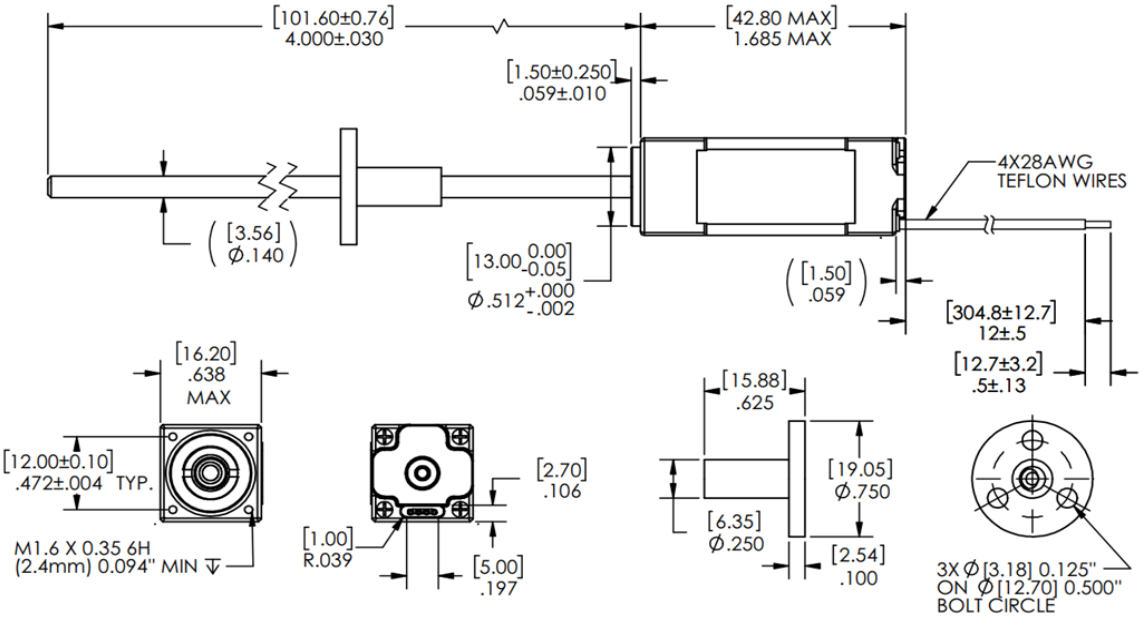


Stroke	Dim. "A"	Dim. "B"	Suffix #
0.354 (9.0)	0.437 (11.10)	0.000 (0.00)	–904
0.500 (12.7)	0.583 (14.81)	0.011 (0.28)	–905
0.750 (19.05)	0.833 (21.16)	0.261 (6.63)	–907
1.000 (25.4)	1.083 (27.51)	0.511 (12.98)	–910
1.250 (31.8)	1.333 (33.86)	0.761 (19.33)	–912
1.500 (38.1)	1.583 (40.21)	1.011 (25.68)	–915
2 (50.8)	2.083 (52.91)	1.078 (43.38)	–920

Non-Captive Lead Screw
Dimensions = (mm) inches

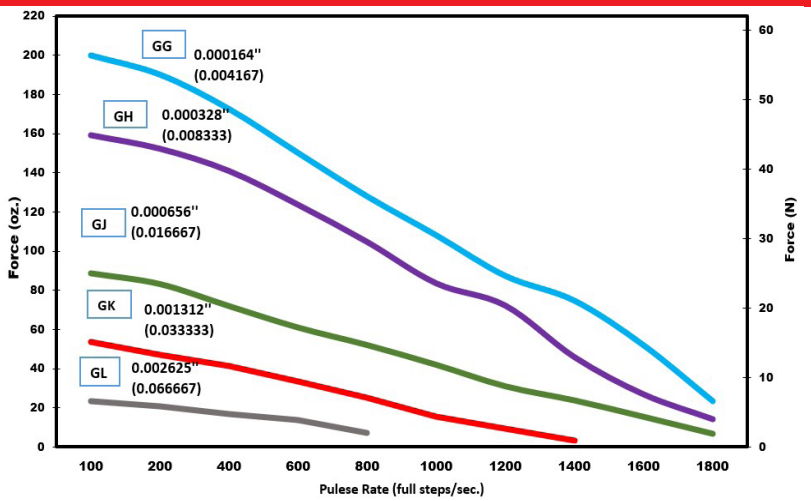


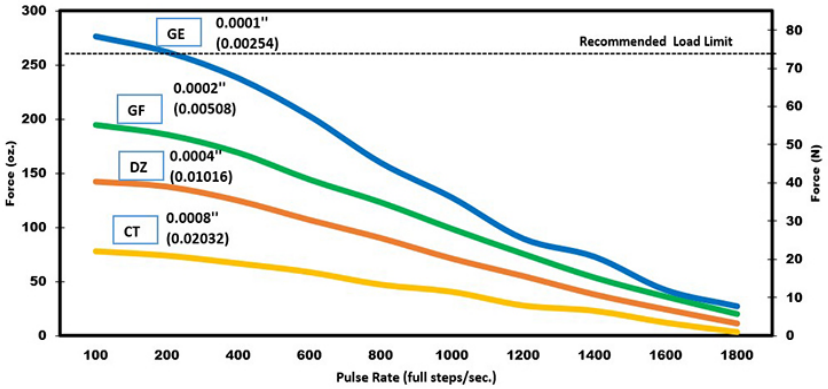
External Linear
Dimensions = (mm) inches



Force vs. Pulse Rate

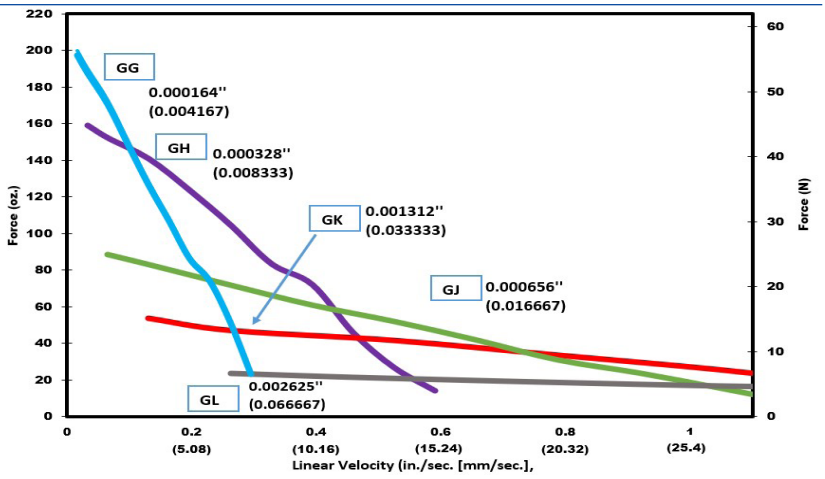
– Chopper
– 100% Duty Cycle
– Bipolar
– Ø.14 (3.56) Lead Screw





Force vs. Linear Velocity

– Chopper
– 100% Duty Cycle
– Bipolar
– Ø.14 (3.56) Lead Screw

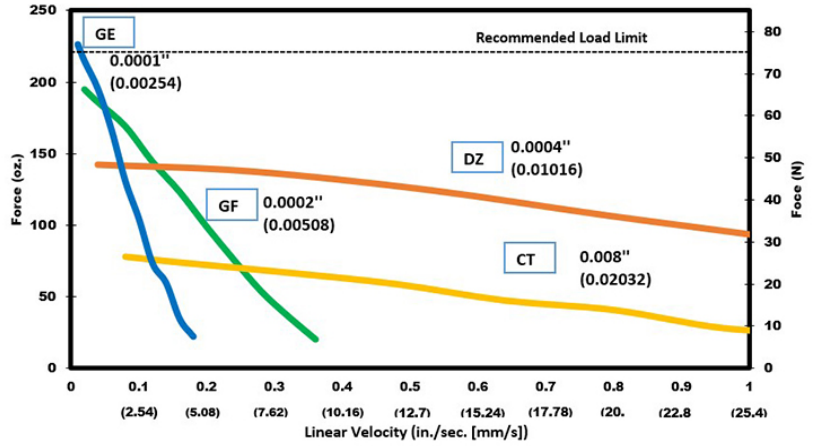


*Care should be taken when utilizing these screw pitches to ensure that the physical load limits of the motor are not exceeded. Please consult the factory for advice in selecting the proper pitch for your application.

NOTE: All chopper drive curves were created with a 7.5 volt motor and a 40 volt power supply.

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 the motor without overshoot.

With L/R drives peak force and speeds are reduced, using a unipolar drive will yield a further 30% force reduction.

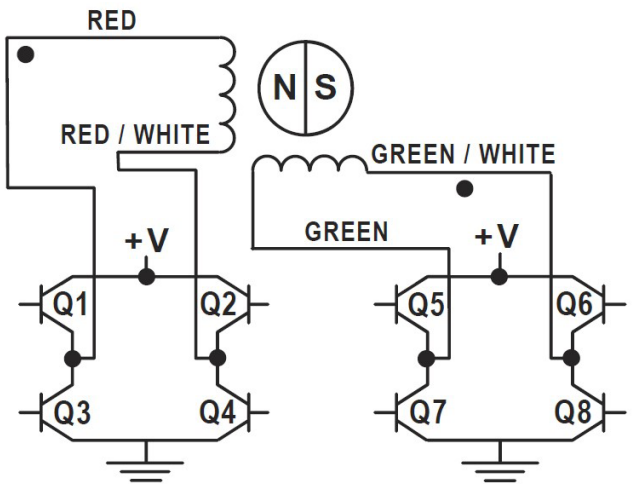


Identifying the Hybrid Part Number Codes when Ordering

E	16	C	4	GF	—	7.5	—	910
Prefix (include only when using the following) E = External K = External with 40° thread form P = Proximity Sensor S = Home Position Switch	Series Number Designation 16=16000 (Series numbers represent approximate width of motor body)	Style C = 3° Non-captive D = 3°Captive or External (use “E” or “K” Prefix for External version)	Coils 4 = Bipolar (4 wire)	Code ID Resolution Travel/Step *GE = 0.0001-in (0.00254) GF = 0.0002-in (0.00508) DZ = 0.0004-in (0.01016) CT = 0.0008-in (0.02032) *GG = 0.000164-in (0.004167) GH = 0.000328 (0.008333) GJ = 0.000656-in (0.016667) GK = 0.001312-in (0.033333) GL = 0.002625-in (0.066667) *TFE not available		Voltage VDC 05 = 5 VDC 7.5 = 7.5 VDC 12 = 12 VDC Custom voltages available		Suffix Stroke Example: –910 = 1-in (Refer to Stroke chart on Captive motor series product page.) Suffix also represents: –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 in Part Number (–) as shown above. For assistance call our Engineering Team at 203 756 7441.

Hybrids: Wiring



Hybrids: Stepping Sequence

EXTEND CW

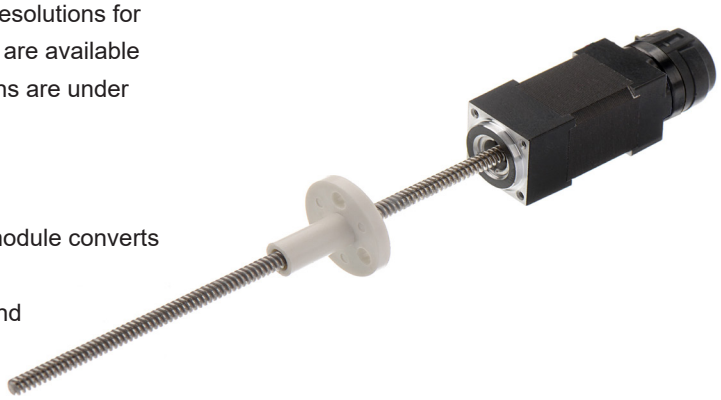
Bipolar	Q2-Q3	Q1-Q4	Q6-Q7	Q5-Q8
Step				
1	ON	OFF	ON	OFF
2	OFF	ON	ON	OFF
3	OFF	ON	OFF	ON
4	ON	OFF	OFF	ON
1	ON	OFF	ON	OFF

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

Encoders Designed for All Sizes of Hybrid Linear Actuators

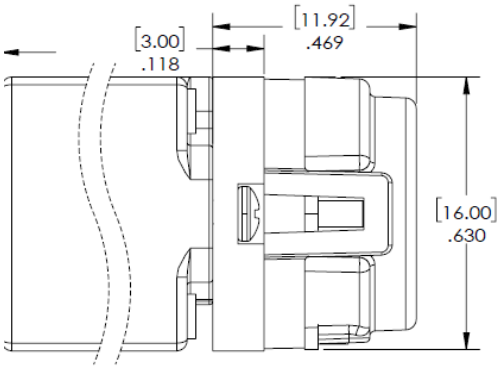
All Haydon Hybrid Linear Actuators are available with specifically designed encoders for applications that require feedback. The compact optical incremental encoder design is available with two channel quadrature TTL squarewave outputs. An optional index is also available as a 3rd channel. The Size 6 Encoder provides resolutions for applications that require 250 and 4000 counts per revolution. Encoders are available for the external linear configuration only. Captive and non-captive options are under development

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.



Size 6 with Encoder

16 MM 16000 Series Size 6



Single Ended Encoder - Pinout - Size 6	
Connector Pin #	Description
1	Ground
2	Index
3	Channel A
4	+5 VDC Power
5	Channel B

Electrical Specifications				
	Minimum	Typical	Maximum	Units
Input Voltage	4.5	5.0	5.5	VDC
Output Signals	4.7	5.0	5.5	VDC

2 channel quadrature TTL squarewave outputs.

Channel B leads A for a clockwise rotation of the rotor viewed from the encoder cover.

Optional index available as a 3rd channel (one pulse per revolution).

Operating Temperature		
Size 6	Minimum	Maximum
	- 40°C (-40°F)	100°C (212°F)

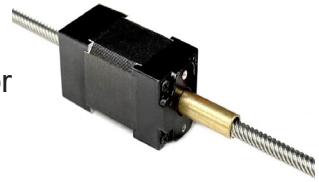
Mechanical Specifications	
	Maximum
Acceleration	250,000 rad/sec^2
Vibration (10 Hz to 2 kHz)	20 g

Resolution			
4 Standard Cycles Per Revolution (CPR) or Pulses Per Revolution (PPR)			
Size 6	CPR	250	4000
	PPR	1000	16000

Other Resolutions Available - Contact Factory

Hybrid Stepper Motors: Optional Assemblies

Encoder Ready Option for all Hybrid Sizes

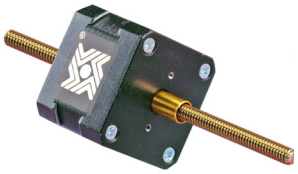


Encoder Ready Option
Shown 16000 Series Size 6

Our Hybrid Linear Actuators can now be manufactured as an Encoder Ready Actuator. Encoder Ready Actuators can be used to install several popular hollow shaft encoders. Available with an extended rotor journal and a threaded rear housing. The motor uses a proprietary manufacturing process which incorporates engineering thermoplastics in the rotor drive nut and a stainless steel Acme Lead Screw that allows the motor to be much more efficient and durable than today's more commonly used V-thread bronze nut configurations.

Extended Rotor Journal for all Hybrid Sizes

Available with an extended rotor journal. The extended rotor journal can be used for encoder installation, manual adjustment, or flag installation for a positioning sensor.



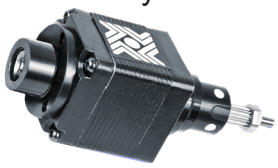
Extended Rotor Journal
Shown 34000 Series Size 17

Home Position Switch for Hybrids

A miniature electronic Home Position Switch capable of monitoring the home positions of linear actuators. The switch mounts on the rear sleeve of captive linear motors and allows the user to identify start, stop or home positions. When ordering motors with the home position switch the part number should be preceded by an "S" prefix.

End of Stroke Proximity Sensor for all Hybrid Sizes

The Sensor incorporates a hall effect device, which is activated by a rare earth magnet embedded in the end of the internal screw. The compact profile of the sensor allows for installation in limited space applications. The sensor has a virtually unlimited cycle life.



End of Stroke
Proximity Sensor

Special cabling and connectors can also be provided.

When ordering motors with the proximity sensor, the part number should be preceded by a "P" prefix.

Black Ice® and Kerkote® TFE Coated Lead Screws*

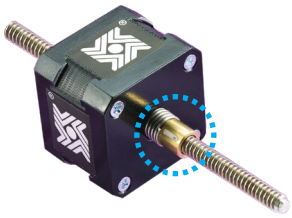
TFE Coated Lead Screws for applications that require a greaseless screw and nut interface. A dry (non-lubricated) TFE coated lead screw provides improved performance in both life and thrust as compared to a conventional stainless steel lead-screw. TFE can be applied to a wide variety of lead-screw pitches and is available for our brand captive, non-captive and external linear actuators. Not available for 0.00006-in (.0015 mm) and 0.000098-in (.0025 mm) resolutions.

TFE Coated Lead Screw

*Certain conditions apply.

Integrated Anti-Backlash Nut for Hybrids*

Most sizes (except Size 34) of our captive and non-captive hybrid stepper motors can be equipped with an integral anti-backlash feature. There is a normal backlash between the lead screw and integral rotor nut. Our actuators are designed for millions of cycles. However over time, additional backlash could increase and eventually double. Haydon Kerk Integrated Anti-Backlash Nut can eliminate all backlash. Designed specifically for our captive and non-captive hybrid motors, nuts use an opposing spring force to eliminate backlash between the screw and the nut interface. The nuts will self-compensate and accommodate any wear. Haydon Kerk Motion Solutions application engineers can help you select the appropriate preload for your application.



Integrated Anti-Backlash Nut

*Except Size 34.