## Can-Stack Actuators

The Haydon™ brand of can-stack stepper motor linear actuators provides both a broader range and, for a given size, significantly higher thrust than previously available from mini-steppers. Haydon Kerk Motion Solutions patented design accepts a larger rotor than conventional units, improving efficiency and eliminating the need for massive heat sinks. Unique 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.

## G4 19000 Series

## Ø 20 mm (.79-in) Can-Stack <br> Stepper Motor Linear Actuators

Utilizing high energy rare earth (neodymium) magnets,the G4 Series linear actuators consistently deliver exceptional performance. All units are built with dual ball bearings.
The highest force of any similar size linear actuator stepper motor

## Multiple versions available

- Captive
- Non-Captive
- External Linear



## Specifications



| Linear Travel / Step <br> $15^{\circ}$ <br> Step Angle |  |  | Order <br> Code I.D. |
| :---: | :---: | :---: | :---: |
| step | inches | mm |  |
| $7.5^{\circ}$ | 0.0005 | 0.013 | 3 |
|  | 0.001 | 0.0254 | 1 |
|  | 0.002 | 0.051 | 2 |
| $15^{\circ}$ | 0.001 | 0.0254 | 1 |
|  | 0.002 | 0.051 | 2 |
|  | 0.004 | 0.102 | 4 |

Special drive considerations may be necessary when leaving shaft fully extended or fully retracted. Standard motors are Class B rated for maximum temperature of $130^{\circ} \mathrm{C}\left(266^{\circ} \mathrm{F}\right)$.

## Captive Lead Screw

Dimensions $=(\mathrm{mm})$ inches


## Non-Captive Lead Screw



## External Linear



Connector


FORCE vs. PULSE RATE

- L/R Drive
- Bipolar
- 100\% Duty Cycle


FORCE vs. PULSE RATE

- L/R Drive
- Bipolar
- 25\% Duty Cycle

Obtained by a special winding or by running a standard motor at double the rated current.


## FORCE vs. PULSE RATE

- Chopper Drive
- Bipolar
- 100\% Duty Cycle


FORCE vs. PULSE RATE

- Chopper Drive
- Bipolar
- 25\% Duty Cycle


NOTE: All chopper drive curves were created with a 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.


NOTE: Dashes must be included in Part Number (-) as shown above. For assistance call our Engineering Team at 2037567441.

## Can-Stacks: Wiring

## BIPOLAR



Can-Stacks: Stepping Sequence

| Bipolar | Q2-Q3 | Q1-Q4 | Q6-Q7 | Q5-Q8 |
| :---: | :---: | :---: | :---: | :---: |
| Step |  |  |  |  |

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

## ■ Can-Stack Stepper Motor Linear Actuators Options

## TFE Coated Lead Screws for applications that require a permanent, dry lubricant

Ideal for applications where conventional oils and greases cannot be used for lead screw lubrication.
Non-lubricated TFE Coated Lead Screw provides improved performance in both life and thrust as compared to a "dry" stainless steel lead screw. TFE can be applied to a wide variety of lead screw pitches. Available captive, non-captive and external linear.
Typical applications: where contamination from grease or lubricants must be avoided; silicon wafer handling, clean rooms, medical equipment or laboratory instrumentation.

Lead Screw Comparison: FORCE vs. PULSE RATE

- L/R Drive - 100\% Duty Cycle



## Home Position Switch monitors movements more precisely for greater control and improved quality control

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. Depending on your preference, contacts can be normally open or normally closed. The contact closure is repeatable to within one step position, identifying linear movements as low as $0.0005-\mathrm{in}(0.0013 \mathrm{~cm})$ per step. Multiple contact switches are also available.
Activation force of $10 \mathrm{oz}(2.78 \mathrm{~N})$ required therefore may not be appropriate for smaller can-stack actuators.

When ordering motors with the home position switch, the part number should be preceded by an "S".

| Specifications |  |
| :---: | :---: |
| Contact Ratings (Standard) | 1.00 AMP @ 120 VAC 1.00 AMP @ 28 VDC |
| Operating Temperature | $-30^{\circ} \mathrm{C}$ to $+55^{\circ} \mathrm{C}\left(-22^{\circ} \mathrm{F}\right.$ to $\left.131^{\circ} \mathrm{F}\right)$ |
| Electrical Life | $<20$ milliohms typ. initial at $2-4 \mathrm{~V}$ DC, 100 mA Tested to 60,000 make-and-break cycles at full load |
| Schematic | Multiple contact options available. |


ADJUST LOCATION OF LOCK NUT TO ENSURE THE REIRACTED DIMENSION


| Stroke <br> inches $(\mathrm{mm})$ | Dim "A" Extended <br> inches (mm) | Dim "B" Retracted <br> inches (mm) | Dim "C" Ref. <br> inches (mm) |
| :---: | :---: | :---: | :---: |
| $.512(13)$ | $1.385+/-.015$ | $.841+/-.025$ <br> $(35.17+/-0.38)$ | $2.230+/-.025$ <br> $(21.37++-0.64)$ <br> $(56.63+/-0.64)$ |
| $.708(18)$ | $1.802+/-.015$ <br> $(45.77+/-0.38)$ | $1.050+/-.025$ | $2.438+/-.025$ |
|  | $(26.67+/-0.64)$ | $(61.93+/-0.64)$ |  |
| $.984(25)$ | $2.353+/-.015$ | $1.325+/-.025$ | $2.714+/-.025$ |
|  | $(59.77+/-0.38)$ | $(33.67+/-0.64)$ | $(68.93+--0.64)$ |
| $1.22(31)$ | N/A Contact Customer Service |  |  |

■ Can-Stack Stepper Motor Linear Actuators Options
End of Stroke Proximity Sensor incorporates a hall effect device, activated by a rare earth magnet embedded in the end of the internal screw

Compact profile of the sensor allows for installation in limited space applications. Virtually unlimited cycle life. Special cabling and connectors available.

| Specifications |  |  |
| :---: | :---: | :---: |
| Supply Voltage (VDC) |  | 3.8 min. to 24 max. |
| Current Consumption |  | 10 mA max. |
| Output Voltage (operated) |  | 0.15 typ., 0.40 max. Sinking 20 mA max. |
| Output Current |  | 20 mA max. |
| Output Leakage Current (released) |  | $10 \mu \mathrm{~A}$ max. @ Vout = 24 VDC; Vcc = 24 VDC |
| Output Switching Time | $\begin{aligned} & \text { Rise, } \\ & 10 \text { to } 90 \% \end{aligned}$ | . 05 山s typ., $1.5 \mu \mathrm{~s}$ max. @ Vcc $=12 \mathrm{~V}, \mathrm{RL}=1.6 \mathrm{KOhm}$ |
|  | $\begin{gathered} \text { Fall, } \\ 90 \text { to } 10 \% \end{gathered}$ | . $15 \mu \mathrm{styp} ., 1.5 \mu \mathrm{~s}$ max. @ CL $=20 \mathrm{pF}$ |
| Temperature |  | -40 to $+150^{\circ} \mathrm{C}$ |



NOTE: Sensor is category 2 ESD sensitive per DOD-STD-1686A. Assembly operations should be performed at workstations with conductive tops and operators grounded.


| Stroke <br> inches $(\mathrm{mm})$ | Dim "A" Extended <br> inches $(\mathrm{mm})$ | Dim "B" Retracted <br> inches $(\mathrm{mm})$ |
| :---: | :---: | :---: |
| $.512(13)$ | $1.360(34.55)$ | $.73(18.55)$ |
| $.708(18)$ | $1.569(39.85)$ | $.94(23.85)$ |
| $.984(25)$ | $1.844(46.85)$ | $1.21(30.85)$ |
| $1.22(31)$ | $2.081(52.85)$ | $1.45(36.85)$ |

The sensor has virtually unlimited cycle life. Special cabling and connectors can also be provided.

## G4 25000 Series <br> Ø 25 mm (1.0-in) Can-Stack Stepper Motor Linear Actuators

High durability and exceptional performance. All units are built with dual ball bearings.
Generates higher force than other competitors
Multiple versions available

- Captive
- Non-Captive
- External Linear



## Specifications



| $\emptyset 25 \mathrm{~mm}$ (1.0-in) Motor |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
| Captive | 2544 | + | 2554 | $\dagger$ |
| Part No. Non-Captive | 2534 | † | 2584 | - |
| External Linear* | E2544 | I | E2554 | $\square{ }^{\dagger}$ |
| Wiring | Bipolar |  |  |  |
| Step angle | $7.5^{\circ}$ |  | $15^{\circ}$ |  |
| Winding Voltage | 5 VDC | 12 VDC | 5 VDC | 12 VDC |
| Current (RMS)/phase | 385 mA | 160 mA | 385 mA | 160 mA |
| Resistance/phase | $13 \Omega$ | $72 \Omega$ | $13 \Omega$ | $72 \Omega$ |
| Inductance/phase | 10.8 mH | 60 mH | 8.08 mH | 48 mH |
| Power Consumption | 3.85 W |  |  |  |
| Rotor Inertia | $1.07 \mathrm{gcm}^{2}$ |  |  |  |
| Insulation Class | Class B |  |  |  |
| Weight | 1.7402 (49 g) |  |  |  |
| Insulation Resistance | $20 \mathrm{M} \Omega$ |  |  |  |


| $\begin{array}{c}\text { Linear Travel / Step } \\ 15^{\circ}\end{array}$ |  |  | Order |
| :---: | :---: | :---: | :---: |
| Order Ingle |  |  |  |$]$.

Special drive considerations may be necessary when leaving shaft fully extended or fully retracted. Standard motors are Class B rated for maximum temperature of $130^{\circ} \mathrm{C}\left(266^{\circ} \mathrm{F}\right)$.
tPart numbering information on page 153.
Captive Lead Screw
Dimensions $=(\mathrm{mm})$ inches

| Stroke (Minimum) <br> inches $(\mathrm{mm})$ | Front Sleeve A <br> inches $(\mathrm{mm})$ | Retracted B <br> inches $(\mathrm{mm})$ | Extended C <br> inches $(\mathrm{mm})$ | Rear Sleeve D <br> inches (mm) | Code with <br> Connector | Code with <br> Leads |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $.512(13 \mathrm{~mm})$ | $.472+/-.010(11.99+/-0.25)$ | $.787+/-.025(19.99+/-0.64)$ | $1.329+/-.015(33.76+/-0.38)$ | 1.128 Max. $(28.65$ Max. $)$ | -905 | -1005 |
| $.708(18 \mathrm{~mm})$ | $.680+/-.010(17.28+/-0.25)$ | $.994+/-.025(25.25+/-0.64)$ | $1.743+/-.015(44.27+/-0.38)$ | 1.336 Max. $(33.94 \mathrm{Max})$. | -907 | -1007 |
| $.984(25 \mathrm{~mm})$ | $.955+/-.010(24.26+/-0.25)$ | $1.269+/-.025(32.23+/-0.64)$ | $2.293+/-.015(58.24+/-0.38)$ | 1.611 Max. $(40.92$ Max. $)$ | -910 | -1010 |
| $1.22(31 \mathrm{~mm})$ | $1.191+/-.010(30.25+/-0.25)$ | $1.505+/-.025(38.23+/-0.64)$ | $2.765+/-.015(70.23+/-0.38)$ | 1.847 Max. $(46.91$ Max. $)$ | -912 | -1012 |

## Non-Captive Lead Screw

Dimensions $=(\mathrm{mm})$ inches

Up to $6.3-\mathrm{in}(160 \mathrm{~mm})$ standard screw lengths. Longer screw lengths are available.


## External Linear

Dimensions $=(\mathrm{mm})$ inches
Up to 6.3 -in ( 160 mm ) standard screw lengths.
Longer screw lengths are available.
 SPACED ON ©(12.70) SPACED ON छ(12.70)
.50 BOLT CIRCLE


## Connector



| Part <br> Number | Dimension "A" |
| :---: | :---: |
| $56-1318-4$ | $(24 \pm 0.39) 610 \pm 10 \mathrm{~mm}$ |
| $56-1318-3$ | $(18 \pm 0.39) 450 \pm 10 \mathrm{~mm}$ |
| $56-1318-2$ | $(12 \pm 0.39) 305 \pm 10 \mathrm{~mm}$ |
| $56-1318-1$ | $(6 \pm 0.39) 150 \pm 10 \mathrm{~mm}$ |

FORCE vs. PULSE RATE

- L/R Drive
- Bipolar
- 100\% Duty Cycle


FORCE vs. PULSE RATE

- L/R Drive
- Bipolar
- 25\% Duty Cycle

Obtained by a special winding or by running a standard motor at double the rated current.


## FORCE vs. PULSE RATE

- Chopper Drive
- Bipolar
- 100\% Duty Cycle



## FORCE vs. PULSE RATE

- Chopper Drive
- Bipolar
- 25\% Duty Cycle



## Identifying the Can-Stack Number Codes when Ordering

| E | 25 | 5 | 4 | 4 | 12 | 1010 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Prefix <br> (include only when using the following) <br> E = External <br> K = External <br> with $40^{\circ}$ <br> thread <br> form <br> P = Proximity <br> Sensor <br> S = Home <br> Position <br> Switch | Series Number Designation $25=25000$ (Series numbers represent approximate diameters of motor body) | Style $3=7.5^{\circ}$ <br> Non-Captive $4=7.5^{\circ}$ <br> Captive or External (use "E" or "K" Prefix for External version) $5=15^{\circ}$ <br> Captive or External (use "E" or "K" Prefix for External version $8=15^{\circ}$ <br> Non-Captive | Coils $4=\begin{aligned} & \text { Bipolar } \\ & (4 \text { wire }) \end{aligned}$ | Code ID Resolution Travel/Step $\begin{aligned} & \mathbf{1}=.001-\mathrm{in}(.0254) \\ & \mathbf{2}=.002-\mathrm{in}(.051) \\ & \mathbf{3}=.0005-\mathrm{in}(.013) \\ & \mathbf{4}=.004-\mathrm{in}(.102) \end{aligned}$ | Voltage $\begin{gathered} 05=5 \mathrm{VDC} \\ 12=12 \mathrm{VDC} \end{gathered}$ <br> Custom V available | Suffix <br> Stroke <br> Example: -1010 <br> = captive 25 mm stroke with leads <br> -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 2037567441 .

Can-Stacks: Wiring
BIPOLAR


Can-Stacks: 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.

## - Can-Stack Stepper Motor Linear Actuators Options

## TFE Coated Lead Screws for applications that require

## a permanent, dry lubricant

Ideal for applications where conventional oils and greases cannot be used for lead screw lubrication.
Non-lubricated TFE Coated Lead Screw provides improved performance in both life and thrust as compared to a "dry" stainless steel lead screw. TFE can be applied to a wide variety of lead screw pitches. Available captive, non-captive and external linear. Typical applications: where contamination from grease or lubricants must be avoided; silicon wafer handling, clean rooms, medical equipment or laboratory instrumentation.

Lead Screw Comparison: FORCE vs. PULSE RATE

- L/R Drive - 100\% Duty Cycle



## Home Position Switch monitors movements more precisely for greater control and improved quality control

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. Depending on your preference, contacts can be normally open or normally closed. The contact closure is repeatable to within one step position, identifying linear movements as low as $0.0005-\mathrm{in}(0.0013 \mathrm{~cm})$ per step. Multiple contact switches are also available. Activation force of $100 \mathrm{zz}(2.78 \mathrm{~N})$ required therefore may not be appropriate for smaller can-stack actuators.
When ordering motors with the home position switch, the part number should be preceded by an "S".

| Specifications |  |
| :---: | :---: |
| Contact Ratings (Standard) | 1.00 AMP @ 120 VAC <br> 1.00 AMP @ 28 VDC |
| Operating Temperature | $-30^{\circ} \mathrm{C}$ to $+55^{\circ} \mathrm{C}\left(-22^{\circ} \mathrm{F}\right.$ to $\left.131^{\circ} \mathrm{F}\right)$ |
| Electrical Life | $<20$ milliohms typ. initial at $2-4 \mathrm{VDC}, 100 \mathrm{~mA}$ <br> Tested to 60,000 make-and-break cycles at full load |
| Schematic | 1 |



| Stroke <br> inches $(\mathrm{mm})$ | Dim "A" Extended <br> inches $(\mathrm{mm})$ | Dim "B" Retracted <br> inches $(\mathrm{mm})$ | Dim "C" Ref. <br> inches $(\mathrm{mm})$ |
| :---: | :---: | :---: | :---: |
| $.512(13)$ | $1.329+/-.025$ <br> $(33.76+/-0.64)$ | $.787+/-.025$ <br> $(19.99+/-0.64)$ | $2.051+/-.025$ <br> $(52.09+/-0.64)$ |
| $.708(18)$ | $1.743+/-.025$ <br> $(44.27+/-0.64$ | $.994+/-.025$ <br> $(25.25+/-0.64)$ | $2.258+/-.025$ <br> $(57.35+/-0.64)$ |
| $.984(25)$ | $2.293+/-.025$ <br> $(58.24+/-0.64)$ | $1.269+/-.025$ <br> $(32.23+/-0.64)$ | $2.534+/-.025$ <br> $(64.37+/-0.64)$ |
| $1.22(31)$ | $2.765+/-.025$ <br> $(70.23+/-0.64)$ | $1.505+/-.025$ <br> $(38.23+/-0.64)$ | $2.770+/-.025$ <br> $(70.37+/-0.64)$ |

G4 25000 Series • Can-Stack Stepper Motor Linear Actuators

## ■ Can-Stack Stepper Motor Linear Actuators Options

End of Stroke Proximity Sensor incorporates a hall effect device, activated by a rare earth magnet embedded in the end of the internal screw

Compact profile of the sensor allows for installation in limited space applications. Virtually unlimited cycle life. Special cabling and connectors available.

| Specifications |  |
| :---: | :---: |
| Supply Voltage (VDC) | 3.8 min. to 24 max. |
| Current Consumption | 10 mA max. |
| Output Voltage <br> (operated) | 0.15 typ., 0.40 max. <br> Sinking 20 mA max. |
| Output Current |  |$\quad 20 \mathrm{~mA}$ max..




| Stroke <br> inches $(\mathrm{mm})$ | Dim "A" Extended <br> inches $(\mathrm{mm})$ | Dim "B" Retracted <br> inches $(\mathrm{mm})$ |
| :---: | :---: | :---: |
| $.512(13)$ | $1.248(31.71)$ | $.632(16.05)$ |
| $.708(18)$ | $1.449(36.81)$ | $.833(21.15)$ |
| $.984(25)$ | $1.723(43.76)$ | $1.106(28.10)$ |
| $1.22(31)$ | $1.959(49.76)$ | $1.343(34.10)$ |

The sensor has virtually unlimited cycle life. Special cabling and connectors can also be provided.

## G4 25000 Series E8T Encoder

G4 25000 Series E8T Transmissive Optical Encoder is designed to provide the digital quadrature encoder feedback for high volume, compact space applications.

- Resolutions from 180 to 720
- Single-ended / Differential
- Frequency response to 100 kHz
- Low power consumption, 5 V @ 30 mA max
- High retention polarized connector

Assembly Options:

- Differential line driver with complementary outputs
- Detachable cable
- Through-hole cover

| Stroke <br> inches $(\mathrm{mm})$ | Dim "A" Extended <br> inches $(\mathrm{mm})$ |
| :---: | :---: |
| $.512(13)$ | $\mathrm{N} / \mathrm{A}$ |
| $.708(18)$ | $\mathrm{N} / \mathrm{A}$ |
| $.984(25)$ | $.071(1.80)$ |
| $1.22(31)$ | $.307(7.80)$ |




## G4 37000 Series

## Ø 36 mm (1.4-in) Can-Stack Stepper Motor Linear Actuators

Outstanding durability and high performance.
The G4 Series features high energy neodymium magnets and dual ball bearings.

Exceptionally high linear force-to-size ratio, ideal for precision motion
Multiple versions available

- Captive
- Non-Captive
- External Linear
$\emptyset 37 \mathrm{~mm}$ (1.4-in)
Non-Captive



## Specifications

| $\emptyset 36 \mathrm{~mm}$ (1.4-in) Motor |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Part No. | Captive | 3744 | $\dagger$ | 3754 | $\dagger$ |
|  | Non-Captive | 3734 | + | 3784 | 1 |
|  | External Linear | E3744 | $\square+$ | E3754 | 1- ${ }^{+}$ |
| Wiring |  | Bipolar |  |  |  |
| Step angle |  | $7.5^{\circ}$ |  | $15^{\circ}$ |  |
| Winding Voltage |  | 5 VDC | 12 VDC | 5 VDC | 12 VDC |
| Current (RMS)/phase |  | 561 mA | 230 mA | 561 mA | 230 mA |
| Resistance/phase |  | $8.9 \Omega$ | $52 \Omega$ | $8.9 \Omega$ | $52 \Omega$ |
| Inductance/phase |  | 11.6 mH | 65 mH | 8.5 mH | 46 mH |
| Power Consumption |  | 5.6 W |  |  |  |
| Rotor Inertia |  | $8.5 \mathrm{gcm}^{2}$ |  |  |  |
| Insulation Class |  | Class B |  |  |  |
| Weight |  | 4.2 oz (120 g) |  |  |  |
| Insulation Resistance |  | $20 \mathrm{M} \Omega$ |  |  |  |


| Linear Travel / Step $15^{\circ}$ Step Angle |  |  | Order <br> Code I.D. |
| :---: | :---: | :---: | :---: |
| step | inches | mm |  |
| $\begin{gathered} 7.5^{\circ} \\ \text { Angle } \end{gathered}$ | 0.0005 | 0.013 | 3 |
|  | 0.001 | 0.0254 | 1 |
|  | 0.002 | 0.051 | 2 |
| $\begin{gathered} 15^{\circ} \\ \text { Angle } \end{gathered}$ | 0.001 | 0.0254 | 1 |
|  | 0.002 | 0.051 | 2 |
|  | 0.004 | 0.102 | 4 |

Special drive considerations may be necessary when leaving shaft fully extended or fully retracted. Standard motors are Class B rated for maximum temperature of $130^{\circ} \mathrm{C}\left(266^{\circ} \mathrm{F}\right)$.
+Part numbering information on page 159.


Non-Captive Lead Screw
Dimensions $=(\mathrm{mm})$ inches


## External Linear

Dimensions $=(\mathrm{mm})$ inches
Up to 6.3 -in $(160 \mathrm{~mm})$ standard screw lengths.
Longer screw lengths are available.


Connector


FORCE vs. PULSE RATE

- L/R Drive
- Bipolar
- 100\% Duty Cycle


FORCE vs. PULSE RATE

- L/R Drive
- Bipolar
- 25\% Duty Cycle

Obtained by a special winding or by running a standard motor at double the rated current.


FORCE vs. PULSE RATE

- Chopper Drive
- Bipolar
- 100\% Duty Cycle


FORCE vs. PULSE RATE

- Chopper Drive
- Bipolar
- 25\% Duty Cycle


NOTE: All chopper drive curves were created with a 5 volt motor and a 40 volt power supply. Actuator bearings are rated for 75 lbs . 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.

Identifying the Can-Stack Number Codes when Ordering

| E | 37 | 4 | 4 | 2 | 05 | 1015 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Prefix <br> (include only when using the following) <br> E = External <br> K = External with $40^{\circ}$ thread form <br> $\mathrm{P}=$ Proximity Sensor <br> S = Home Position Switch | Series Number Designation $37=37000$ <br> (Series numbers represent approximate diameters of motor body) | $\begin{array}{r} \text { Style } \\ 3=7.5^{\circ} \end{array}$ <br> Non-Captive <br> $4=7.5^{\circ}$ <br> Captive or External (use "E" or "K" Prefix for External version) $5=15^{\circ}$ <br> Captive or External (use "E" or "K" Prefix for External version $8=15^{\circ}$ <br> Non-Captive | Coils $4=\begin{aligned} & \text { Bipolar } \\ & (4 \text { wire }) \end{aligned}$ | Code ID Resolution Travel/Step $\begin{aligned} & \mathbf{1}=.001-\mathrm{in}(.0254) \\ & \mathbf{2}=.002-\mathrm{in}(.051) \\ & \mathbf{3}=.0005-\mathrm{in}(.013) \\ & \mathbf{4}=.004-\mathrm{in}(.102) \end{aligned}$ | Voltage $\begin{gathered} 05=5 \mathrm{VDC} \\ 12=12 \mathrm{VDC} \end{gathered}$ <br> Custom V available | Suffix <br> Stroke <br> Example: - $1015=$ captive 38.1 mm stroke with leads -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 2037567441 .

## Can-Stacks: Wiring

## BIPOLAR



Can-Stacks: Stepping Sequence

| Bipolar | Q2-Q3 | Q1-Q4 | Q6-Q7 | Q5-Q8 |
| :---: | :---: | :---: | :---: | :---: |
| Step |  |  |  |  |
| O | ON | OFF | ON | OFF |

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

## - Can-Stack Stepper Motor Linear Actuators Options

## TFE Coated Lead Screws for applications that require a permanent, dry lubricant

Ideal for applications where conventional oils and greases cannot be used for lead screw lubrication.

Non-lubricated TFE Coated Lead Screw provides improved performance in both life and thrust as compared to a "dry" stainless steel lead screw. TFE can be applied to a wide variety of lead screw pitches. Available captive, non-captive and external linear.
Typical applications: where contamination from grease or lubricants must be avoided; silicon wafer handling, clean rooms, medical equipment or laboratory instrumentation.

Lead Screw Comparison: FORCE vs. PULSE RATE

- L/R Drive - 100\% Duty Cycle



## Home Position Switch monitors movements more precisely for greater control and improved quality control

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. Depending on your preference, contacts can be normally open or normally closed. The contact closure is repeatable to within one step position, identifying linear movements as low as $0.0005-\mathrm{in}(0.0013 \mathrm{~cm})$ per step. Multiple contact switches are also available. Activation force of $10 \mathrm{oz}(2.78 \mathrm{~N})$ required therefore may not be appropriate for smaller can-stack actuators.
When ordering motors with the home position switch, the part number should be preceded by an "S".

## Specifications

| Contact Ratings (Standard) | 1.00 AMP @ 120 VAC <br> 1.00 AMP @ 28 VDC |
| :---: | :---: |
| Operating Temperature | $-30^{\circ} \mathrm{C}$ to $+55^{\circ} \mathrm{C}\left(-22^{\circ} \mathrm{F}\right.$ to $\left.131^{\circ} \mathrm{F}\right)$ |
| Electrical Life | $<20$ milliohms typ. initial at $2-4 \mathrm{~V} \mathrm{DC}, 100 \mathrm{~mA}$ <br> Tested to 60,000 make-and-break cycles at full load |
| Schematic | 1 |



| Stroke <br> inches $(\mathrm{mm})$ | Dim "A" Extended <br> inches $(\mathrm{mm})$ | Dim "B" Retracted <br> inches $(\mathrm{mm})$ | Dim "C" Ref. <br> inches $(\mathrm{mm})$ |
| :---: | :---: | :---: | :---: |
| $.631(16)$ | $1.348+/-.025$ <br> $(34.24+/-0.64)$ | $.677+/-.025$ <br> $(17.19+/-0.64)$ | $2.218+/-.025$ <br> $(56.33+/-0.64)$ |
| $1.00(25.4)$ | $2.348+/-.025$ | $1.177+/-.025$ | $2.718+/-.025$ <br> $(56.94+/-0.64)$ |
| $(29.89+/-0.64)$ | $(69.03+/-0.64)$ |  |  |
| $1.50(38.1)$ | $3.348+/-.025$ <br> $(85.04+/-0.64)$ | $1.677+/-.025$ <br> $(42.59+/-0.64)$ | $3.218+/-.025$ <br> $(81.73+/-0.64)$ |

## ■ Can-Stack Stepper Motor Linear Actuators Options

End of Stroke Proximity Sensor incorporates a hall effect device, activated by a rare earth magnet embedded in the end of the internal screw

Compact profile of the sensor allows for installation in limited space applications. Virtually unlimited cycle life. Special cabling and connectors available.

| Specifications |  |
| :---: | :---: |
| Supply Voltage (VDC) | 3.8 min . to 24 max. |
| Current Consumption | 10 mA max. |
| Output Voltage <br> (operated) | 0.15 typ., 0.40 max. <br> Sinking 20 mA max. |
| Output Current |  |$\quad 20 \mathrm{~mA} \mathrm{max}.$.




| Stroke <br> inches $(\mathrm{mm})$ | Dim "A" <br> inches $(\mathrm{mm})$ | Dim "B" <br> inches $(\mathrm{mm})$ |
| :---: | :---: | :---: |
| $.631(16)$ | $1.404(35.65)$ | $.695(17.65)$ |
| $1.00(25.4)$ | $1.906(48.41)$ | $1.197(30.41)$ |
| $1.50(38.1)$ | $2.409(61.18)$ | $1.700(43.18$ |

The sensor has virtually unlimited cycle life. Special cabling and connectors can also be provided.

## G4 37000 Series E8T Encoder

G4 37000 Series E8T Transmissive Optical Encoder is designed to provide the digital quadrature encoder feedback for high volume, compact space applications.

- Resolutions from 180 to 720
- Single-ended / Differential
- Frequency response to 100 kHz
- Low power consumption, 5 V @ 30 mA max
- High retention polarized connector

Assembly Options:

- Differential line driver with complementary outputs
- Detachable cable
- Through-hole cover

| Stroke <br> inches $(\mathrm{mm})$ | Dim "A" Extended <br> inches $(\mathrm{mm})$ |
| :---: | :---: |
| $.631(16)$ | N/A |
| $1.00(25.4)$ | $.098(2.50)$ |
| $1.50(38.1)$ | $.598(15.20)$ |



## 15000 Series

## $\varnothing 15$ mm (.59-in) Can-Stack Stepper Motor Linear Actuators

Delivering force of up to $8 \mathrm{lbs}(35 \mathrm{~N})$ without compromising long life or cost. Lightweight models can also be micro- stepped for even finer resolution. Bi-directional travel motor. Available as connector stator or "space saving" flying leads type motor bodies.

The world's smallest commercial linear stepper motor

## Multiple versions available

- Captive
- External Linear with free-wheeling BFW nut
- External Linear with ZBM anti-backlash nut*
*May not be available in all leads


## Specifications


tPart numbering information below.

Identifying the Can-Stack Number Codes when Ordering

| LC | 15 | 7 | 4 | W | 04 | 999 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Prefix <br> LC = Captive <br> LE = External <br> Linear | Series Number Designation $15=15000$ <br> (Series numbers represent approximate diameters of motor body) | Step Angle $7=18^{\circ}$ | Coils $4=\begin{aligned} & \text { Bipolar } \\ & (4 \text { wire }) \end{aligned}$ | Code ID Resolution Travel/Step $\begin{aligned} & \mathrm{BZ}=.00059-\mathrm{in}(.015) \\ & \mathrm{W}=.00079-\mathrm{in}(.02) \\ & \mathrm{AQ}=.00098-\mathrm{in}(.025) \\ & \mathrm{BH}=.00197-\mathrm{in}(.05) \\ & \mathrm{DC}=.00394-\mathrm{in}(.10) \end{aligned}$ | Voltage $\begin{aligned} 04 & =4 \mathrm{VDC} \\ 05 & =5 \mathrm{VDC} \\ 12 & =12 \mathrm{VDC} \end{aligned}$ <br> Custom V available | Suffix <br> Stroke <br> Example: -999 = 12-in leads <br> $-X X X=$ Proprietary suffix assigned to a specific customer application. The identifier can apply to either a standard or custom part. |

[^0]15000 Series • Can-Stack Stepper Motor Linear Actuators
Captive Lead Screw


MICRO Series
Dimensions $=(\mathrm{mm})$ inches
Standard nut styles. Consult the factory for custom solutions.

| MICRO Series Nut Styles |  |  |  |
| :---: | :---: | :---: | :---: |
| Part No. | BFW Nut Style | Dynamic Load <br> $\mathbf{l b s}(\mathrm{Kg})$ | Drag Torque <br> oz-in (NM) |
| BFWB | Barrel Mount | $10(4.5)$ | Free Wheeling |
| BFWR | Rectangular Flange |  |  |

Barrel Nut Style


Rectangular Nut Style


FORCE vs. PULSE RATE

> - L/R Drive - Bipolar - 100\% Duty Cycle


FORCE vs. PULSE RATE
-Chopper Drive - Bipolar - 100\% Duty Cycle


FORCE vs. PULSE RATE

- L/R Drive - Bipolar - 25\% Duty Cycle


Obtained by a special winding or by running a standard motor at double the rated current.

FORCE vs. PULSE RATE

- Chopper Drive - Bipolar - 25\% Duty Cycle


NOTE: All chopper drive curves were created with a 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.

15000 Series • Can-Stack Stepper Motor Linear Actuators Wiring \& Stepping Sequence

## Can-Stacks: Wiring

## BIPOLAR



Can-Stacks: Stepping Sequence


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


## NEW! 15000 Series E16 Encoder

15000 Series E16 optical encoder is designed to provide A, B and Index digital quadrature signals for high volume, restricted space applications.

- Resolutions from 250/256 to 4000/4096
- Single-ended only
- Low power consumption, 5V @ 26mA max

Assembly Options:

- Detachable cable



## Custom Free-Wheeling Nuts

Modified and custom free-wheeling nuts are available for the LE external linear versions. Custom geometries and materials can be combined for a wide variety of product application requirements, to help eliminate additional adjacent components as well as to deliver cost and space-saving benefits.
$\emptyset 15 \mathrm{~mm}$ (.59-in)
External Linear


| Pin \# | Description |
| :---: | :---: |
| 1 | Ground |
| 2 | Index |
| 3 | A channel |
| 4 | +5VDC power |
| 5 | B channel |



## Z20000 Series

## $\varnothing 20$ mm (.79-in) Can-Stack

 Stepper Motor Linear ActuatorsUtilizing rare earth (neodymium) magnets, the Z-Series Linear Actuators consistently deliver exceptional performance at an economical price. Also available in a special "earless" configuration without a mounting flange, which is ideal for space constrained applications.

Economical motors for high volume applications

## Multiple versions available

- Captive
- Non-Captive
- External Linear

Specifications
$\emptyset 20 \mathrm{~mm}$ (.79-in)

ors

Option:
Earless Z20000
Series Actuator

+Part numbering information on page 168.
*When ordering Z-Series External Linear motors, add -900 to end of the Part Number.


| Linear Travel / Step <br> $15^{\circ}$ |  | Order <br> Code I.D. |
| :---: | :---: | :---: |
| inches | mm |  |
| 0.001 | 0.0254 | 1 |
| 0.002 | 0.051 | 2 |
| 0.004 | 0.102 | 4 |

Special drive considerations may be necessary when leaving shaft fully extended or fully retracted. Standard motors are Class B rated for maximum temperature of $130^{\circ} \mathrm{C}\left(266^{\circ} \mathrm{F}\right)$.


## Non-Captive Lead Screw

Dimensions $=(\mathrm{mm})$ inches

Up to 6-in (152 mm) standard screw lengths, Longer screw lengths are available.


## External Linear

Dimensions $=(\mathrm{mm})$ inches
Up to 6-in ( 152 mm ) standard screw lengths. Longer screw lengths are available.


FORCE vs. PULSE RATE

- L/R Drive
- Bipolar
- 100\% Duty Cycle


FORCE vs. PULSE RATE

- L/R Drive
- Bipolar
- 25\% Duty Cycle

Obtained by a special winding or by running a standard motor at double the rated current.


FORCE vs. PULSE RATE

- Chopper Drive
- Bipolar
- 100\% Duty Cycle


FORCE vs. PULSE RATE

- Chopper Drive
- Bipolar
- 25\% Duty Cycle


NOTE: All chopper drive curves were created with a 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.

Identifying the Can-Stack Number Codes when Ordering

| Z | 20 | 5 | 4 | 2 | 05 | 900 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Prefix <br> Z = Series <br> Code | Series Number Designation $20=20000$ <br> (Series numbers represent approximate diameters of motor body) | Style <br> $5=15^{\circ}$ <br> Captive or External (use -900 Suffix for External version) $8=15^{\circ}$ <br> Non-Captive | Coils $4=\begin{aligned} & \text { Bipolar } \\ & \\ & \text { (4 wire) } \end{aligned}$ | $\begin{aligned} & \begin{array}{l} \text { Code ID Resolution } \\ \quad \text { Travel/Step } \end{array} \\ & 1=.001 \text {-in }(.0254) \\ & 2=.002 \text {-in (.051) } \\ & 4=.004-\text { in }(.102) \end{aligned}$ | Voltage $\begin{gathered} 05=5 \mathrm{VDC} \\ 12=12 \mathrm{VDC} \end{gathered}$ <br> Custom V available | Suffix <br> Stroke <br> Example: -900 used to code Z-Series external linear <br> - 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 2037567441.

## Can-Stacks: Wiring

BIPOLAR


Can-Stacks: Stepping Sequence

| Bipolar Q2-Q3 Q1-Q4 Q6-Q7 Q5-Q8 <br> Step     <br> 1 ON OFF ON OFF <br> 2 OFF ON ON OFF <br> 3 OFF ON OFF ON <br> 4 ON OFF OFF ON <br> 1 ON OFF ON OFF |
| :--- |

■ Can-Stack Stepper Motor Linear Actuators Options

## TFE Coated Lead Screws for applications

 that require a permanent, dry lubricantIdeal for applications where conventional oils and greases cannot be used for lead screw lubrication.
Non-lubricated TFE Coated Lead Screw provides improved performance in both life and thrust as compared to a "dry" stainless steel lead screw. TFE can be applied to a wide variety of lead screw pitches. Available captive, non-captive and external linear.
Typical applications: where contamination from grease or lubricants must be avoided; silicon wafer handling, clean rooms, medical equipment or laboratory instrumentation.

Lead Screw Comparison: FORCE vs. PULSE RATE - L/R Drive - 100\% Duty Cycle


## - Can-Stack Stepper Motor Linear Actuators Options

## Specially Engineered Can-Stack Linear Actuators for high temperature applications

Stepping motors specially designed for high temperature environments.
Materials meeting class $F$ temperature ratings are used in construction. Specialized components include high temperature bobbins, coils, lead wires, lubricant and adhesives.

## Home Position Switch monitors movements more precisely for greater control and improved quality control

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. Depending on your preference, contacts can be normally open or normally closed. The contact closure is repeatable to within one step position, identifying linear movements as low as $0.0005-\mathrm{in}(0.0013 \mathrm{~cm})$ per step. Multiple contact switches are also available.
Activation force of 10 oz ( 2.78 N ) required therefore may not be appropriate for smaller can-stack actuators.
When ordering motors with the home position switch, the part number should be preceded by an " S ".

End of Stroke Proximity Sensor incorporates a hall effect device, activated by a rare earth magnet embedded in the end of the internal screw

Compact profile of the sensor allows for installation in limited space applications.
Virtually unlimited cycle life. Special cabling and connectors available.




Specifications

| Contact Ratings (Standard) | 1.00 AMP @ 120 VAC <br> 1.00 AMP @ 28 VDC |
| :---: | :---: |
| Operating Temperature | $-30^{\circ} \mathrm{C}$ to $+55^{\circ} \mathrm{C}\left(-22^{\circ} \mathrm{F}\right.$ to $\left.131^{\circ} \mathrm{F}\right)$ |
| Electrical Life | $<20$ milliohms typ. initial at $2-4 \mathrm{VDC}, 100 \mathrm{~mA}$ <br> Tested to 60,000 make-and-break cycles at full load |
| Schematic | Multiple contact options available. |


| Specifications |  |
| :--- | :---: |
| Supply Voltage (VDC) |  |

NOTE: Sensor is category 2 ESD sensitive per DOD-STD-1686A. Assembly operations should be performed at workstations with conductive tops and operators grounded.

## Z26000 Series

## Ø 26 mm (1-in) Can-Stack Stepper Motor Linear Actuators

Designed to accommodate high volume applications Z26000 Series motors utilize rare earth (neodymium) magnets. Also, available in a special "earless" configuration without a mounting flange. All units are built with durable dual ball bearings.

## Multiple versions available

- Captive - Non-Captive - External Linear


NOW AVAILABLE! Shorter motor body option available (see page 174)

Specifications

| Ø 26 mm (1-in) Z-Series Motor |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Part No. | Captive | Z2644 - - - + |  | Z2654 - - ${ }^{\text {- }}$ |  | Z2646 - - $\square^{+}$ |  | Z2656 - - $\square^{\dagger}$ |  |
|  | Non-Captive | Z2634 - - ${ }^{\text {- }}$ + |  | Z2684 - - |  | Z2636 - - + + |  | Z2686 - - ${ }^{\text {- }}$ |  |
|  | External Linear* | Z2644 - -9 + ${ }^{\text {+* }}$ |  | Z2654 - - ${ }^{\text {a }}$ +* |  | Z2646--9 + ${ }^{\text {+* }}$ |  | Z2656--9 - ${ }^{\text {+* }}$ |  |
| Wiring |  | Bipolar |  |  |  | Unipolar* |  |  |  |
| Step angle |  | $7.5^{\circ}$ |  | $15^{\circ}$ |  | $7.5^{\circ}$ |  | $15^{\circ}$ |  |
|  | ing Voltage | 5 VDC | 12 VDC | 5 VDC | 12 VDC | 5 VDC | 12 VDC | 5 VDC | 12 VDC |
| Curre | (RMS)/phase | 340 mA | 140 mA | 340 mA | 140 mA | 340 mA | 140 mA | 340 mA | 140 mA |
|  | tance/phase | $14.7 \Omega$ | $84 \Omega$ | $14.7 \Omega$ | $84 \Omega$ | $14.7 \Omega$ | $84 \Omega$ | 14.7 ת | $84 \Omega$ |
|  | tance/phase | 8.5 mH | 55 mH | 6.7 mH | 44 mH | 4.3 mH | 24 mH | 3.4 mH | 19 mH |
| Powe | Consumption | 3.4 W |  |  |  |  |  |  |  |
|  | or Inertia | $1.4 \mathrm{gcm}^{2}$ |  |  |  |  |  |  |  |
|  | ation Class | Class B |  |  |  |  |  |  |  |
|  | Weight | 1.20 z (34 g) |  |  |  |  |  |  |  |
| Insula | on Resistance | $20 \mathrm{M} \Omega$ |  |  |  |  |  |  |  |

tPart numbering information on page 4. *Unipolar drive gives approximately $40 \%$ less thrust compared to bipolar drive. ** When ordering Z-Series External Linear motors, add -900 to end of the Part Number.

| Linear Travel / Step <br> $15^{\circ}$ <br> Step Angle |  |  | Order <br> Code I.D. |
| :---: | :---: | :---: | :---: |
| step | inches | mm |  |
| $7.5^{\circ}$ | 0.0005 | 0.013 | 3 |
|  | 0.001 | 0.0254 | 1 |
|  | 0.002 | 0.051 | 2 |
| $15^{\circ}$ | 0.00164 | 0.04166 | AS |
|  | 0.002 | 0.051 | 2 |
|  | 0.004 | 0.102 | 4 |

Special drive considerations may be necessary when leaving shaft fully extended or fully retracted. Standard motors are Class B rated for maximum temperature of $130^{\circ} \mathrm{C}\left(266^{\circ} \mathrm{F}\right)$.

Also available, specially engineered Z26000 (Ø $26 \mathrm{~mm}, 1$-in) linear actuators that extend captive lead screw travel beyond $12.7 \mathrm{~mm}(1 / 2-\mathrm{in})$.


Captive Lead Screw


Non-Captive Lead Screw


External Linear see new motor body option avaliable on next page.
Dimensions $=(\mathrm{mm})$ inches


Up to 6-in ( 152 mm ) standard screw lengths. Longer screw lengths are available.


Linear Series Z26000 Nut Option
Dimensions $=(\mathrm{mm})$ inches



New space
saving option


When ordering, the shorter motor option can be referenced using the last three suffix digits (-XXX).

Identifying the Can-Stack Number Codes when Ordering

| Z | 26 | 4 | 4 | 2 | 05 | 900 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Prefix <br> Z = Series <br> Code | Series Number Designation $26=26000$ <br> (Series numbers represent approximate diameters of motor body) | Style <br> $3=7.5^{\circ}$ <br> Non-Captive <br> $4=7.5^{\circ}$ <br> Captive or <br> External <br> (use "E" or <br> "K" Prefix <br> for External version) $5=15^{\circ}$ <br> Captive or External (use "E" or "K" Prefix for External version $8=15^{\circ}$ <br> Non-Captive | $\left.\mathbf{4}=\begin{array}{c} \text { Coils } \\ \text { Bipolar } \\ (4 \text { wire }) \end{array}\right)$ | Code ID Resolution Travel/Step $\begin{aligned} \mathbf{1} & =.001-\mathrm{in}(.0254) \\ \mathbf{2} & =.002-\mathrm{in}(.051) \\ \mathbf{3} & =.0005-\mathrm{in}(.013) \\ \mathbf{4} & =.004-\mathrm{in}(.102) \\ \mathrm{AS} & =.04166-\mathrm{in} \\ & (.00164) \end{aligned}$ | Voltage $\begin{gathered} 05=5 \mathrm{VDC} \\ 12=12 \mathrm{VDC} \end{gathered}$ <br> Custom V available | Suffix <br> Stroke <br> Example: -900 used to code Z-Series external linear $-X X X=$ 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 2037567441 .

Can-Stacks: Wiring


Can-Stacks: Stepping Sequence


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

FORCE vs. PULSE RATE

- L/R Drive
- Bipolar
- 100\% Duty Cycle


FORCE vs. PULSE RATE

- L/R Drive
- Bipolar
- 25\% Duty Cycle

Obtained by a special winding or by running a standard motor at double the rated current.


FORCE vs. PULSE RATE

- Chopper Drive
- Bipolar
- 100\% Duty Cycle



## FORCE vs. PULSE RATE

- Chopper Drive
- Bipolar
- 25\% Duty Cycle


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

## AC (Alternating Current) Synchronous Actuators

Stepping motors can also be run on AC (Alternating Current). However, one phase must be energized through a properly selected capacitor. In this case the motor is limited to only one synchronous speed. For instance, if 60 hertz is being supplied, there are 120 reversals or alterations of the power source. The phase being energized by a capacitor is also producing the same number of alterations at an offset time sequence. The motor is really being energized at the equivalent of 240 steps per second.

## Alternating Current (AC) Hybrid Linear Actuators

Stepping motors can also be run on Alternating Current (AC). However, one phase must be energized through a properly selected capacitor. In this case, the motor is limited to only one synchronous speed.
For instance, if 60 hertz is being supplied, there are 120 reversals or alterations of the power source. The phase being energized by a capacitor is also producing the same number of alterations at an offset time sequence. The motor is really being energized at the equivalent of 240 steps per second.
In the case of a linear actuator the linear speed produced is dependent on the resolution per step of the motor. For example, if 60 hertz is supplied to a . $001-\mathrm{in} /$ step motor the resulting speed is .240 -in per second (240 steps per second times .001-in/step). Many of our stepping motors are available as 300 or 600 RPM AC synchronous motors.


Electrical Data

| Series | Size | Watts | Amps | Capacitor <br> (Mfd) @ 60 Hz | Capacitor <br> (Mfd) @ 50 Hz | Coil Resistance (Ohms) |  | Connection |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  | Main Wind. | Cap. Wind. | Diagram |  |  |
| $\mathbf{3 5 0 0 0}$ | 14 | 5.7 | 0.21 | 15 | 15 | 300 | 300 | 3 |
| 43000 | 17 | 6.5 | 0.27 | 15 | 15 | 104 | 104 | 3 |
| 57000 | 23 | 13.0 | 0.60 | 30 | 40 | 35 | 35 | 3 |
| $87000^{\star}$ | 34 | 30.0 | 2.00 | 200 | 200 | 2.3 | 2.3 | 4 |

* With 12 OHM, 100 watt resistor in series.

|  |  |  | Identifying the AC Hybrid Part Number Codes when Ordering |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| A | 35 | H | 4 |  | N |  | 24 | 800 |
| Prefix <br> $A=$ <br> A Coil) | Series Number Designation $35=35000$ <br> (Size 14) $43=43000$ <br> (Size 17) $57=57000$ <br> (Size 23) $87=87000$ <br> (Size 34) | Style $\mathrm{F}=1.8^{\circ}$ <br> Non-captive <br> H $=1.8^{\circ}$ Captive or External (use "E" or "K" Prefix for External version) $\mathrm{J}=0.9^{\circ}$ <br> Non-captive <br> $\mathrm{K}=0.9^{\circ}$ Captive or External (use "E" or "K" Prefix for External version) | Coils <br> 4 = Bipolar (4 wire) | 35000 and 43000 Series Code ID Resolution Travel/Step $\begin{aligned} & \mathbf{N}=.00012-\mathrm{in}(.0030) \\ & \mathrm{K}=.00024-\mathrm{in}(.0060) \\ & \mathrm{J}=.00048-\mathrm{in}(.0121) \\ & \mathbf{Q}=.00096-\mathrm{in}(.0243) \\ & \mathrm{P}=.00015625-\mathrm{in}(.0039) \\ & \mathbf{A}=.0003125-\mathrm{in}(.0079) \\ & \mathbf{B}=.000625-\mathrm{in}(.0158) \\ & \mathbf{C}=.00125-\mathrm{in}(.0317) \\ & \mathbf{R}=.00192-\mathrm{in}(.0478) \end{aligned}$ <br> High Resolution $\begin{aligned} & \mathbf{U}=.00006-\mathrm{in}(.0015) \\ & \mathbf{V}=.000078-\text { in }(.00198) \end{aligned}$ | 57000 Series Code ID <br> Resolution Travel/Step $\begin{aligned} & \mathbf{7}=.000125-\mathrm{in}(.0031) \\ & \mathrm{S}=.0004167-\mathrm{in} \\ & \\ & (.01058418) \\ & \mathbf{3}=.0005-\mathrm{in}(.0127) \\ & \mathbf{1}=.001-\mathrm{in}(.0254) \\ & \mathbf{A}=.0003125-\mathrm{in}(.0079) \\ & \mathrm{T}=.0008333-\mathrm{in}(.0211) \\ & \mathbf{2}=.002-\mathrm{in}(.0508) \end{aligned}$ <br> High Resolution $\mathbf{P}=.00015625-\mathrm{in}$ (.003969) $\begin{gathered} \mathrm{X}=.00020833-\mathrm{in} \\ \quad(.00529166) \\ 9=.00025-\mathrm{in}(.0635) \end{gathered}$ | 87000 Series Code ID Resolution Travel/Step $\begin{aligned} & \mathbf{3}=.0005-\mathrm{in}(.0127) \\ & \mathbf{B}=.000625-\mathrm{in}(.0158) \\ & \mathbf{C}=.00125-\mathrm{in}(.0317) \\ & \mathbf{Y}=.0025-\mathrm{in}(.0635) \\ & \mathbf{Z}=.005-\mathrm{in}(.127) \end{aligned}$ | Voltage <br> $24=$ <br> 24 VDC | Suffix <br> -800 = External linear (added to Captive shaft part number) $-X X X=$ <br> Proprietary suffix assigned to a specific customer application. The identifier can apply to either a standard or custom part. |

[^1][^2]For an external linear shaft, add the three digit suffix - 800 to the captive shaft part number.
Example 3: A35H4N-24 with an external linear shaft becomes A35H4N-24-800.
All standard motors operate at 24 Volts, represented in the part number by the number -24 (A35H4N-24). No other suffix is required

## AC Can-Stack Linear Actuators

Stepping motors can also be run on Alternating Current (AC). However, one phase must be energized through a properly selected capacitor. In this case, the motor is limited to only one synchronous speed.

For instance, if 60 hertz is being supplied, there are 120 reversals or alterations of the power source. The phase being energized by a capacitor is also producing the same number of alterations at an offset time sequence. The motor is really being energized at the equivalent of 240 steps per second.

In the case of a linear actuator the linear speed produced is dependent on the resolution per step of the motor. For example, if 60 hertz is supplied to a .001 -in/ step motor the resulting speed is .240 -in per second (240 steps per second times . 001 -in/step). Many of our stepping motors are available as 300 or 600 RPM AC synchronous motors.


Identifying the AC Can-Stack Part Number Codes when Ordering

| A | 35 | 5 | 4 |  | 2 |  | 24 | 800 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Prefix <br> $A=$ <br> A Coil <br> Z = <br> Economy <br> Series <br> (For 20000 <br> and 26000 <br> Series only) | Series Number Designation $20=20000$ <br> (Ø20mm, .79-in) $26=26000$ <br> (Ø26mm, 1 -in) $36=36000$ (Ø36mm, 1.4-in) <br> $46=46000$ ( 046 mm , $1.8-\mathrm{in})$ | Style <br> $3=7.5^{\circ}$ <br> Non-Captive <br> $4=7.5^{\circ}$ <br> Captive or <br> External (use "E" or "K" Prefix for External version) $5=15^{\circ}$ <br> Captive or External (use "E" or "K" Prefix for External version $8=15^{\circ}$ <br> Non-Captive | Coils 4 = Bipolar (4 wire) | 20000 and Z20000 <br> Series Code ID Resolution Travel/Step $\begin{aligned} & 1=.001-\mathrm{in}(.0254) \\ & 2=.002-\mathrm{in}(.051) \\ & \mathbf{4}=.004-\mathrm{in}(.102) \end{aligned}$ | 26000 Series Code ID Resolution Travel/Step $\begin{aligned} & \mathbf{1}=.001-\text { in }(.0254) \\ & \mathbf{2}=.002-\text { in }(.051) \\ & \mathbf{3}=.0005-\mathrm{in}(.013) \\ & \mathbf{4}=.004-\mathrm{in}(.102) \\ & \mathbf{9}=.00025-\mathrm{in}(.00635) \end{aligned}$ <br> Z26000 Series Code ID Resolution Travel/Step $\begin{aligned} & \mathbf{1}=.001-\mathrm{in}(.0254) \\ & 2=.002-\mathrm{in}(.051) \\ & 3=.0005-\mathrm{in}(.013) \\ & \mathbf{4}=.004-\mathrm{in}(.102) \\ & \mathrm{AS}=.04166-\mathrm{in}(.00164) \end{aligned}$ | 36000 Series Code ID Resolution Travel/Step $\begin{aligned} & 1=.001-\text { in }(.0254) \\ & 2=.002-\text { in }(.051) \\ & 3=.0005-\text { in }(.013) \\ & 4=.004-\text { in }(.102) \end{aligned}$ <br> High Resolution $\begin{aligned} & 7=. .000125-\text { in (.0032) } \\ & 9=.00025-\text { in (.00635) } \end{aligned}$ <br> 46000 Series Code ID Resolution Travel/Step $\begin{aligned} & \mathbf{1}=.001-\mathrm{in}(.0254) \\ & \mathbf{2}=.002-\mathrm{in}(.051) \\ & \mathbf{3}=.0005-\mathrm{in}(.013) \\ & \mathbf{4}=.004-\mathrm{in}(.102) \\ & \mathbf{8}=. .0008-\mathrm{in}(.203) \\ & \mathbf{G}=.016-\mathrm{in}(.406) \end{aligned}$ | Voltage $\begin{gathered} 24= \\ 24 \text { VDC } \end{gathered}$ | Suffix $-800=$ <br> External linear (added to Captive shaft part number) $-X X X=$ <br> 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 2037567441.

Motor part numbers are for a captive shaft. For a non-captive shaft, change the third digit from a " 4 " to an " 3 ". Example 1: A26441-24 with a non-captive shaft becomes A26341-24. Exception: When the third digit is " 5 " for a non-captive shaft substitute " 8 ". Example 2: A26544-24 with a non-captive shaft becomes A26844-24.

For an external linear shaft, add the three digit suffix - 800 to the captive shaft part number.
Example 3: A26441-24 with an external linear shaft becomes A26441-24 - 800. All standard motors operate at 24 Volts, represented in the part number by the suffix - 24 (A36443-24).

| Specifications |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Motor Part No. | Linear Speed @ 60 Hz |  | Linear Speed @ 50 Hz |  | Maximum Force |  |
| , | (inches/sec.) | (cm/sec.) | (inches/sec.) | (cm/sec.) | (lbs.) | (Newtons) |
| Z20541-24-700 | 0.24 | 0.610 | 0.20 | 0.508 | 5.5 | 24 |
| Z20542-24-700 | 0.48 | 1.219 | 0.40 | 1.016 | 3.0 | 13 |
| Z20544-24-700 | 0.96 | 2.438 | 0.80 | 2.032 | 1.8 | 8 |
| A26443-24 | 0.12 | 0.305 | 0.10 | 0.254 | 7.4 | 33 |
| A26441-24 | 0.24 | 0.610 | 0.20 | 0.508 | 4.4 | 20 |
| A26542-24 | 0.48 | 1.219 | 0.40 | 1.016 | 3.5 | 16 |
| A26544-24 | 0.96 | 2.438 | 0.80 | 2.032 | 2.0 | 9 |
| Z26443-24-700 | 0.12 | 0.305 | 0.10 | 0.254 | 13.0 | 58 |
| Z26441-24-700 | 0.24 | 0.610 | 0.20 | 0.508 | 8.3 | 37 |
| Z26542-24-700 | 0.48 | 1.219 | 0.40 | 1.016 | 6.6 | 29 |
| Z26544-24-700 | 0.96 | 2.438 | 0.80 | 2.032 | 3.3 | 15 |
| A36443-24** | 0.12 | 0.305 | 0.10 | 0.254 | 16.0 | 71 |
| A36441-24** | 0.24 | 0.610 | 0.20 | 0.508 | 12.0 | 53 |
| A36442-24** | 0.48 | 1.219 | 0.40 | 1.016 | 6.0 | 27 |
| A36544-24** | 0.96 | 2.438 | 0.80 | 2.032 | 3.0 | 13 |
| A46443-24** | 0.12 | 0.305 | 0.10 | 0.254 | 43 | 191 |
| A46441-24** | 0.24 | 0.610 | 0.20 | 0.508 | 34 | 151 |
| A46442-24** | 0.48 | 1.219 | 0.40 | 1.016 | 20 | 89 |
| A46544-24** | 0.96 | 2.438 | 0.80 | 2.032 | 11 | 49 |
| A46548-24** | 1.92 | 4.877 | 1.60 | 4.064 | 5.4 | 24 |
| A4654G-24** | 3.84 | 9.754 | 3.20 | 8.128 | 2.7 | 12 |

** Select motors available with 24 Volts or 120 Volts (replace 24 with 120).



[^0]:    NOTE: Dashes must be included in Part Number ( - ) as shown above. For assistance call our Engineering Team at 2037567441

[^1]:    NOTE: Dashes must be included in Part Number ( - ) as shown above. For assistance call our Engineering Team at 2037567441

[^2]:    Motor part numbers are for a captive shaft. For a non-captive shaft, change the middle letter from an "H" to an "F". Example 1: A35H4N-24 with a non-captive shaft becomes A35F4N-24.
    Exception: A43K4U-24 (high resolution) and A43K4V-24 (High resolution), for a non-captive shaft substitute " J " in place of the " K ". Example 2: A43K4U-24 with a non-captive shaft becomes A43J4U-24.

