MICRO PRECISION LINEAR ACTUATORS
Modular Miniature Linear Actuators

helixlinear.com
COMPANY

Helix is a global supplier to the Medical Device, Life Science, Security, Semiconductor, Aerospace, Electromechanical and Defense industry. Helix leads the linear motion industry by manufacturing the highest quality linear actuation solutions in the world. We focus entirely on manufacturing electromechanical actuation systems that help our customers be more productive and profitable. Our execution of innovative product designs solves real problems for our customers and builds a foundation for long term success.

HISTORY

Helix was founded in 2011 to manufacture high-quality lead screws for the growing electromechanical actuation industry. Helix’s rapid growth has included the addition of linear actuator solutions to deliver integrated and or turnkey solutions.

CULTURE

Our culture is based on a team of smart, happy and competitive professionals focused on manufacturing innovative products centered on delivering precise electromechanical linear motion solutions. We are in the people business, as well as the product business. People make and sell our products and a team of smart, happy and competitive people focus on success.

OPERATIONS

Our company is built to deliver high-quality products and engineering support to solve the most demanding linear motion applications in any industry. We deliver components and subsystem solutions to high volume OEMs and custom machine builders to help secure their success.
TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>COMPANY OVERVIEW</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>IPA - INTEGRATED PRECISION ACTUATOR</td>
<td>4-5</td>
</tr>
<tr>
<td>CPA - COUPLED PRECISION ACTUATOR</td>
<td>6-7</td>
</tr>
<tr>
<td>SPA - SIMPLE PRECISION ACTUATOR</td>
<td>8-9</td>
</tr>
<tr>
<td>HYBRID STEPPER MOTOR SPECIFICATIONS</td>
<td>10</td>
</tr>
<tr>
<td>ACCESSORIES</td>
<td>11</td>
</tr>
</tbody>
</table>
IPA - Integrated Motor Linear Actuator

- Hybrid stepper motor
- Integrated profile rail
- PTFE coated screw
- Anti-backlash nut

Helix attaches the lead screw to a custom designed hybrid stepper motor with beefed-up deep groove ball bearings to maximize thrust loads and rigidity.

Motors are laser welded to the lead screw for a truly compact low cost actuator. They are available with optional encoders, connectors, and custom cables.

### IPA Ordering Guide Table

<table>
<thead>
<tr>
<th>IPA</th>
<th>B</th>
<th>196</th>
<th>AB</th>
<th>17</th>
<th>0609</th>
<th>D</th>
<th>E 200</th>
<th>A</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Series</strong></td>
<td><strong>Linear Guide Supports</strong></td>
<td><strong>Screw Lead</strong></td>
<td><strong>Nut Type</strong></td>
<td><strong>Motor Frame Size</strong></td>
<td><strong>Motor Length</strong></td>
<td><strong>Motor Power</strong></td>
<td><strong>Encoder</strong></td>
<td><strong>Encoder Position</strong></td>
<td><strong>Modifications</strong></td>
</tr>
<tr>
<td>IPA Integrated Motor and Lead Screw Actuator</td>
<td>A - No external rail (Square carriage)</td>
<td>039 - 1mm</td>
<td>S - Standard nut</td>
<td>17 NEMA 17</td>
<td>(mm) See page 5 for actuator length data</td>
<td>S - Single Stack</td>
<td>E 200 200 CPR</td>
<td></td>
<td>S - Standard</td>
</tr>
<tr>
<td></td>
<td>B - One rail - Right* one runner block (&quot;L&quot;-shaped carriage)</td>
<td>078 - 2mm</td>
<td>AB - Anti-backlash nut</td>
<td>23 NEMA 23</td>
<td></td>
<td>D - Double Stack</td>
<td>E 500 500 CPR</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>C - One rail - Left* one runner block (&quot;L&quot;-shaped carriage)</td>
<td>196 - 5mm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>E1000 1000 CPR</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>D - Two rails, one runner block (&quot;U&quot;-shaped carriage)</td>
<td>393 - 10mm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>E2000 2000 CPR</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>472 - 12mm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>999 - 25mm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>M38 - 1.5in</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**EXAMPLE PART NUMBER:** IPA - B - 196 - AB - 17 - 0609 - D - E 200 - A - S

*Left and right sides are determined by looking down the assembly with the motor at the end nearest to you.

**NOTE:** Actuators can be customized in many ways to fit your application:
- Additional lead screw sizes available
- Custom mounting plates
- Custom carriages
IPA - INTEGRATED MOTOR LINEAR ACTUATOR

**IPA DIMENSIONS**

NEMA size 23 shown

- **Standard or Anti-backlash Nuts**
- **PTFE Coated Precision Lead Screw**
- **L - Style Mounting Carriage**
- **Mounting Feet**
- **Anodized Aluminum Extrusion**
- **Optional Integrated Profile Rail**
- **Optical Rotary Encoder Available**

**Rail and Carriage Mounting Options**

- No Rail (Square Carriage)
- One Rail (Left or Right "L" shaped carriage)
- Two Rails ("U" shaped carriage)

**BODY LENGTH** = TRAVEL + 1.75" (CARRIAGE WIDTH)

We recommend an overtravel zone of 10mm be added to each end of your desired stroke when using a stepper motor.

**OPTIONAL COMPONENTS**

- Anti-backlash lead nuts
- Rotary optical encoders
- Magnetic sensors

The specifications and data in this publication are believed to be accurate and reliable. However, it is the responsibility of the product user to determine the suitability of Helix products for a specific application. While defective products will be replaced without charge if promptly returned, no liability is assumed beyond such replacement.

Helix attaches the lead screw to a custom designed hybrid stepper motor with beefed-up deep groove ball bearings to maximize thrust loads and rigidity.

Motors are laser welded to the lead screw for a truly compact low cost actuator. They are available with optional encoders, connectors, and custom cables.
Micro Precision Linear Actuators

CPA - Coupled Motor Linear Actuator

- Hybrid stepper motors and stepper servo motors
- Integrated profile rail
- PTFE coated screw

Standard motor mounts allow for attachment of any NEMA frame motor. The lead screw is supported by deep groove ball bearings for years of dependable life and rigidity.

Motor mounts come complete with coupling. Custom mounts can be supplied.

<table>
<thead>
<tr>
<th>CPA</th>
<th>B</th>
<th>196</th>
<th>AB</th>
<th>14</th>
<th>0609</th>
<th>D</th>
<th>E 200</th>
<th>A</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Series</td>
<td>Linear Guide Supports</td>
<td>Screw Lead</td>
<td>Nut Type</td>
<td>Motor Frame Size</td>
<td>Actuator Length</td>
<td>Motor Power</td>
<td>Encoder</td>
<td>Encoder Position</td>
<td>Modifications</td>
</tr>
<tr>
<td>CPA Coupled Motor and Lead Screw Actuator</td>
<td>A - No external rail (Square carriage)</td>
<td>039 - 1mm</td>
<td>S - Standard nut</td>
<td>14 NEMA 14</td>
<td>(mm) See page 7 for actuator length data</td>
<td>N - No Motor</td>
<td>E 200</td>
<td>A</td>
<td>S - Standard</td>
</tr>
<tr>
<td></td>
<td>B - One rail - Right* one runner block (“L”-shaped carriage)</td>
<td>078 - 2mm</td>
<td></td>
<td>17 NEMA 17</td>
<td></td>
<td>S - Single Stack</td>
<td>E 500</td>
<td>B</td>
<td>M - Modified</td>
</tr>
<tr>
<td></td>
<td>C - One rail - Left* one runner block (“L”-shaped carriage)</td>
<td>196 - 5mm</td>
<td>AB - Anti-backlash nut</td>
<td></td>
<td></td>
<td>D - Double Stack</td>
<td>E1000</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>D - Two rails, one runner block (“U”-shaped carriage)</td>
<td>393 - 10mm</td>
<td></td>
<td>23 NEMA 23</td>
<td></td>
<td>T - Triple Stack</td>
<td>E2000</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>472 - 12mm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>999 - 25mm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>M38 - 1.5in</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

EXAMPLE PART NUMBER: CPA - B - 196 - AB - 14 - 0609 - D - E 200 - A - S

*Left and right sides are determined by looking down the assembly with the motor at the end nearest to you.

NOTE: Actuators can be customized in many ways to fit your application:
- Additional lead screw sizes available
- Custom mounting plates
- Custom carriages
The specifications and data in this publication are believed to be accurate and reliable. However, it is the responsibility of the product user to determine the suitability of Helix products for a specific application. While defective products will be replaced without charge if promptly returned, no liability is assumed beyond such replacement.

**CPA - COUPLED MOTOR LINEAR ACTUATOR**

**Optional Components**

- Anti-backlash lead nuts
- Digital rotary encoders
- Magnetic sensors

**CPA DIMENSIONS**

**NEMA size 23 shown**

<table>
<thead>
<tr>
<th>Option</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Rail (Square Carriage)</td>
<td>2.22 [56.4]</td>
</tr>
<tr>
<td>One Rail (Left or Right &quot;L&quot; shaped carriage)</td>
<td>1.77 [45]</td>
</tr>
<tr>
<td>Two Rails (&quot;U&quot; shaped carriage)</td>
<td>2.90 [73.1]</td>
</tr>
</tbody>
</table>

**Carriage Detail**

- L-Style Mounting Carriage
- Flexible Coupling
- Optical Rotary Encoder Available
- Hybrid Stepper Motors NEMA 14, 17, 23
- Bearing Support
- Standard or Anti-backlash Nuts
- Anodized Aluminum Extrusion
- Mounting Feet
- Optional Integrated Profile Rail
- PTFE Coated Precision Lead Screw
- Magnetic Sensors

**Rail and Carriage Mounting Options**

- No Rail (Square Carriage)
- One Rail (Left or Right "L" shaped carriage)
- Two Rails ("U" shaped carriage)

**NOTE:** Actuators can be customized in many ways to fit your application:

- Additional lead screw sizes available
- Custom mounting plates
- Custom carriages

*Left and right sides are determined by looking down the assembly with the motor at the end nearest to you.*

**Optional Integrated Profile Rail**

**BODY LENGTH = TRAVEL + 1.75" (CARRIAGE WIDTH)**

WE RECOMMEND AN OVERTRAVEL ZONE OF 10mm BE ADDED TO EACH END OF YOUR DESIRED STROKE WHEN USING A STEPPER MOTOR.

**Mounting Foot**

- 2X .17 [4.36]
- 2X .14 [3.56]
- 2X .12 [3.05]
- 2X .06 [1.52]
- 2X .02 [0.5]

**Optical Rotary Encoder Available**

- Flexible Coupling
- Optical Rotary Encoder

**Standard or Anti-backlash Nuts**

- M3 [3.0]
- M4 [4.0]
- M5 [5.0]
- M6 [6.3]
- M8 [8.0]

**Motor Power**

- N - No Motor
- S - Single Stack
- D - Double Stack
- T - Triple Stack

**Modifications**

- S - Standard
- M - Modified

**Motor Frame Size**

- 14 NEMA 14
- 17 NEMA 17
- 23 NEMA 23

**Screw Lead**

- 0.39 [1mm]
- 0.78 [2mm]
- 1.96 [5mm]
- 3.93 [10mm]
- 4.72 [12mm]
- 9.99 [25mm]
- 1.58 [1.5in]

**Motor**

- Power
  - N - No Motor
  - S - Single Stack
  - D - Double Stack
  - T - Triple Stack

**Rail and Carriage Mounting Options**

- A - No external rail (Square carriage)
- B - One rail - Right* one runner block ("L"-shaped carriage)
- C - One rail - Left* one runner block ("L"-shaped carriage)
- D - Two rails, one runner block ("U"-shaped carriage)

**Encoder Position**

- A
- B
- C
- D
- E

**Encoder**

- E 200 CPR
- E 500 CPR
- E 1000 CPR
- E 2000 CPR

**Modified Series CPA B AB 14196 D S**

**EXAMPLE PART NUMBER:** CPA - B - 196 - AB - 14 - 0609 - D - E 200 - A - S

**Rail and Carriage Mounting Options**

- No Rail (Square Carriage)
- One Rail (Left or Right "L" shaped carriage)
- Two Rails ("U" shaped carriage)

**Standard motor mounts allow for attachment of any NEMA frame motor. The lead screw is supported by deep groove ball bearings for years of dependable life and rigidity. Motor mounts come complete with coupling. Custom mounts can be supplied.**
MICRO PRECISION LINEAR ACTUATORS

### SPA - Simple Linear Actuator

- Hand, motor or belt actuated
- Integrated profile rail
- PTFE coated screw

These actuators come standard with a journal end on the lead screw, making it convenient to supply your own drive; belt, coupler or knob. There is versatile manual brake option for securely locking the actuator into position.

The lead screw is supported by end mounted deep groove ball bearings for years of dependable life and rigidity.

#### SPA Ordering Guide Table

<table>
<thead>
<tr>
<th>SPA</th>
<th>A</th>
<th>196</th>
<th>AB</th>
<th>00</th>
<th>0609</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Series</td>
<td>Linear Guide Supports</td>
<td>Screw Lead</td>
<td>Nut Type</td>
<td>End Configuration</td>
<td>Actuator Length</td>
<td>Modifications</td>
</tr>
<tr>
<td>SPA PTFE Guide Lead Screw Actuator</td>
<td>A - No external rail (Square carriage)</td>
<td>039 - 1mm</td>
<td>S - Standard nut</td>
<td>00 - Drive Shaft</td>
<td>(mm) See page 9 for actuator length data</td>
<td>S - Standard</td>
</tr>
<tr>
<td>SPA PTFE Guide Lead Screw Actuator</td>
<td>B - One rail - Right* one runner block (<em>L</em>-shaped carriage)</td>
<td>078 - 2mm</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SPA PTFE Guide Lead Screw Actuator</td>
<td>C - One rail - Left* one runner block (<em>L</em>-shaped carriage)</td>
<td>196 - 5mm</td>
<td>AB - Anti-backlash nut</td>
<td>HK - Hand Knob</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SPA PTFE Guide Lead Screw Actuator</td>
<td>D - Two rails, one runner block (<em>U</em>-shaped carriage)</td>
<td>393 - 10mm</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SPA PTFE Guide Lead Screw Actuator</td>
<td></td>
<td>472 - 12mm</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SPA PTFE Guide Lead Screw Actuator</td>
<td></td>
<td>999 - 25mm</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SPA PTFE Guide Lead Screw Actuator</td>
<td></td>
<td>M38 - 1.5in</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**EXAMPLE PART NUMBER:** SPA - B - 196 - AB - 00 - 0609 - S

*Left and right sides are determined by looking down the assembly with the motor at the end nearest to you.

**NOTE:** Actuators can be customized in many ways to fit your application:
- Additional lead screw sizes available
- Custom mounting plates
- Custom carriages

**OPTIONAL COMPONENTS**
- Standard or Anti-backlash Nuts
- PTFE Coated Precision Lead Screw
- Anodized Aluminum Extrusion
- Mounting Feet
- Hand Knob
- Bearing Support
- Standard Carriage Plate
- Anti-backlash lead nuts
- Linear actuator carriage
- Magnetic sensors
**OPTIMAL COMPONENTS**

- Anti-backlash lead nuts
- Linear actuator carriage
- Magnetic sensors
High Load and High Moment Capacity
The HMR Miniature Linear Guide series is designed using two rows of recirculating balls. The design uses a Gothic profile with a 45° contact angle to achieve equal load capacity in all directions. Within the restriction of limited space, larger stainless steel balls are used to enhance the load and torsion resistance capacity.

Helix linear guides (indicated with the thick black line to the right) provide greater surface contact as compared to competing products (indicated with the thin green-dotted line at right) when comparing same widths rails.

Lubrication Storage Design
Lubricant injection holes are featured at both ends of the runner block. As the balls circulate during movement of the block, the stainless steel balls carry lubrication oil to the raceway, thus efficiently lubricating the balls and the oil raceway, and achieving long-term, maintenance-free linear motion. This design also provides superb lubricating ability for short stroke movement. A newly-invented embedded lubrication pad design provides a selection of options for machine design.

(3M / W, 5M / W, 7M / W, 9M / W, 12M / W, 15M / W)

HMR-ee Series Stainless Steel Reinforced Plates Ensure High Robustness
Runner blocks are equipped with two stainless steel plates which reinforce the end-cap from end to end. This sturdier design supports higher running speeds. The plates can also function as scrapers to facilitate smooth travel.
Runner blocks are equipped with two stainless steel plates which facilitate smooth travel. The plates can also function as scrapers to reinforce the end-cap from end to end. This sturdier design supports higher running speeds.

**Robustness**

**HMR-ee Series Stainless Steel Reinforced Plates Ensure High Robustness**

Bedded lubrication pad design provides a selection of options for lubricating ability for short stroke movement. A newly-invented emulsion lubricant injection holes at both ends of the runner block. As the balls circulate during movement of the block, the stainless steel balls carry lubrication oil to the raceway, thus efficiently lubricating the balls and the oil raceway, and achieving long-term, maintenance-free linear motion. This design also provides superb lubrication of recirculating balls. The design uses a Gothic profile with a 45° helix linear guides (indicated with the thick black line to the right) when comparing same width rails.

**High Load and High Moment Capacity**

The specifications and data in this publication are believed to be accurate and reliable. However, it is the responsibility of the product user to determine the suitability of Helix products for a specific application. While defective products will be replaced without charge if promptly returned, no liability is assumed beyond such replacement.

**TECHNICAL DATA**

**SMA - 17**

**SIZE 17 - HYBRID LINEAR ACTUATOR (1.8° STEP ANGLE)**

<table>
<thead>
<tr>
<th>MOTOR CHARACTERISTICS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wiring</td>
</tr>
<tr>
<td>Operating Voltage</td>
</tr>
<tr>
<td>Current / Phase</td>
</tr>
<tr>
<td>Resistance / Phase</td>
</tr>
<tr>
<td>Inductance / Phase</td>
</tr>
<tr>
<td>Power Consumption</td>
</tr>
<tr>
<td>Temperature Rise</td>
</tr>
<tr>
<td>Weight</td>
</tr>
<tr>
<td>Insulation Resistance</td>
</tr>
</tbody>
</table>

**SPEED CHARTS**

**Force vs. Speed (RPMs)**

**Force vs. Linear Velocity**

**SMA - 23**

**SIZE 23 - HYBRID LINEAR ACTUATOR (1.8° STEP ANGLE)**

<table>
<thead>
<tr>
<th>MOTOR CHARACTERISTICS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wiring</td>
</tr>
<tr>
<td>Operating Voltage</td>
</tr>
<tr>
<td>Current / Phase</td>
</tr>
<tr>
<td>Resistance / Phase</td>
</tr>
<tr>
<td>Inductance / Phase</td>
</tr>
<tr>
<td>Power Consumption</td>
</tr>
<tr>
<td>Temperature Rise</td>
</tr>
<tr>
<td>Weight</td>
</tr>
<tr>
<td>Insulation Resistance</td>
</tr>
</tbody>
</table>

**SPEED CHARTS**

**Force vs. Speed (RPMs)**

**Force vs. Linear Velocity**

The specifications and data in this publication are believed to be accurate and reliable. However, it is the responsibility of the product user to determine the suitability of Helix products for a specific application. While defective products will be replaced without charge if promptly returned, no liability is assumed beyond such replacement.
## MOTOR SPECIFICATIONS

<table>
<thead>
<tr>
<th>NEMA Rating</th>
<th>Motor Power</th>
<th>Current Per Phase</th>
<th>Holding Torque</th>
<th>Detent Torque</th>
<th>Rotor Inertia</th>
<th>Length (mm)</th>
<th>Weight (g)</th>
<th>Model P.N. #</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEMA 14</td>
<td>Single</td>
<td>0.8</td>
<td>180</td>
<td>25.49</td>
<td>10</td>
<td>1.42</td>
<td>34 (1.34)</td>
<td>160</td>
</tr>
<tr>
<td>NEMA 14</td>
<td>Double</td>
<td>0.8</td>
<td>220</td>
<td>31.15</td>
<td>15</td>
<td>2.12</td>
<td>42 (1.65)</td>
<td>200</td>
</tr>
<tr>
<td>NEMA 14</td>
<td>Triple</td>
<td>0.8</td>
<td>300</td>
<td>42.48</td>
<td>20</td>
<td>2.83</td>
<td>52 (2.05)</td>
<td>230</td>
</tr>
<tr>
<td>NEMA 17</td>
<td>Single</td>
<td>1.3</td>
<td>280</td>
<td>39.65</td>
<td>16</td>
<td>2.27</td>
<td>34 (1.34)</td>
<td>220</td>
</tr>
<tr>
<td>NEMA 17</td>
<td>Double</td>
<td>1.7</td>
<td>520</td>
<td>73.68</td>
<td>26</td>
<td>3.68</td>
<td>68 (1.9)</td>
<td>350</td>
</tr>
<tr>
<td>NEMA 17</td>
<td>Triple</td>
<td>2.3</td>
<td>700</td>
<td>99.12</td>
<td>36</td>
<td>5.09</td>
<td>80 (1.9)</td>
<td>480</td>
</tr>
<tr>
<td>NEMA 23</td>
<td>Single</td>
<td>0.6</td>
<td>800</td>
<td>113.29</td>
<td>28</td>
<td>3.96</td>
<td>190 (1.77)</td>
<td>520</td>
</tr>
<tr>
<td>NEMA 23</td>
<td>Double</td>
<td>1.0</td>
<td>1500</td>
<td>212.42</td>
<td>50</td>
<td>7.08</td>
<td>380 (2.52)</td>
<td>850</td>
</tr>
<tr>
<td>NEMA 23</td>
<td>Triple</td>
<td>3.0</td>
<td>1800</td>
<td>254.90</td>
<td>60</td>
<td>8.49</td>
<td>440 (2.99)</td>
<td>1050</td>
</tr>
</tbody>
</table>

### NEMA 14 Hybrid Stepper Motor

![NEMA 14 Hybrid Stepper Motor Diagram]

### NEMA 17 Hybrid Stepper Motor

![NEMA 17 Hybrid Stepper Motor Diagram]

### NEMA 23 Hybrid Stepper Motor

![NEMA 23 Hybrid Stepper Motor Diagram]
Linear Guidance Options and Specifications
Built with Anodized aluminum and noncorrosive components for years of dependable life - ideal for clean environments. Motors are laser welded to the 300 series stainless screw for additional stiffness and loading. These linear actuators are available with optional encoders, connectors, sensors and custom cables. Standard accessories such as mounting blocks, limit switches and high-payload options are also available.

In addition, Helix offers three rail options including no rail, single rail and double rail with the following characteristics:

- **No Rail**
  Non-motorized. Economical alternative rail. Used for low load, speed. Load can ONLY come from X axis.

- **Single Rail**
  NEMA 14, 17 and 23 stepper motor compatible. Higher load and speed. Load can come from X, Y and Z axis.

- **Double Rail**
  NEMA 14, 17 and 23 stepper motor compatible. Highest load and speed. Load can come from X, Y and Z axis.

## CARRIAGE LOADS

<table>
<thead>
<tr>
<th>No Rail</th>
<th>Single Rail</th>
<th>Double Rail</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>Y</td>
<td>Z</td>
</tr>
<tr>
<td>Mx = 20 lb/in</td>
<td>Mx = 20 lb/in</td>
<td>Mx = 20 lb/in</td>
</tr>
<tr>
<td>Mx = 145 lb/in</td>
<td>Mz = 110 lb/in</td>
<td>Mz = 110 lb/in</td>
</tr>
<tr>
<td>Mx = 200 lb/in</td>
<td>My = 300 lb/in</td>
<td>Mz = 200 lb/in</td>
</tr>
</tbody>
</table>
OPTICAL ROTARY ENCODERS

- Designed to provide digital feedback information
- Molded polycarbonate enclosure
- 5-pin or 10-pin finger latching connector (sold separately)
- 32 to 5000 cycles per revolution (CPR)
- 128 to 20000 pulses per revolution (PPR)
- 2 channel quadrature TTL squarewave outputs
- Optional index (3rd channel)
- -25 to +100°C operating temperature
- Mounting compatibility with HEDS-5500

For differential versions: the internal differential line driver (26C31) can source and sink 20mA at TTL levels. The recommended receiver is industry standard 26C32. Maximum noise immunity is achieved when the differential receiver is terminated with a 150 Ohm resistor in series with a .0047 F capacitor placed across each differential pair. The capacitor simply conserves power; otherwise power consumption would increase by approximately 20mA per pair, or 60mA for 3 pairs. The mating connectors are available from US Digital with several cable options and lengths.

MAGNETIC SENSORS

- Non-contact sensors determine position of carriage
- Maintains integrity of linear actuator
- Sensors operate without intruding upon the actuator, keeping the system completely intact

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Voltage</td>
<td>5-28 VDC</td>
</tr>
<tr>
<td>Voltage Drop</td>
<td>1.0 V</td>
</tr>
<tr>
<td>Current Rating</td>
<td>0.2 Amps Max.</td>
</tr>
<tr>
<td>Switching Power</td>
<td>4.8 watts Max.</td>
</tr>
<tr>
<td>Switching Speed</td>
<td>4μs operate / 4μs release</td>
</tr>
<tr>
<td>Short Circuit Protection</td>
<td>No</td>
</tr>
<tr>
<td>Reverse Polarity Protection</td>
<td>Yes</td>
</tr>
<tr>
<td>Overload Protection</td>
<td>No</td>
</tr>
<tr>
<td>Leakage Current</td>
<td>&lt; 0.01 mA</td>
</tr>
<tr>
<td>Sensing Technology</td>
<td>GMR</td>
</tr>
<tr>
<td>Off Delay Time</td>
<td>150-200 ms</td>
</tr>
<tr>
<td>Function Display</td>
<td>PNP switching status yellow / NPN switching status red</td>
</tr>
<tr>
<td>Switching Frequency</td>
<td>&lt; 1000 Hz</td>
</tr>
<tr>
<td>Magnetic Sensitivity</td>
<td>2.5 millitesla (25 gauss)</td>
</tr>
<tr>
<td>Housing Materials</td>
<td>Ultem</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>-4°F to 176°F (-20°C to 80°C)</td>
</tr>
<tr>
<td>Protection Rating</td>
<td>NEMA 6 / IP 67</td>
</tr>
<tr>
<td>Agency Approvals</td>
<td>CE, RoHS, REACH</td>
</tr>
</tbody>
</table>

23200 Commerce Park Road | Beachwood, OH 44122 USA | 216-485-2232 or 1-855-435-4958 | email: sales@helixlinear.com
The specifications and data in this publication are believed to be accurate and reliable. However, it is the responsibility of the product user to determine the suitability of Helix products for a specific application. While defective products will be replaced without charge if promptly returned, no liability is assumed beyond such replacement.

### OPTICAL ROTARY ENCODERS
- Designed to provide digital feedback information
- Molded polycarbonate enclosure
- 5-pin or 10-pin finger latching connector (sold separately)
- 32 to 5000 cycles per revolution (CPR)
- 128 to 20000 pulses per revolution (PPR)
- 2 channel quadrature TTL squarewave outputs
- Optional index (3rd channel)
- -25 to +100°C operating temperature
- Mounting compatibility with HEDS-5500

### MAGNETIC SENSORS
- Non-contact sensors determine position of carriage
- Maintains integrity of linear actuator
- Sensors operate without intruding upon the actuator, keeping the system completely intact
**LIFE SCIENCES**
- Pipetting automation
- Syringe pumps
- Microscopes
- MRI scanners
- CT scanners
- Radiographic machines
- In-vitro diagnostics
- Genomics
- Blood gas chemistry

**PRINTING & BINDING**
- “Z” axis actuators
- Multi-axis gantries
- 3D printing
- Automation / Material handling
- Additive manufacturing (AD)
- Large format sign printing
- Digital offset printing process
- Folding and sealing equipment
- Thermal CTP systems

**SECURITY - MILITARY**
- Automated door locking systems
- Pan-tilt-zoom cameras
- Automated gates
- Tactical automated security cameras
- Missile fin actuation
- Tank sighting systems
- Drones and UAVs
- Torpedo fin actuation
- Guided munitions

**SEMICONDUCTOR**
- Burnishing stages
- Stacking systems
- Vision inspection machines
- X, Y, Z gantries
- Wafer elevators / Wafer handling
- Acoustic microscopes
- Ultrasonic imaging
- Tuning coils
- Vacuum chamber doors