If you’re looking for higher performance in a smaller package, this is it. The **h3** provides a torque output increase while reducing the package size and weight within your application. Higher duty cycles can be achieved through superior heat dissipation, made possible by the unique aluminum housing design of the motor. Learn more about our One Giant Leap In Stepper Technology.
Why an \textbf{h}igh-torque housed \textbf{h}ybrid \textbf{s}tepper \textbf{m}otor

**Neodymium-Iron-Boron High Energy Magnets**

**Captured Front Bearing**

**Larger Bearings**

**Aluminum Housing**

**O-Ring**

**Stator Enhanced Magnets**

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**Innovation & Performance**

The \textbf{h} Stepper (High-Torque Housed Hybrid) innovates the traditional hybrid stepper motor by offering several unique design enhancements that expand the possibilities of the motor’s applications. \textbf{h} motors incorporate innovative cooling technology (patent pending), high torque magnetic design, rugged and captured bearings, and optimized torque density through enhancing magnets.

The Portescap engineering team provides quick prototype delivery and optimization of windings based on application requirements. Higher-level customization is also available to reduce customer assembly time and inventory levels. Thanks to the combination of features on the \textbf{h} Stepper, it’s able to provide best in class performance.

Portescap can customize the \textbf{h} Stepper to provide an easier manufacturing process, with options including shaft modifications, windings, connectors, shaft adders (gear/pinions), and encoders. Let Portescap work with your design engineers to create the ideal motion solution for your application needs.

**Standard Features**

- **Holding torque**
  - NEMA 17 up to 73 oz-in/0.51 N-m
  - NEMA 23 up to 524 oz-in/3.7 N-m
  - NEMA 34 up to 1,613 oz-in/11.39 N-m

- **UL and CE agency certified**

- **RoHS Compliant**

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**Your Custom Motor**

- Available in sizes NEMA 17, 23 and 34
- Unipolar and bipolar windings available
- Various stack lengths available in each frame size
- Shaft modifications, including hollow shafts
- Lead length modifications and connectors
- Encoders
# How to select your motor

## PRODUCT RANGE CHART

<table>
<thead>
<tr>
<th></th>
<th>NEMA 17</th>
<th></th>
<th>NEMA 23</th>
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<th>NEMA 34</th>
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<tr>
<td></td>
<td>Standard</td>
<td>Enhanced</td>
<td>Standard</td>
<td>Enhanced</td>
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<td>3 Stack</td>
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<td>h</td>
<td></td>
</tr>
<tr>
<td>Short Stack Linear Actuator</td>
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<td></td>
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<tr>
<td>1 Stack Linear Actuator</td>
<td>h</td>
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<tr>
<td>2 Stack Linear Actuator</td>
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</tr>
<tr>
<td>3 Stack Linear Actuator</td>
<td>h</td>
<td></td>
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<td></td>
<td>h</td>
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</tr>
</tbody>
</table>

## Motor Designation

**Frame size**

- 17

**H = Hybrid Stepper Motor**

**Motor Lengths (see drawing)**

- 0 = Short Stack
- 1 = 1 Stack
- 2 = 2 Stack
- 3 = 3 Stack

**Rated Current Per Phase**

- 05 = .5 A
- 10 = 1.0 A
- 15 = 1.5 A
- 20 = 2.0 A
- 30 = 3.0 A
- 50 = 5.0 A

**D = Neodymium Rotor Magnet**

**E = Enhanced**

**18 = 1.8” Per Step With 2 Phases Energized**

**B = Bipolar Coil**

**U = Unipolar Coil**
Basic Stepper Motor Operation

Series step motors have two windings (two phases) that are energized with DC current. When the current in one winding is reversed, the motor shaft moves one step, or 1.8°. By reversing the current in each winding, the position and speed of the motor is easily and precisely controlled, making these motors extremely useful for many different motion control applications.

For even finer resolution and smoother operation, micro-stepping drives divide each step into many increments by controlling the magnitude of the current in each winding.

The performance of hybrid step motors is highly dependent on the current and voltage supplied by a drive. Stepper motors are available with a variety of windings so they can be used with drives that have a broad range of voltage and current ratings. Performance curves are included in this catalog for many common motor drive combinations.

Holding Torque

Because motor performance at speed varies greatly with the drive, holding torque is used to rate hybrid step motors. Holding torque specifies the maximum torque that can be applied to a motor shaft and not cause the shaft to rotate. It is measured with the motor at standstill and energized with rated DC current. Since the motor is energized with pure DC current, holding torque is not dependent on specific drive characteristics.

Enhancing Technology

- Smaller drives = Lower system cost
- More torque = Smaller, faster machines
- Higher efficiency = Lower operating costs

Through the use of enhancing technology, Stepper motors provide the maximum performance available. This patent pending technology boosts torque up to 40% across the operating speed range and allows machines to be designed that are smaller and move faster.

Initial system costs are often less with enhanced motors because the additional torque is produced without the need for larger drives or power supplies. The additional output power is produced through higher efficiency. The higher efficiency reduces energy usage by 25% and lowers operating costs.

Enhanced Stepper motors use additional magnets inserted between each stator tooth. These magnets block the magnet fields from flowing around the stator teeth. This forces more of the magnetic field to flow through each tooth where it produces torque.

Patented enhancing technology redirects magnetic flux to inhibit leakage and optimize torque production.

Torque Enhancement Percentages

- NEMA 23 up 25%
- NEMA 34 up 30%
Basic Stepper Motor Operation

- Typical hybrid stepper motors are constructed with a spring washer that pushes on the ball bearings (preloads the bearings). This is done to reduce bearing noise, increase bearing life, and keep the rotor in position.

  ![Spring Washer](image)

- If the front bearing is not retained, limited axial force can be applied to the front shaft and not cause the rotor to move in the motor.

- As the axial load force becomes greater than the spring washer force, the rotor moves in the stator. This causes whatever is attached to the motor shaft to also shift position.

- This can cause a number of problems. For example, if a leadscrew is attached to the motor shaft the linear load will not be in position.

  ![Snap Ring](image)

- To prevent this unwanted shaft movement, all size 23 & size 34 series motors are provided with a snap ring behind the front bearing that locks the bearing in place even under very heavy axial loads. This snap ring, combined with the oversized bearings used in the series, is a great feature.

- series construction are ideal for leadscrew applications because it often allows the customer to eliminate separate leadscrew thrust bearings and support structures.

- This construction is also very beneficial when the motors are used with encoders. The captured bearing prevents shaft movement that causes the encoder disc to rub and fail.
# Explanation of Specifications

<table>
<thead>
<tr>
<th>MOTOR PART NUMBER</th>
<th>23HX18D10B</th>
<th>EXPLANATION</th>
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<tbody>
<tr>
<td>RESISTANCE PER PHASE, ±10%</td>
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<td>INDUCTANCE PER PHASE, TYP</td>
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<td>RATED CURRENT PER PHASE *</td>
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<td>DETENT TORQUE, MAX</td>
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<td>ROTOR MOMENT OF INERTIA</td>
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<td>INSULATION RESISTANCE AT 500VDC</td>
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<td>RoHS</td>
<td>-</td>
<td>COMPLIANT</td>
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**Definitions**

**Pull-Out Torque**  The amount of torque that the motor can produce at speed without stalling

**Pull-In Torque**  The amount of torque that the motor can produce from zero speed without stalling

**Speed**  # of pulses per second provided to the motor, also stated in revolutions per minute

**Voltage**  Voltage applied to the drive

**Current**  Current applied to the drive

**Drive**  Chopper type drive - current controlled to the motor winding
**Where to apply your stepper**

The Stepper (High-Torque Housed Hybrid) is designed to meet the broad spectrum of stepper motor applications in various markets:

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**Focus on: Medical Pump**

The requirement of the application was to operate smoothly, without resonance, over the entire speed range (1 to 1,000 RPM). A hybrid stepper running roughly would cause the incorrect amount of medicine to be dispensed. Many hybrids were tested, but the Stepper provided smooth operation over the entire speed range, a minimal resonance band and higher output torque. Now the medicine dispensing speed can be varied as designed, without need to compensate for motor roughness.

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### Medical & Lab Automation
- Peristaltic & syringe pumps
- Analyzers
- Optical scanners
- Pharmacy dispensing machines
- Dental imaging
- Fluid handling & movement systems

### Textile
- Yarn monitoring system
- Carpet tufting pattern machine
- Rotor or ring spinning
- Electronic wire winding
- XY garment cutting table

### Factory Automation
- Semiconductor equipment
- Electronic assembly
- Packaging equipment
- Conveyors

### Telemetry
- Cell phone masts
- GPS
- Antenna positioning
- Radar array

### Other
- Printer & copier automation
- Ticketing
- Office automation
- Electronic assembly
- Engraving