Motion Control, Solved.
MOTOR ENGINEERING & MANUFACTURING

- Optimized For Your Application
- Quick Prototype Turnaround
- Small Batch to OEM Volume Production
- US Based Support & Manufacturing
In motion control, no two designs are the same. When you’re optimizing for the best efficiency, accuracy, or speed, you don’t want a motor that is close enough, you want a motor that meets your requirements precisely. This is exactly what we can provide: a motor with the exact specifications you need for your specific design or application.

We manufacture and keep data with accordance to ISO9001:2015, AS9100D and many other standards. For this reason, our motors can be found in numerous FDA and FAA-approved applications.

Our expertise is in Motor Engineering and Manufacturing!

We’ve designed our motors to solve specific problems within your application. Our motors deliver more torque, smaller size, higher speeds, increased accuracy, and reduced noise and resonance—among many more benefits.

Why Lin?

Our expertise is in Motor Engineering and Manufacturing!

**Why Lin?**

Our expertise is in Motor Engineering and Manufacturing

**Motor Engineering**

We help you engineer the right motor solution for your application

**Manufacturing**

From Prototype to Volume Production, we are here to support you

**Solutions**

We design, engineer, and manufacture motors that solve specific problems

**Industries**

Our products are used by engineers in many different industries

**OEM Stepper Motors**

Configurable steppers to meet your product requirements

**Specialty Motors**

IP Rated Motors

**Specialty Motors**

Vacuum Rated Motors

**Specialty Motors**

High/Low Temperature Motors

**Innovative Design**

Z Series - Extremely Accurate & Smooth Stepper Motors

**HPM Nano Stepper Motor**

PTX05 - HPM Stepper Motor

**Miniature Stepper Motors**

PT206 - Hybrid Stepper Motor

**Slim & Compact Motors**

PT210 - Small, smooth & extremely precise

**Whisper Torque Stepper Motors**

PT210 - Smooth, quiet, accurate and delivers ample amount of torque

**Integrated Hybrid Stepper Motors**

Mechtronics Solution

**PM Can Stack Stepper Motors**

Small and cost effective steppers

**Configured Solutions**

Motor configuration and customization options

**NEW PRODUCTS**

**BLDC Motors**

High torque and high speed, low vibration and noise.

**Frameless Brushless DC Motors**

Fully integrated BLDC motors

**Slotless BLDC Motors**

Small, high speed and high efficiency BLDC motors

**Coreless Brushed DC Motors**

Small, efficient, cost effective DC motors

**LE Linear Actuators**

Actuators with external nut

**LN Linear Actuators**

Non-captive actuators

**LinFinity Nuts**

Our patented LinFinity™ linear actuator technology

**Linear Options & Configurator**

Variety of options, modifications, and Rapid Prototype Configurator

**Motion Block Mechatronics**

Enhanced vs. Standard Product Life-Cycle

**Your Design: Integrated & Manufactured**

Motion Block Case Study

**Value Add and Accessories**

Drivers, controllers, encoders, gearboxes and accessories

**Sold & Serviced By:**

ELECTROMATE

Toll Free Phone (877) SERVO98

www.electromate.com

sales@electromate.com

**CERTIFICATIONS**

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Reach

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**AVAILABLE CERTIFICATIONS**

ISO

9001:2015

REGISTERED

AS9100D

UL

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**ON DEMAND ASSEMBLY**

Our unique method of assembly allows us to stock a large selection of standard components that can be assembled in a multitude of ways for your specific needs. This allows us to assemble a motor that meets your exact specifications, with minimal lead time, and at a great price point.

**MEET REQUIREMENTS**

We manufacture and keep data with accordance to ISO9001:2015, AS9100D and many other standards. For this reason, our motors can be found in numerous FDA and FAA-approved applications.

**INNOVATIVE SOLUTIONS**

We’ve designed our motors to solve specific problems within your application. Our motors deliver more torque, smaller size, higher speeds, increased accuracy, and reduced noise and resonance—among many more benefits.

**GET EXACTLY WHAT YOU NEED**

In motion control, no two designs are the same. When you’re optimizing for the best efficiency, accuracy, or speed, you don’t want a motor that is close enough, you want a motor that meets your requirements precisely. This is exactly what we can provide: a motor with the exact specifications you need for your specific design or application.
EVERY DAY MORE ENGINEERS CHOOSE LIN ENGINEERING
This is how we earn your business and become a valued supply chain partner.

UNRIVALED APPLICATION SUPPORT
- 98% application success rate
- 90% of prototypes shipped in less than 2 weeks
- California based support

OEM ENGINEERING SUPPORT
For OEM orders, we'll work directly with your engineering team throughout the design phase of your project to ensure the best overall system optimization and motor fit while avoiding over-engineering.

CONFIGURED SOLUTIONS
- Standard / off-the-shelf motors are easily accessible via the web store
- Easily configure your solution:
  * Windings for efficiency
  * Cabling and connectors
  * Much more!

HIGH PERFORMANCE
- Highest torque output
- High accuracy = no skipping steps
- Reduced vibration and resonance

CUSTOMERS IN 2010
Customers in 2020

UNRIVALED APPLICATION SUPPORT

From Prototypes to Volume Production, we are here to support you.

FAST PROTOTYPE TURNAROUND
Our Northern California manufacturing facility doubles as our prototyping facility. This gives us a much higher flexibility to try out different components and windings to ensure the motor will perform at its best. This also ensures that prototypes operate the same as the volume parts. Plus, we test each motor in real time.

SCALABLE MANUFACTURING VOLUMES
We grow with your needs. The benefits of multiple manufacturing facilities—within the United States and in Asia—allows us to maintain whatever volume you need, as well as handle spikes with minimal concern. Our Northern California facility is optimized for low to mid volume production, while our off-shore facilities are optimized for high volume production, which allows us to scale with your manufacturing requirements. As the demand for your product in the marketplace multiplies, our ability to provide what you need increases as well. Furthermore, we guarantee the identical quality assurance.

QUALITY DONE RIGHT
4.5 Sigma From Lin Engineering - a True Quality System
We’ve implemented 4.5 Sigma in order to accomplish the following goals:
- Establish a robust Mean Value Control System
- Perform incoming inspection at our supplier’s site
- Ensure quality products with every shipment

Customers in 2010
Customers in 2020

ELECTROMATE
Toll Free Phone (877) SERVO98
www.electromate.com
sales@electromate.com
Lin Engineering Motors enable you to achieve:

- Smaller Frame Size
- Less Resonance
- Less Noise
- Low Power Consumption
- High Temperature Operation
- Low Temperature Operation
- Vacuum Environment Operation
- Clean Room Environment Operation
- Wet Environment Operation
- Dusty Environment Operation
- And Much More

Our Stepper Motors and Motion Control Products are used by Engineers in many different industries, including:

- Automated Guided Vehicles (AGV)
- Automotive
- Aviation
- Industrial Automation
- Life Science
- Medical
- Packaging
- Food & Beverage
- Printing & Engraving
- Robotics
- Scanning
- Security & Surveillance
- Semiconductor
- Space
PRODUCTS: OEM STEPPER MOTORS

- **NEMA 6 - 3.46°**
  - **106**
    - Our Smallest
    - Hybrid Stepper
    - Up to 2.1 oz-in (0.014 N-m)
    - Holding Torque

- **NEMA 8 - 1.8°**
  - **208**
    - Compact Stepper
    - Up to 4 oz-in (0.03 N-m)
    - Holding Torque

- **NEMA 11 - 1.8°**
  - **211**
    - Compact Stepper
    - Up to 16.6 oz-in (0.12 N-m)
    - Holding Torque

- **NEMA 14 - 0.9°**
  - **3709/3809**
    - Signature Series
    - Reduces Resonance
    - Up to 16 oz-in (0.12 N-m)
    - Holding Torque

- **NEMA 14 - 1.8°**
  - **3518**
    - Integral Connector Available
    - Up to 20 oz-in (0.14 N-m)
    - Holding Torque

- **NEMA 17 - 0.9°**
  - **416-05/06**
    - Super Slim Line
    - Up to 7.3 oz-in (0.05 N-m)
    - Holding Torque

- **NEMA 17 - 1.8°**
  - **417**
    - High Torque
    - High Accuracy
    - Up to 30 oz-in (0.21 N-m)
    - Holding Torque

- **4209**
  - High Torque/High Accuracy
  - Up to 62 oz-in (0.44 N-m)
  - Holding Torque

- **4109**
  - Ideal for High Speed
  - Up to 22 oz-in (0.16 N-m)
  - Holding Torque

- **G3718**
  - Cost Effective
  - Improved passive cooling
  - Up to 42 oz-in (0.30 N-m)
  - Holding Torque

- **4118**
  - Super Torque
  - Integral Connector Available
  - Vacuum Option Available
  - Up to 115 oz-in (0.81 N-m)
  - Holding Torque

- **4418**
  - Xtreme Torque Series
  - Improved passive cooling
  - Up to 35% More Torque
  - Compared to Standard
  - Up to 100 oz-in (0.71 N-m)
  - Holding Torque

- **4518**
  - Cool Operating Stepper
  - Reduces Resonance
  - Easy Installation
  - Up to 130 oz-in (0.92 N-m)
  - Holding Torque

- **416-07**
  - Low Profile
  - Up to 8.4 oz-in (0.06 N-m)
  - Holding Torque

- **Z/H417**
  - Hollow Shaft
  - Virtually zero detent torque.
  - Up to 33.5 oz-in (0.24 N-m)
  - Holding Torque
  - Hollow Shaft with up to 12mm ID available!

- **5704**
  - Power & Precision
  - Up to 140 oz-in (0.99 N-m)
  - Holding Torque

- **NEMA 23 - 0.45°**
  - **416-05/06**
    - Super Slim Line
    - Up to 7.3 oz-in (0.05 N-m)
    - Holding Torque

- **ZH417**
  - Hollow Shaft
  - Virtually zero detent torque.
  - Up to 33.5 oz-in (0.24 N-m)
  - Holding Torque

- **NEMA 23 - 0.9°**
  - **618**
    - High Torque/High Accuracy
    - Up to 203 oz-in (1.43 N-m)
    - Holding Torque

- **5618**
  - High Torque
  - Up to 178 oz-in (1.24 N-m)
  - Holding Torque

- **5718**
  - High Torque
  - Up to 305 oz-in (2.16 N-m)
  - Holding Torque

- **5818**
  - High Torque
  - Up to 294 oz-in (2.08 N-m)
  - Holding Torque

- **ES518**
  - Xtreme Torque
  - Up to 150 oz-in (1.06 N-m)
  - Holding Torque

- **ES5718**
  - Hercules High Torque
  - Up to 500 oz-in (3.44 N-m)
  - Holding Torque

- **NEMA 23 - 1.8°**
  - **618**
    - High Torque
    - Up to 700 oz-in (4.94 N-m)
    - Holding Torque

- **8718**
  - High Torque
  - Up to 1,288 oz-in (9.09 N-m)
  - Holding Torque
IP RATED MOTORS

Every new application creates its own restrictions and challenges, so when you discover that your motion system will have to operate in extreme environmental conditions such as rain, dust or even under water, what do you do? Luckily, we continue to research, develop, and unveil cutting-edge technologies to facilitate wider and wider ranges of applications. While our standard lines of stepper motors are well-known for their durability, our IP65 and IPX7 lines can also withstand harsh environments where typical motors will fail.

The IP65 Rated Series provides dust proof operation, and can withstand low-pressure jets of water sprayed from all directions as close as three meters for extended periods of time. The water jets can be delivered at pressures of up to 30kPa, at a rate of 12.5 l/min, and for duration of up to three minutes. In addition to extended protection from challenging environmental factors, the IP65 rated motors have a food grade coating making them ideal for the “washdown” cycles of food processing applications.

The IPX7 Rated Series of motors are completely protected against dust and withstand immersion into liquids at depths of 15cm to 1m for up to 30 minutes. Stepper motors are now available with IPX7 Rating in three sizes—NEMA 17, 23, and 34—the motors are capable of producing holding torque up to 1,288 oz-in. Plus, unipolar and bipolar windings are available to allow for the torque and speed required to accommodate your specific application.

211 Series
- NEMA 11 (28 mm)
- Up to 16 oz-in (0.12 N-m) Holding Torque

4118 Series
- NEMA 17 (42 mm)
- Up to 115 oz-in (0.81 N-m) Holding Torque

5718 Series
- NEMA 23 (57 mm)
- Up to 305 oz-in (2.16 N-m) Holding Torque
HIGH/LOW TEMPERATURE MOTORS

Lin Engineering standard motors are rated to operate in ambient temperatures from -20° to +50° C. While this satisfies the majority of applications, there are certain applications that require the motor to operate at higher or lower temperature ranges.

Like any specific application concerns, motors that must work under extreme conditions of hot and cold require critical design features to accommodate their use. Whether your application is situated in the heat of a desert or the freezing temperatures of the arctic, Lin Engineering has the expertise to provide the right motor for you. The company has designed two types of specialty hot/cold motors meant to operate specifically in extreme temperature ranges—Type I and Type II.

**Type I**

Type I operates in ambient temperatures from -40 °C (-40 °F) to 80 °C (176 °F) and up to 110 °C (230 °F) for the case temperature.

**Type II**

Type II operates in ambient temperatures from -40 °C to 110 °C (230 °F) with up to 140 °C (284 °F) for the case temperature.

MOTORS AVAILABLE FOR HOT/COLD OPERATION

**4118 Series**
- More torque than standard NEMA 17 stepper motors
- Custom wound for high speed or low speed applications
- Up to 115 oz-in (0.81 N-m) Holding Torque

**5718 Series**
- High Torque
- Cost effective
- Up to 305 oz-in (2.16 N-m) Holding Torque

PRODUCTS: SPECIALTY MOTORS

PRODUCTS: INNOVATIVE DESIGN

Z SERIES
EXTREMELY ACCURATE & SMOOTH STEPPER MOTORS

**Features and Benefits**
- NEMA 17, 0.9° Step Angle
- Virtually Zero Detent Torque
- Smooth and Quiet Operation
- High Step Accuracy
- Reduced Resonance
- Hollow Shaft up to 11 mm in diameter
- No Torque Loss Due to Large Hollow Bore

A conventional hybrid stepper motor utilizes a permanent magnet in the rotor. Our patented design uses a ring magnet in the stator instead. This drastically reduces the detent torque (unenergized drag torque) because the magnetic flux path is able to reach over the stator windings and only go through the outer edge of the rotor. Reducing detent torque improves accuracy, smooth operation and reduces noise. Best of all, modifying the magnet location does not change the dynamic torque.

**Extreme Step Accuracy**
Z-Series motor maintains ±1.5 arc minutes error under 64x microstepping. Industry average can range from ±4.5 to ±18 arc minutes in 0.9° step motors.

**Quiet Operation**
By eliminating detent torque, the motor operates substantially quieter than regular hybrid stepper motors.

**Application**
Z-Series motors are perfect for any application which requires extreme precision, smoothness, and quiet operation.

APPLICATION EXAMPLES

- SCANNERS & PRINTERS
- MEDICAL TOOLS
- SEMICONDUCTOR MANUFACTURING
- CAMERA STABILIZATION & SURVEILLANCE
PRODUCTS: HPM NANO STEP MOTOR

PTX05
HPM NANO STEP MOTOR

Features & Benefits:
• HPM (Hybrid-PM-Mix), a First of Its Kind.
• Just 13mm In Diameter
• Optimized for High and Low Speed Operations
• Precise Positioning Control
• Position Hold
• Low Noise and Vibration
• Cost Effective
• Gear Head Options

We’ve taken the best parts of a Hybrid Stepper, PM stepper, and a BLDC motor, and combined them to create a motor that acts as a high-speed BLDC motor with the benefits of a Hybrid Stepper technology: precise positioning control, position holding, and low speed operations.

This motor opens new possibilities for Engineers to create motion that was not feasible before. Imagine being able to precisely control the movement, stop and hold the position, and then drive the motor at speeds of 10,000 RPM.

APPLICATION EXAMPLES

- ELECTRONIC OIL VALVES
- ELECTRIC GRIPPERS
- SYRINGE PUMPS
- MINIATURE HYDRAULIC PUMPS

PRODUCTS: MINIATURE HYBRID STEPPER MOTOR

PT106
MINIATURE HYBRID STEPPER MOTOR

Features & Benefits:
• Just 16mm Wide - Our Smallest Hybrid Stepper
• NEMA 6, 3.46° Step Angle
• 104 Steps Per Revolution
• 4x More Holding Torque Than Can Stack PM Steppers
• 5x More Accurate Than Can Stack PM Steppers
• Operates At Over 8,000 RPM
• Up to 2.1 oz-in (14.82 mNm) Holding Torque

One of the biggest problems Engineers face while designing ever-smaller devices is making things move. As the size of equipment decreases, the demand for smaller motors increase. However, oftentimes small enough motors simply don’t exist, and if they do, they do not provide enough torque or speed to be useful in the application. Often, the only option is to use a large framed motor and shrink everything else around it. Motion control is the real bottleneck which forces Engineers to compromise on the footprint of their device.

APPLICATIONS

The PT106 is a perfect candidate for many applications that require tiny motors, especially in the field of medical devices and laboratory automation. Applications that require high degree of precision like miniature pumps, fluid metering and control, and optical sensor controls can take advantage of the PT106 motor. The PT106 can even be incorporated into motorized hand tools like electronic pipettes, and other handheld devices where Hybrid Stepper Motors were previously impossible to integrate.

- HANDHELD TOOLS
- PINCH VALVES
- FLOW CONTROL VALVES
- SHUTTER/APERTURE CONTROL
- PUMPS
- OPTICAL SENSOR CONTROL
PRODUCTS: **SLIM & COMPACT MOTORS**

**3709 XTREME ACCURACY STEPPER MOTOR**

Features & Benefits:
- NEMA 17 Mountings, 0.9° Step Angle
- Thin and Compact
- Multiple Mounting Plate Options
- Smooth Motion and High Accuracy
- Up to 22 oz-in (0.15 N-m) Holding Torque

**THIN & COMPACT**

3709 Series motors feature a flat/puck-shaped design and range from 14 to 22 mm in thickness. Making the motor a perfect fit for compact and portable devices, where size or weight is essential.

**HOW DID WE DO IT?**

The motors feature a unique end-cap design that incorporates the bearings, and the entire unit is sealed and laser welded for strength and longevity of the product. Being resourceful allows us to create a very compact motor.

**HIGH TORQUE**

3709 Series motors are capable of producing up to 16 oz-in of holding torque. This is quite astounding for such a small motor.

**MULTIPLE MOUNTING OPTIONS**

Motors are offered in variety of standard mounting options in NEMA 17 offsets. Available hole patterns include Thru hole DO 0.13, #4-40 UNC and M3 x 0.5.

Additionally, Lin Engineering can place the motor in almost any customer supplied/designed housing imaginable. Multiple Shaft options are also available.

**AVAILABLE OPTIONS**

- **CUSTOM WINDING**
  Custom windings can insure maximum torque at a desired speed.

- **CUSTOMIZED LEADS**
  Custom connections can range from EMI or IP protection, to custom color coding.

- **VARIOUS SHAFT OPTIONS**
  With in-house machining capabilities, we are able to provide a variety of shaft options at a cost effective price with minimal lead times.
PRODUCTS: INTERGRATED STEPPERS

**Silverpak 17D**
INTEGRATED MOTOR + DRIVER

**Features and Benefits:**
- NEMA 17, 1.8° Bipolar Step Motor
- Operates from +12 to 24 VDC
- Up to 85 oz-in of Holding Torque
- Phase Current Ranges from 0.25 to 2.0 Amps Peak

**Silverpak 17DE**
INTEGRATED MOTOR + DRIVER+ENCODER

**Features and Benefits:**
- NEMA 17, 1.8° Bipolar Step Motor
- Operates from +12 to 24 VDC
- Up to 84.8 oz-in of Holding Torque
- Phase Current Ranges from 0.1 to 2.0 Amps Peak

**Silverpak 17C**
INTEGRATED MOTOR + DRIVER + CONTROLLER

**Features and Benefits:**
- NEMA 17, 1.8° Bipolar Step Motor
- Operates from +12 to 24 VDC
- Up to 84.8 oz-in of Holding Torque
- Phase Current Ranges from 0.1 to 2.0 Amps Peak

**Silverpak 23C**
INTEGRATED MOTOR + DRIVER + CONTROLLER

**Features and Benefits:**
- NEMA 23, 1.8° Bipolar Step Motor
- Up to 294 oz-in of Holding Torque
- Input voltage of +12 to 40 VDC
- Phase Current Ranges from 0.3 to 3.0 Amps Peak

**Silverpak 23CE**
INTEGRATED MOTOR + DRIVER + CONTROLLER + ENCODER

**Features and Benefits:**
- NEMA 23, 1.8° Bipolar Step Motor
- Up to 294 oz-in of holding torque
- Input voltage of +12 to 40 VDC
- Phase Current Ranges from 0.3 to 3.0 Amps Peak

### CUSTOMIZE YOUR INTEGRATED MOTORS

- **SHAFT**
- **GEARBOXES**
- **CUSTOM WINDING**

PRODUCTS: PM (CAN STACK) STEPPER MOTORS

**PM (Can-stack) Steppers** are a popular choice for their small size, and low power draw. They also present a cost effective solution for applications that do not demand the speed, accuracy, or torque output of a Hybrid Stepper. These motors are commonly used in various Automotive, Printing/Scanning, and Consumer Electronics applications.

### FEATURES & BENEFITS:
- **Small Frame Size**
- **Cost Effective Solutions**
- **20mm To 42mm Frame Size**
- **3.75 To 18 Degree Step Angle**
- **5V To 32V Rating**

**PM MOTOR CONSTRUCTION**

- Stator
- Sleeve bearing
- Rear mounting plate
- Connector
- Shaft
- Housing
- Front mounting plate

### COMMON APPLICATIONS

- Automotive
- Printers/Scanners
- Consumer Electronics
- Valve Controls
Multiple Mounting Configurations

NEMA 6, 8, 11, 14, 17, 23 and 34

Multiple Shaft Options *

Extended  Flat  Helical Cut
Slotted  Hollow  Cross Drilled
Press Fit Gear & Pulley

* Based on customer provided drawings and specifications

Winding

Lin can help calculate speed, torque and input power creating a winding that is specific to your application.

▲ The Benefits?
√ High Efficiency
√ Less Power Input
√ No Trial & Error
√ Save Time, Money, and Energy

Encoders, Dampers, Gearboxes, & Mechatronics

Position
 Verification & Accuracy with Encoders
Reduce
 Resonance & Vibration with Dampers
Increase
 Torque & Speed with Gearboxes
Utilize
 Intelligent Motors with Mechatronics

Bearings & Lubricants
Ball Bearings, Stainless Steel Bearings, Seals, Special Lubricants for high temperature/humid operation

Water/Dust Protection
IP65 (Splash Proof)  IPX7 (Submersible)

Vacuum Rated
NEMA 11, 17 & 23 - 1.8°

Lead Wires & Cables

Pin & Connector Installation
Special Lead Wire
Custom Color Code
Teflon Insulated Wire
Special Length Lead Wire
Heat Shrink Tube
Tie Wraps
Jumper
Cable (Special Length Code Available)

OEM production volume reduces the overall cost per unit, which makes many customizations more economical to produce. We can provide motors that are designed to your precise needs with proprietary or non-proprietary customizations to ensure the perfect fit into your product.

√ Reduce Cost
√ Save Time
√ Better Supply Chain Control
√ Lin Quality Standards for Every Component

Lin can help calculate speed, torque and input power creating a winding that is specific to your application.
BLDC motors are a good choice for applications that require high speed operations but do not require precise positioning control or position hold of a stepper. BLDC motors are capable of delivering more torque at higher speeds than conventional steppers can, and also provide smoother and quieter motion. Unlike steppers, the torque output is consistent through the continuous operating speed range of the motor. Our BLDC motors are designed to be continuous operation at speeds of up to 4000 RPM (5000 RPM peak).

Our standard BLDC motors are available in NEMA 17, 23, and 34 frame sizes and various motor lengths.

**Features and Benefits:**
- NEMA 17, 23 and 34 Mounting
- Wide Range Of Speed Control and Smooth Torque Output
- Excellent Speed Stability
- Small Size, High Power
- Low Temperature Rise, Low Noise, Low Vibration
- Long Life, Low Maintenance Costs
- Low Positioning Torque
- Energy Efficient
- Works With Planetary Gearboxes
- Custom Windings and Modifications Available

**Specifications:**

**NEMA 17 (43.2 mm)**

**BL17 Series**

- Length: 1.85 in to 3.98 in (47 mm to 101 mm)
- Rated Voltage: 24 and 48 VDC
- Rated Torque: 10.2 to 30.45 oz-in (0.072 N·m to 0.215 N·m)
- Rated Speed: 4000 RPM
- Rated Power: 30 to 90 W
- Rated Current: 1.67 to 2.4 Amps

**NEMA 23 (58.5 mm)**

**BL23 Series**

- Length: 2.19 in to 4.78 in (55.5 mm to 121.5 mm)
- Rated Voltage: 24 and 48 VDC
- Rated Torque: 20.53 to 60.89 oz-in (0.15 N·m to 0.43 N·m)
- Rated Speed: 4000 RPM
- Rated Power: 60 to 180 W
- Rated Current: 3.2 to 4.5 Amps

**NEMA 34 (80 mm)**

**BL34 Series**

- Length: 2.01 in to 3.4 in (51 mm to 82 mm)
- Rated Voltage: 24 and 48 VDC
- Rated Torque: 34 to 102 oz-in (0.24 N·m to 0.72 N·m)
- Rated Speed: 4000 RPM
- Rated Power: 100 to 300 W
- Rated Current: 5 to 7.49 Amps

**PRODUCTS:** **BRUSHLESS DC MOTORS**

NEM 17, 23 and 34 Mounting
Wide Range Of Speed Control and Smooth Torque Output
Excellent Speed Stability
Small Size, High Power
Low Temperature Rise, Low Noise, Low Vibration
Long Life, Low Maintenance Costs
Low Positioning Torque
Energy Efficient
Works With Planetary Gearboxes
Custom Windings and Modifications Available
PRODUCTS: FRAMELESS BRUSHLESS DC MOTORS

FRAMELESS BLDC MOTORS

Features & Benefits:
• Highly Integrated
• High Torque
• High Efficiency
• Multiple Sizes
• Optional Hall Sensors

Frameless BLDC motors allow for maximum integration with your assembly.

Typical standard BLDC motors are structurally and mechanically self-supporting. The rotor is suspended inside the stator using end-caps at both ends. Whatever apparatus needs to be attached, is usually bolted onto the end-caps. End caps can easily account for up to 50 percent of the motor’s overall length.

Frameless motors reduce waste and redundancy by eliminating the need for additional mounting supports, plates, or brackets. All structural and mechanical supports needed for the design can be integrated directly into the apparatus. The benefit is that both the stator and the rotor can be seamlessly incorporated into the system, reducing size without sacrificing performance.

This provides you with greater opportunities to explore various shapes and sizes of the motor. The motor can be designed to fit the application rather than forcing the application to fit the motor. This gives you the freedom and flexibility to design systems with the smallest footprint possible.

Specifications:
• OD Range: 20 to 160 mm
• ID Range: 8 to 120 mm
• Continuous Torque Range: up to 2 Nm
• Peak Torque Range: up to 6 Nm
• Current Range: up to 12 Amps
• Voltage: up to 80V
• Speed: up to 20,000 RPM
• Thickness: up to 100 mm

COMMON APPLICATIONS

AUTONOMOUS VEHICLES

ROBOTICS

SECURITY & SURVEILLANCE

GIMBALS
**PRODUCTS: CORELESS BRUSHED DC MOTORS**

**CORELESS (IRONLESS) BRUSHED DC MOTOR**

**Features & Benefits:**
- Speeds up to 13,000 RPM
- Ironless Design Eliminates Cogging
- Increased Efficiency and Torque
- Low Inertia Rotor for Fast Response Time
- 13mm to 24mm Diameter
- Cost Effective Motor and Implementation
- Gearbox Options Available

Simplifying the core design and removing iron components from the motor provides multiple benefits: it reduces the overall size of the motor without sacrificing the performance; and it virtually eliminates cogging that’s present in ordinary motors with iron core. This is due to near elimination of eddy current—the electrical current induced within iron conductor. The benefit is increased efficiency and higher torque output. Also, low inertia rotor allows for faster response time.

The brushed motors are cost effective alternatives to the brushless motors due to simpler design—which lowers the unit price point. In addition, brushed motors do not require drivers which are needed to operate BLDC motors—further reducing the overall implementation cost.

**PRODUCTS: SLOTLESS BLDC MOTORS**

**SLOTLESS BLDC MOTOR**

**Features & Benefits:**
- Speeds up to 50,000 RPM
- High Efficiency and Torque
- Operational Lifetime of Up To 20,000 Hours
- Smooth and Silent Operation
- High Accuracy Motion Control
- 13mm to 22mm Diameter
- Gearbox, Encoder, and Driver/Controller Options Available

Slotless BLDC Motors are capable of higher speeds and higher torque outputs than their brushed counterparts. Elimination of mechanical brushes increases the operational lifetime of the motor to 20,000 hours. BLDC motors offer more accurate speed control with the use of drivers and controllers. The Slotless BLDC motor can also be fitted with an encoder for precise positioning control. Slotless BLDC Motors are the right choice for applications requiring higher torque per size output, higher operating speeds, increased longevity, and high accuracy of speed or position control.

**Benefits of slotless vs. slotted motors**

To combat issues related to detent torque, we’ve removed the slots from the motor. Instead, we’re using a unique process of winding the copper wire without the need of slots; this drastically reduces cogging and improves the motor’s ability to respond and accelerate quickly and operate smoothly. Slotless BLDC motors are also quieter and provide more power with a smaller frame size than their slotted counterparts.
In non-captive configuration, the nut is incorporated into the motor’s rotor. As the rotor rotates, it creates linear motion by passing the leadscrew. In this instance, the apparatus can be attached in one of two ways: directly to the motor, or to either ends of the leadscrew.

When the apparatus is attached directly to the motor, the leadscrew is usually rotationally fixed. As the rotor rotates, it moves the motor along the length of the leadscrew providing linear motion. Since both ends of the leadscrew are generally supported, the maximum length of the leadscrew can be greater than that of an actuator with external nut. This is a popular option for applications that require longer travel. This configuration can also handle more linear force than external nut design.

Another advantage to consider is that the motor provides more mass and, therefore, more damping power. This means that you experience less vibration, which often translates to quieter and more accurate motion. Non-captive design can also be desirable when a rotating leadscrew could potentially conflict with other components or prove to be hazardous. Since the leadscrew is fixed in position, less moving parts are exposed.

Another popular option is to attach an apparatus to the lead screw while keeping the motor fixed in position. This removes the need for long leads and lead tracking. Most of the benefits can be retained if the apparatus can be supported from both ends of the lead screw.

The external nut configuration is simple, compact, and offers a high level of design flexibility. In the external nut configuration, the shaft of the stepper motor is replaced with a leadscrew. In a typical application, the motor is fixed in position and an apparatus is attached to the nut. As the leadscrew rotates, the external nut travels along the length of the screw, providing linear motion.

The length and the pitch of the leadscrews are highly customizable, making the external nut configuration useful for a wide variety of applications. Numerous mounting options paired with the many types of nuts available help tailor this linear actuator to fit a specific situation. In addition, the external nut configuration helps achieve greater acceleration and maximum speeds than other configurations while also offering greater efficiency in terms of power consumption.

PRODUCTS: EXTERNAL NUT ACTUATORS

NEMA 8 (20.3 mm)
LE08

NEMA 11 (28.3 mm)
LE11

NEMA 14 (35.5 mm)
LE14

NEMA 17 (43.2 mm)
LE17

NEMA 23 (58.5 mm)
LE23

PRODUCTS: NON-CAPTIVE ACTUATORS

NEMA 8 (20.3 mm)
LN08

NEMA 11 (28.3 mm)
LN11

NEMA 14 (35.5 mm)
LN14

NEMA 17 (43.2 mm)
LN17

NEMA 23 (58.5 mm)
LN23
PRODUCTS: LINFINITY NUT

Features & Benefits:
- Reduced friction and heat build up
- Quite operation
- Maintains high accuracy
- Increased life span
- No maintenance required
- Patented design

The LinFinity Nut is an internally lubricated anti-backlash nut proven to last over 12 million inches of travel in a typical application without maintenance.

The patented design incorporates an internal grease reservoir which distributes a consistent layer of grease throughout the entire surface of the lead screw as the nut travels. The internal reservoir maintains hydrodynamic lubrication throughout the life of the product, which drastically reduces friction and thus increases the performance and longevity of the product.

Ordinary externally lubricated anti-backlash nuts act as a wiper: instead of distributing the grease evenly, they tend to push the grease out to the edges of the screw. This results in the grease drying out and ultimately leads to product failure.

Features & Benefits:
- Reduced heat build up
- Less friction means less heat is being generated. LinFinity reduces heat buildup by at least 20% compared to the closest competing design. Heat leads to premature failure.

Features & Benefits:
- Reduces Noise
- Ordinary externally lubricated nuts tend to increase friction throughout the life of the product. Friction causes excessive noise. LinFinity maintains low friction throughout the lifespan and does not generate more noise with age.

Features & Benefits:
- Extends Life
- Lower heat and reduced friction along with even distribution of grease result in the overall life of the Linear Actuator system to increase.

Rapid Prototype Configurator is a tool to help you configure and receive a prototype linear actuator so you can start your evaluations quickly, easily, and with confidence.

√ Answer four simple questions about your needs
√ Select from thousands of potential combinations for fast delivery
√ Start testing and configuring your system quickly
√ Decide on your final motor requirements
√ Nail down production unit specifications

For complete listing and specifications, visit: LinEngineering.com/Actuators

CONFIGURED OPTIONS SHIPPED IN 2 WEEKS!

Enter Your Speed and Force requirements and your available voltage and amperage (your driver output) and hit calculate.

Dimensions and Specifications will appear in this area after making a selection.

Navigate steps using the navigation bar
**CASE STUDY 1:**
**RAPID PROTOTYPING**

**PROBLEM STATEMENT**
New product launch deadline quickly approaching.

**SOLUTION**
- Created a configured motor with new winding, housing, and encoder.
- Final Design in 3 weeks.
- Prototypes in 5 weeks.

**CASE STUDY 2:**
**STREAMLINED SUPPLY CHAIN**

**PROBLEM STATEMENT**
Current motor and pump stalling intermittently.

**SOLUTION**
- Created configured motor winding for more torque.
- Integrated motor and pump into single sub-assembly.

**CASE STUDY 3:**
**SCALABLE PRODUCTION**

**PROBLEM STATEMENT**
New product release with great reaction from the market that required expedited production ramp-up.

**SOLUTION**
- Incorporated product into automated production line.
- Worked with supply base to expedite setup and delivery.
PRODUCTS: DRIVERS/CONTROLLERS

**Slim Planetary GEARBOX**
- Features & Benefits:
  - High efficiency
  - Shortest Planetary Gearbox
  - 5:1 gear ratio
  - Cost effective
  - Standard NEMA 17 Mount

**PM Planetary GEARBOX**
- Features & Benefits:
  - High efficiency
  - Multiple ratios available
  - Standard NEMA mountings
  - Quick installation
  - Cost effective
  - Low noise gearheads available

**VALUE ADD: GEARBOXES**

**VALUE ADD: ENCODERS/ACCESSORIES**

**OPTICAL ENCODERS**

**AMT11 MODULAR INCREMENTAL ENCODER**
- Features and Benefits:
  - Patented capacitive ASIC technology
  - Incremental resolutions up to 4096 PPR
  - Differential line driver versions
  - 7 different mounting hole options

**E2 ENCODER**
- Features and Benefits:
  - Best for NEMA 17, 23 and 34
  - 32 to 5,000 cycles per revolution (CPR)
  - Tracks from 0 to 300,000 cycles/sec
  - 128 to 5,000 pulses per revolution (PPR)

**CAPACITIVE ENCODERS**

**AMT20 MODULAR ABSOLUTE ENCODER**
- Features and Benefits:
  - Patented capacitive ASIC technology
  - Low power consumption
  - 12-bit absolute position via SPI
  - (4096 positions)

**AMT103 MODULAR INCREMENTAL ENCODER**
- Features and Benefits:
  - Patented capacitive ASIC technology
  - Low power consumption
  - 16 DIP switch selectable resolutions up to 2048 PPR

**VALUE ADD: ENCODERS/ACCESSORIES**

**USB485 Converter Card**
- Compatibility: Serial USB
- Used with: SP17C, SP23C, R256, R356, R525

**RS232-RS485 Converter Card**
- Compatibility: Serial Port
- Used with: SP17C, SP23C, R256, R356, R525