

# Linear Piezomotor **LAS2 Series**

Piezo Motion's novel series of linear piezoelectric motors represent a quantum leap in design construction of compact, high-precision, performance linear motor technologies. This new range of linear motors combines superior nanometer precision and ultrafast response at a very economical cost.



## Performance and Benefits of LAS2 Series Linear Motors

### IMPROVED RESOLUTION

With a control step size of just 0.04  $\mu\text{m}$  at full thrust or holding force, these linear motors offer 25,000 steps per mm of control.

### FASTER REACTION TIME

Within 10 to 30  $\mu\text{s}$ , the piezo motor has made its first step, and motion has commenced compared to a stepper motor with a typical 5 ms to start motion.

### HIGH FORCE DENSITY

These motors offer superior force density for their size and weight, particularly when compared with stepper and lead screw solutions.

### ENERGY AND COST SAVINGS

This piezo motor consumes zero power at holding force and very low power at slow speed (0.025 W at 0.5 mm/s), yielding the possibility of very efficient overall duty.

### SPECIAL PROPERTIES

Piezo Motion motors are immune to EMI and RF interference and have no emissions, making them ideal for a range of sensitive applications. For specialized applications (including MRI) please contact our technical team.

### ECONOMICAL DESIGN

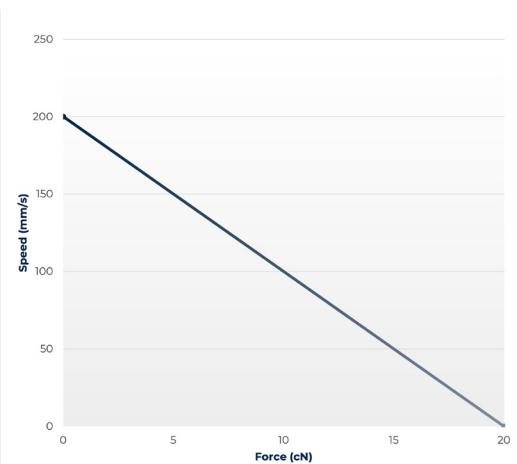
The innovative design and patent-protected technology packaged in stable reinforced thermoplastic makes this high-performing automation affordable for OEM equipment designers.

### LIGHTWEIGHT

This piezo motor contains no copper windings, iron laminations, or permanent magnets and is significantly more potent by weight than EM solutions. This makes them ideally suited to weight-critical applications.

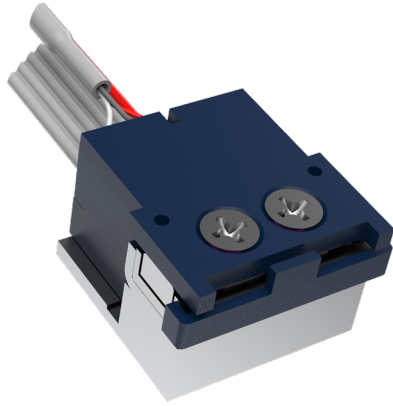
### UNIQUE PROPERTIES

- Ultra-Lightweight
- Low voltage
- 25,000 steps per mm of control
- Superior precision and resolution
- 9 mm travel range
- Six orders of magnitude speed dynamic range
- Ultra-fast response time with superior start-stop characteristics
- Silent operation in continuous mode
- High force for size
- Energy efficient, zero power consumption in hold mode
- Stepping and Continuous mode of operation

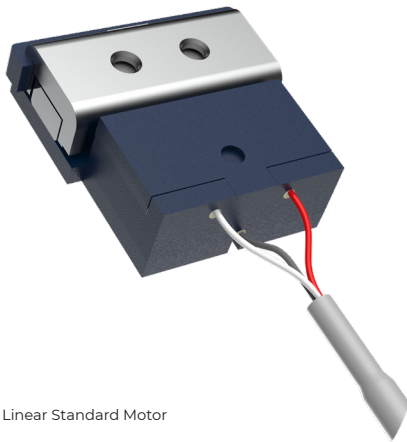


Speed-Force Curves for LAS Series Linear Motor

## LAS2 Series



LAS2 Series Linear Motor with Encoder



LAS2 Series Linear Standard Motor

### MOTOR SPECIFICATIONS

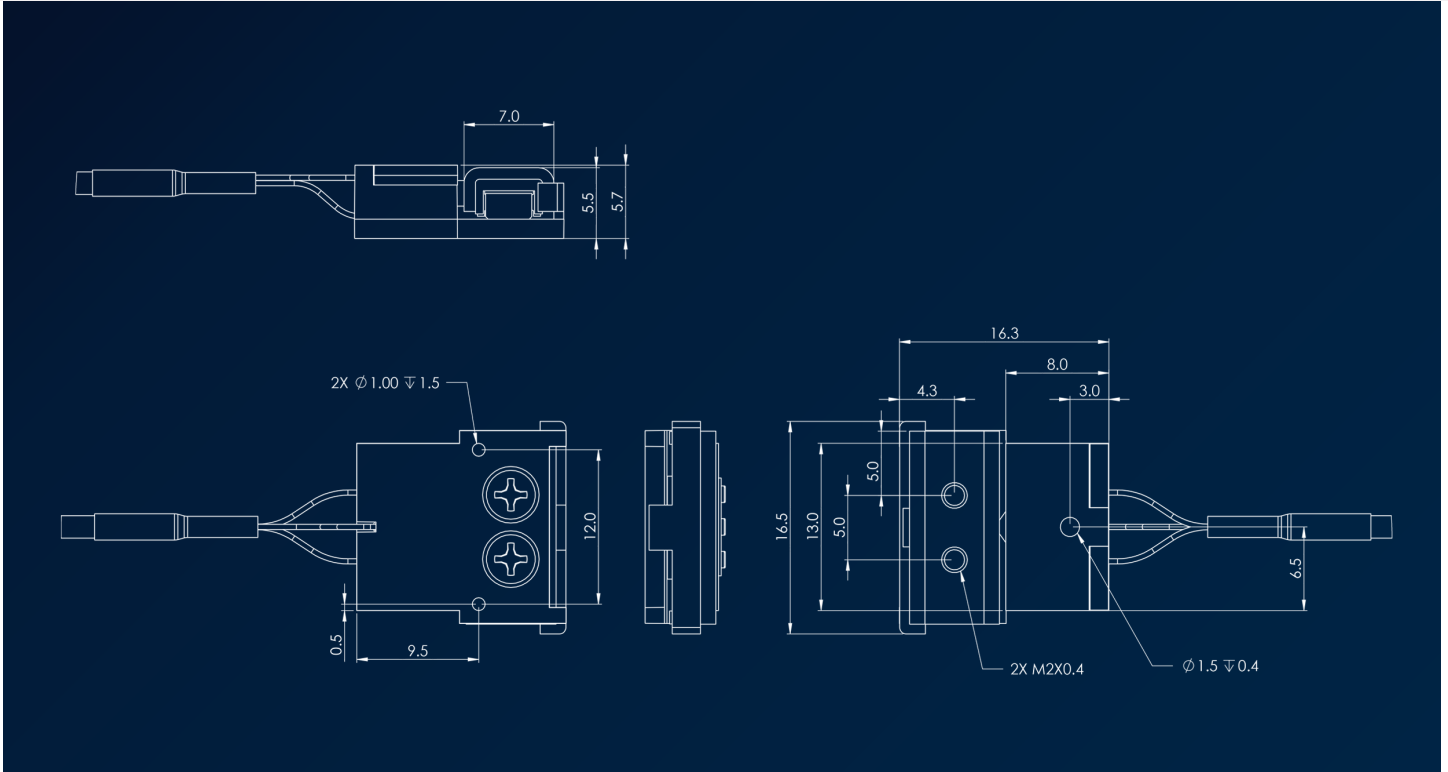
	Standard	Encoder
Driver Board P/N	EDA50V017BB	EDA50V017BB
Power Supply Voltage	5 V	5 V
Push/Pull Force	$\geq 0.2$ N	$\geq 0.2$ N
Self-Braking Force	$>0.25$ N	$>0.25$ N
Motor Response Time	$\approx 30\mu\text{s}$	$\approx 30\mu\text{s}$
Max Speed	200 mm/s	100 mm/s
Travel Range	9.0 mm	9.0 mm
Minimum Linear Step	$<0.04$ $\mu\text{m}$	$<0.04$ $\mu\text{m}$
Encoder Resolution (after quadrature)	N/A	2.66 $\mu\text{m}$
Minimum Controlled Linear Step	N/A	2.66 $\mu\text{m}$
Uni-directional Repeatability	N/A	2.66 $\mu\text{m}$
Linear Backlash at Change of Direction	$\leq 0.1$ $\mu\text{m}$	$\leq 0.1$ $\mu\text{m}$
Elastic stiffness	$\approx 20$ mN/ $\mu\text{m}$	$\approx 20$ mN/ $\mu\text{m}$
Linear Hysteresis	$\leq 2.0$ $\mu\text{m}$	$\leq 2.0$ $\mu\text{m}$
Pitch	$<1$ mrad	$<1$ mrad
Maximum Moment Mx	0.07 Nm	0.07 Nm
Roll	$<0.5$ mrad	$<0.5$ mrad
Maximum Moment My	0.12 Nm	0.12 Nm
Yaw	$<1$ mrad	$<1$ mrad
Maximum Moment Mz	0.9 Nm	0.9 Nm
Vertical Runout	3.0 $\mu\text{m}$	3.0 $\mu\text{m}$
Horizontal Runout	6.0 $\mu\text{m}$	6.0 $\mu\text{m}$
Frequency Response	4 kHz	4 kHz
Operating Temperature	-20 to 80 °C	-20 to 80 °C
Maximum Load (at listed specification)	20 g	20 g
Max Current over velocity range	150 mA	150 mA
Motor Weight	4.7 g	8.5 g
Motor Dimensions	16.3x16.5x5.7 mm	16.3x16.5x10.4 mm
Driver PCB Dimensions	40x25x14 mm	40x25x14 mm
Driver PCB Weight	6.4 g	6.4 g

## Principle of operation

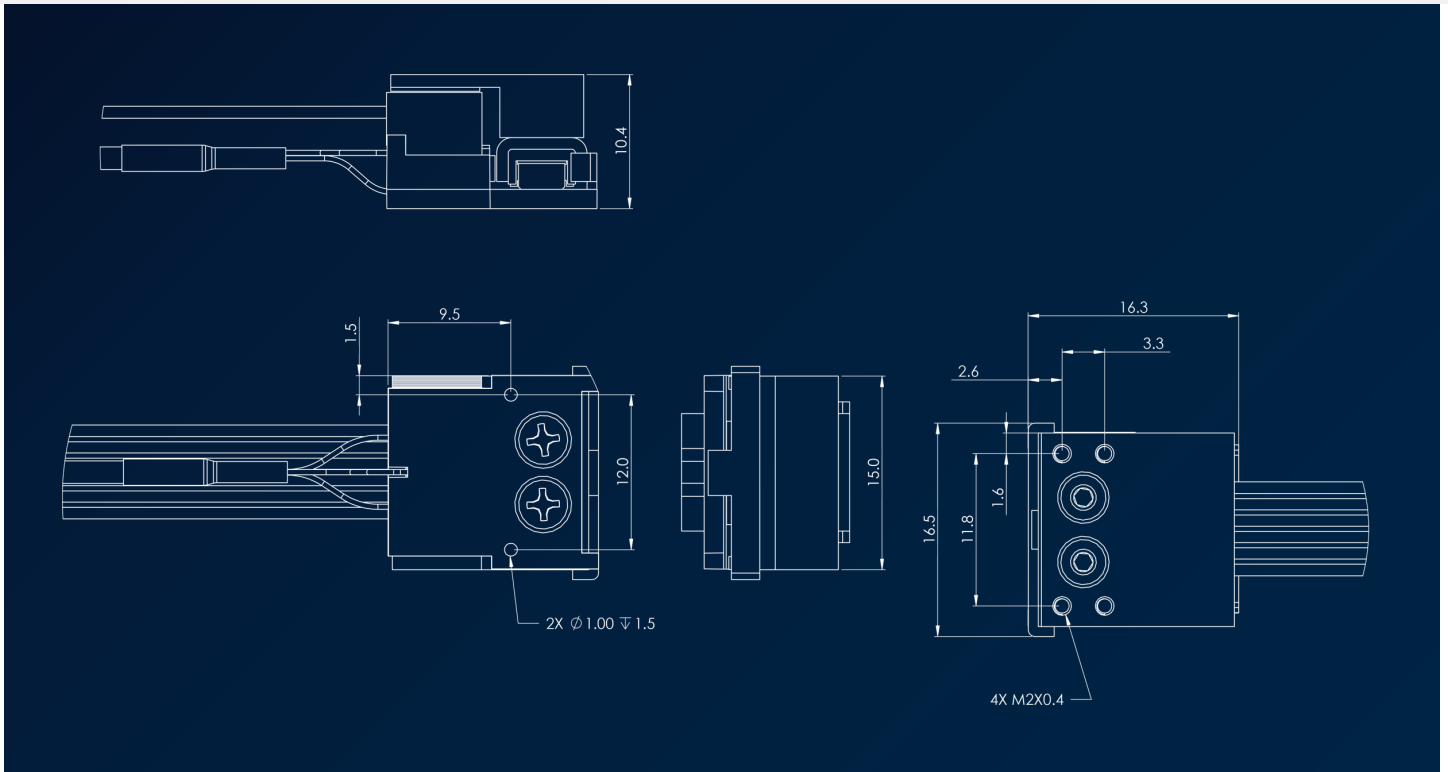
Piezo Motion's rotary piezo motors work on a patented principle of excitation of ultrasonic standing waves within a piezoelectric resonator. The resulting superposition of two orthogonal ultrasonic waves causes elliptical movement of the resonator tip which drives the rotor (for more details visit [piezomotion.com](http://piezomotion.com)). Piezo Motion's electronic driver's have been designed to provide an economical user-control interface. Each driver PCB is preprogrammed for the specific motor model and is software configurable to provide optimization of drive signals and integrated controls. Closed-loop control of the motor is achieved via an encoder mounted on the motor.

# LAS2 Series dimensional drawings

## STANDARD MODEL



## ENCODER MODEL



## Motor control

The control of the LAS Linear Motor is straightforward, each motor requires a driver board. This board will convert desired motion input instructions to the necessary electrical processes using specific frequency and amplitude values. This creates excitation of the piezo resonator and makes the motor perform the desired motion.

### OPEN LOOP

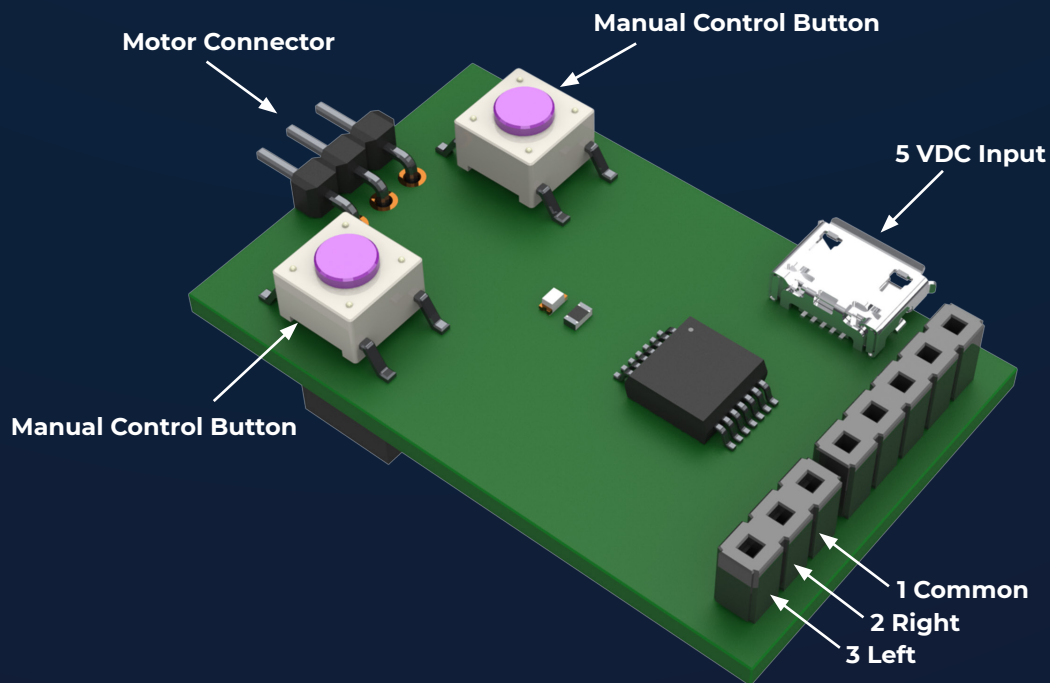
The LAS motor is designed to move in either direction with two push buttons on the driver PCB. Alternatively, the motor is controlled using an external signal source via PWM (Pulse Width Modulation) mode. Control signals are applied to Pin 2 or Pin 3 on the External Input Control Connector. The method of travel, stepping or continuous, depends on the type of signal applied to the External Input Connector. A constant high-level DC signal will result in continuous motion at maximum speed until it reaches a mechanical stop at either end of the motor. A pulse or pulse train will result in a stepping operation. In the stepping mode (PWM), the size of each

step is determined by the pulse duration, and the pulse repetition rate determines the speed of travel. The minimum pulse duration is approximately 10-15  $\mu$ s. The maximum repetition rate, measured in Hertz, is determined by the motor's dynamic range, which is 4 kHz.

### CLOSED-LOOP

For closed-loop control of the LAS motor with a Piezo Motion installed encoder, the user must close the loop using the feedback signals from the encoder. Motor Control can also be implemented with Python commands using Piezo Motion's Motor API. This information is provided in the LAS product user manual.

## Electronic PCB Driver for **LAS2 Series Piezo Motors**



### ELECTRONIC DRIVERS

EDA50V017BB Electronic PCB Driver - Open Loop board only

## Control architecture & options

Piezo Motion motors are available as a basic motor or with a fitted encoder. Our electronic drivers are available as open-loop drivers. Motors can be simply controlled in open-loop mode with several options for achieving closed-loop motion control. To learn more, visit [piezomotion.com/products/motors/](http://piezomotion.com/products/motors/) or scan the QR code below.

	Base Motor	Motor with Encoder
Open Loop Driver	Open Loop Control or third party controller command motor with PWM control and close control loop with external sensor	Open Loop Control or third party controller commands motor with PWM control. User must close the loop by using the feedback signals from the encoder connectors (this information is provided in the LAS product user manual).

## Evaluation Kits

Full range of evaluation kits available. Each kit includes motor, driver board pcb, cables, 5 VDC or 7.5 VDC power adapter & user manual. Encoder kit version also includes factory-fitted magnetic encoder with cable and connector.

### ORDERING INFORMATION

Motor Type	LAS20C009LAC10	LAS20C009LAC10-E
Description	Evaluation kit for LAS series linear motor with steel linear slide bearing and fixed stroke of 9 mm. The motor has a force $\geq 0.2$ N force. It has a 10 cm cable terminated with a molex connector. Evaluation kit includes electronic driver board, 120/220 V to 5 VDC power adapter, cables and manual.	Evaluation kit for LAS series linear motor with steel linear slide bearing and fixed stroke of 9 mm. The motor has a force $\geq 0.2$ N force and is fitted with an optical encoder (2.66 $\mu$ m). It has a 10 cm cable terminated with a molex connector. Evaluation kit includes electronic driver board, 120/220 V to 5 VDC power adapter, cables and manual.
Linear Force	20 cN	20 cN
Encoder Type	N/A	Optical
Linear Stroke	9 mm	9 mm
Minimum Linear Step	< 0.04 $\mu$ m	< 0.04 $\mu$ m

For OEM and custom inquires, contact us at [info@piezomotion.com](mailto:info@piezomotion.com) or scan the QR code below.

## About Piezo Motion

Piezo Motion is a leader in piezo motor technology with multi-million dollar investments in research and development of affordable piezoelectric motors to meet and exceed the needs of today's global markets.

The company is committed to developing innovative piezoelectric technology and motion products that enhance their functionality in a multitude of applications.

Piezo Motion partners with startups, OEMs, research institutions, and industrial companies worldwide; empowering the visionaries behind their products.

**SCAN TO  
LEARN MORE  
& BUY ONLINE**

