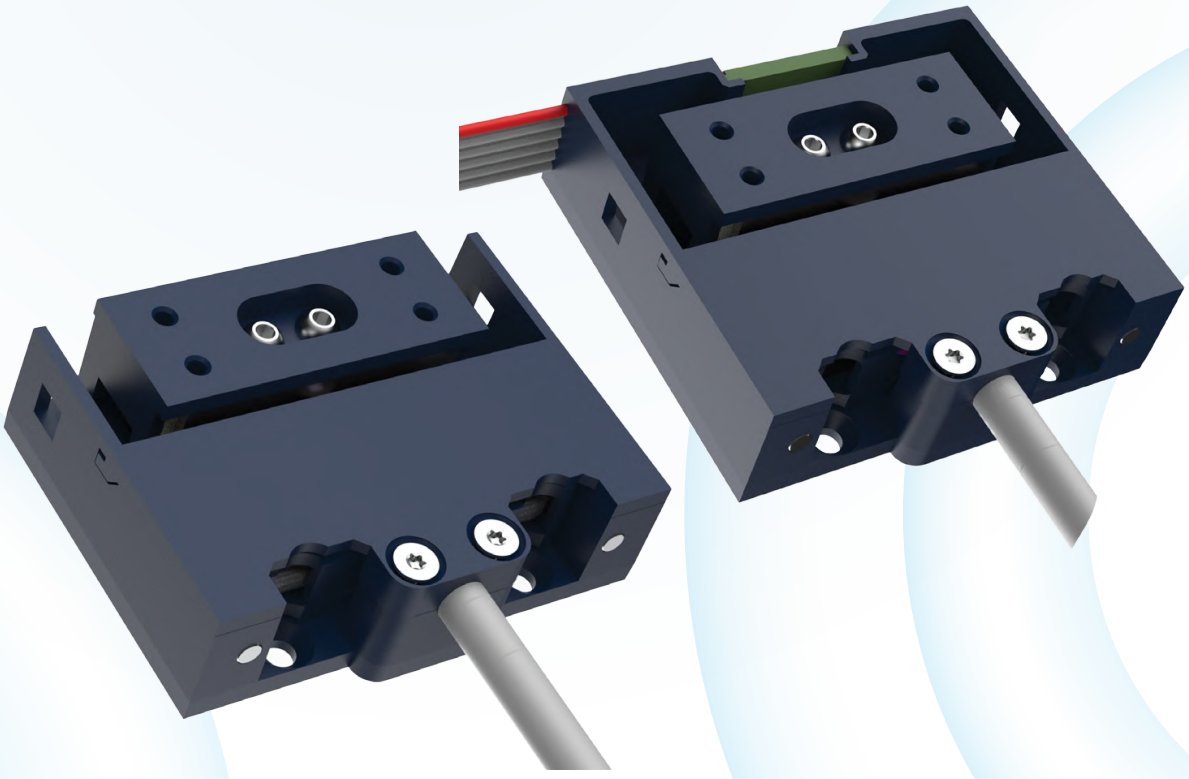
PMC
PIEZO
MOTOR COMPANY

www.piezomotors.com

LRMO-LG Series

Piezoelectric Linear Actuators

Innovation In The Design And
Manufacturing Of Piezoelectric Motors



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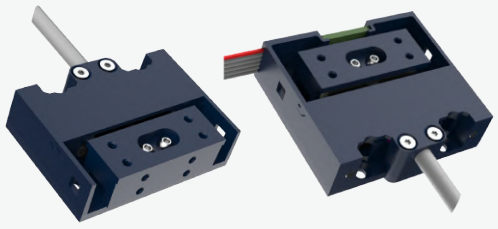
LRMO-LG Series

Piezoelectric Linear Actuators

INTRODUCTION

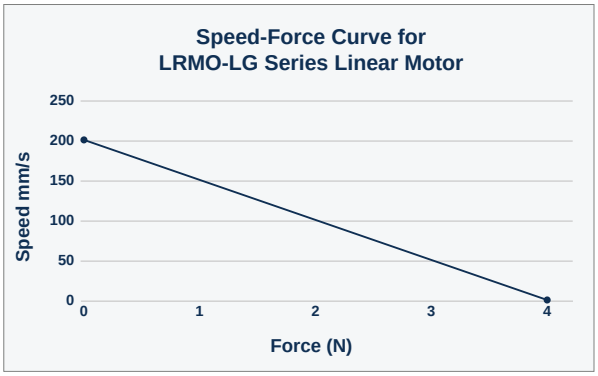
The LRMO-LG series of linear piezo motors represents a quantum leap in design of small size high-performance motors. Injection-molded using extremely durable, but light weight engineered reinforced thermoplastics, the LRMO-LG series provide low cost with superior precision and ultrafast response/start-stop characteristics. Highly energy efficient, the LRMO-LG series consume zero power in hold position while still providing significant force.



LRMO-LG Series
With & Without Encoder

PRINCIPLE OF OPERATION

The LRMO-LG Series linear piezo actuators operates based on the electrical excitation of the piezoceramic body, or resonator, which induces simultaneously two independent longitudinal and bending ultrasonic standing waves in two perpendicular directions. This action generates elliptical vibrations at the resonator's center, resulting in linear motion of the motor, which is passively in contact with the resonator body.

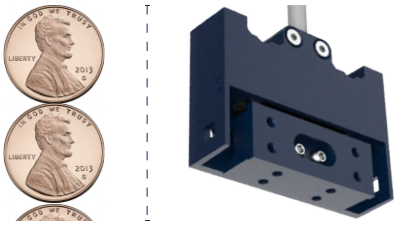


PERFORMANCE & BENEFITS

- High push/pull force: ≥4.0 N
- High self-braking force: ≥4.0 N (zero power in hold)
- Superior stability of velocity control across temperature and load variations.
- Unmatched precision and resolution — minimum linear step <0.05 µm (50 nm = 20,000 steps/mm).
- Stepping and continuous modes of operation.

KEY FEATURES

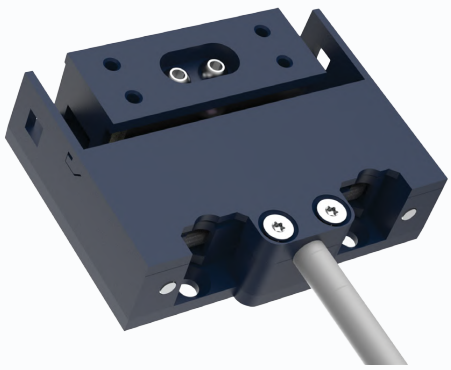
- 9.0 mm standard travel range.
- Ultra-fast response (~30 µs).
- Push/pull force ≥ 4.0 N
- Silent operation, stepping and continuous modes.
- Low voltage operation — 12.0 V DC.



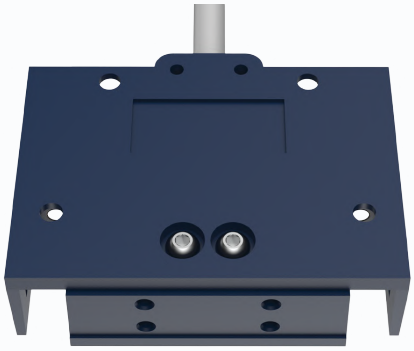
LRMO-LG

Open-Loop Linear Piezo Motor

Plastic Enclosure | Without Encoder



LRMO-LG Series (Without Encoder)
Front View



LRMO-LG Series (Without Encoder)
Rear View

INTRODUCTION

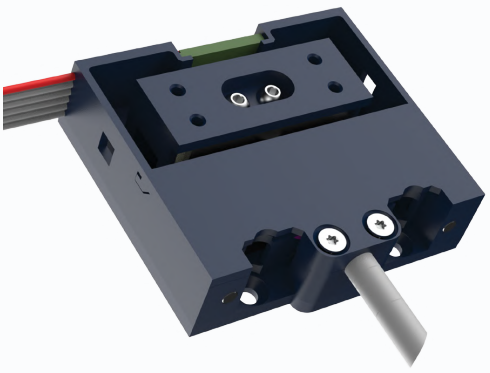
PMC's linear piezoelectric actuator, open-loop PWM control. Available in plastic enclosure (LRMO-LG).

MOTOR SPECIFICATIONS	
Power Supply Voltage	12 V
Push/Pull Force	≥ 4.0 N
Self Braking Force	≥ 4.0 N
Motor Response Time	≈ 30 µs
Max Speed	200 mm/s
Travel Range	9.0 mm
Minimum Linear Step	<0.05 µm
Pitch	≤450 µrad
Maximum Moment Mx	0.07 Nm
Roll	≤225 µrad
Maximum Moment My	0.12 Nm
Yaw	≤450 µrad
Maximum Moment Mz	0.9 Nm
Vertical Runout	3.0 µm
Horizontal Runout	6.0 µm
Frequency Response	4 kHz
Operating Temperature	-20 to 80°C
Maximum Load (at listed specification)	400 g
Max Current over velocity range	350 mA
DIMENSIONS & WEIGHT	
Actuator Dimensions	40 x 31 x 11 mm
Actuator Weight	22 g
Driver PCB Dimensions	40 x 63 x 25 mm
Driver PCB Weight	25g

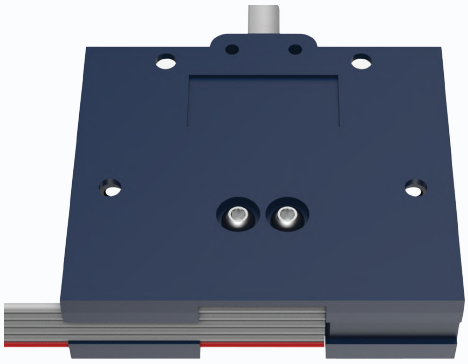
LRMO-E-LG

Close-Loop Linear Piezo Motor

Plastic Enclosure | With Encoder



LRMO-LG Series (With Encoder)
Front View



LRMO-LG Series (With Encoder)
Rear View

INTRODUCTION

Identical to LRMO-LG base motor with factory-fitted optical encoder. Encoder signal output enables closed-loop control via your controller. Plastic enclosure. The encoder resolution of 2.66 µm (after quadrature) enables precise controlled positioning for demanding applications.

MOTOR SPECIFICATIONS	
Power Supply Voltage	12 V
Push/Pull Force	≥ 4.0 N
Self Braking Force	≥ 4.0 N
Motor Response Time	≈ 30 µs
Max Speed	140 mm/s
Travel Range	9.0 mm
Minimum Linear Step	<0.05 µm
Encoder Resolution (after quadrature)	2.66 µm
Minimum Controlled Linear Step	2.66 µm
Uni-directional Repeatability	2.66 µm
Pitch	≤450 µrad
Maximum Moment Mx	0.07 Nm
Roll	≤225 µrad
Maximum Moment My	0.12 Nm
Yaw	≤450 µrad
Maximum Moment Mz	0.9 Nm
Vertical Runout	3.0 µm
Horizontal Runout	6.0 µm
Frequency Response	4 kHz
Operating Temperature	-20 to 80°C
Maximum Load (at listed specification)	400 g
Max Current over velocity range	350 mA
DIMENSIONS & WEIGHT	
Actuator Dimensions	40 x 34 x 11 mm
Actuator Weight	22 g
Driver PCB Dimensions	40 x 63 x 25 mm
Driver PCB Weight	25g

LRMO-LG Motion Control

and Driver Electronics

PWM | Serial | Open-loop & Closed-loop

INTRODUCTION

Control of the LRMO-LG Series Linear Motor is simple and flexible. Each motor is operated via a dedicated driver PCB, which converts motion commands into precise electrical excitation using optimized frequency and amplitude signals to actuate the piezo resonator.

The driver supports multiple control interfaces, including PWM & serial, enabling seamless integration into a wide range of systems. Each PCB is pre-configured for the specific motor model, with additional software configurability to optimize performance and system integration.

In this configuration, a companion daughter board provides closed-loop feedback and serial communication, enabling accurate position control via Piezo Motor Company's software or external controllers.

The LRMO-LG driver architecture offers a compact, cost-effective control solution, while enabling fine motion regulation through closed-loop operation when required.

LRMO-LG OPEN LOOP DRIVER PCB OPTIONS

Standard Open Loop Driver PCB
Part No.: ROLR-PPCB-0470-0000

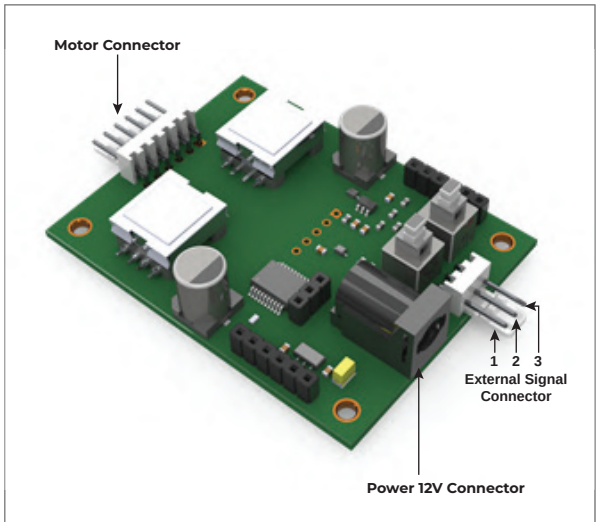
The driver board can be controlled using an external signal source PWM (Pulse Width Modulation) mode. Control signals are applied to the External Signal Connector to generate the desired rotation and speed. Control of speed using PWM is implemented by varying the pulse duration and repetition rate of input signals onto the two directional control pins. Size of step is determined by the pulse duration, and speed is determined by pulse rate. The minimum pulse duration is approximately 30µs.

The LRMO driver PCB is compatible with both LRMO-LG (non-encoder) and LRMO-LG-E (encoder-equipped) motors. For applications requiring closed-loop control with the Open-Loop driver, the control loop must be implemented externally by the user using encoder feedback and a third-party controller.

Control Interface	
PWM (TTL-compatible)	via J1 connector

Additional Features:

- Manual control via two onboard push-buttons.
- Compact, low-overhead solution for cost-sensitive for open-loop applications using a single motor.



Electronic PCB Driver for LRMO-LG Piezomotors

LRMO-E-LG Motion Control
and Driver Electronics

PLC | Serial | Open-loop & Closed-loop

LRMO-E-LG CLOSED LOOP DRIVER PCB OPTIONS

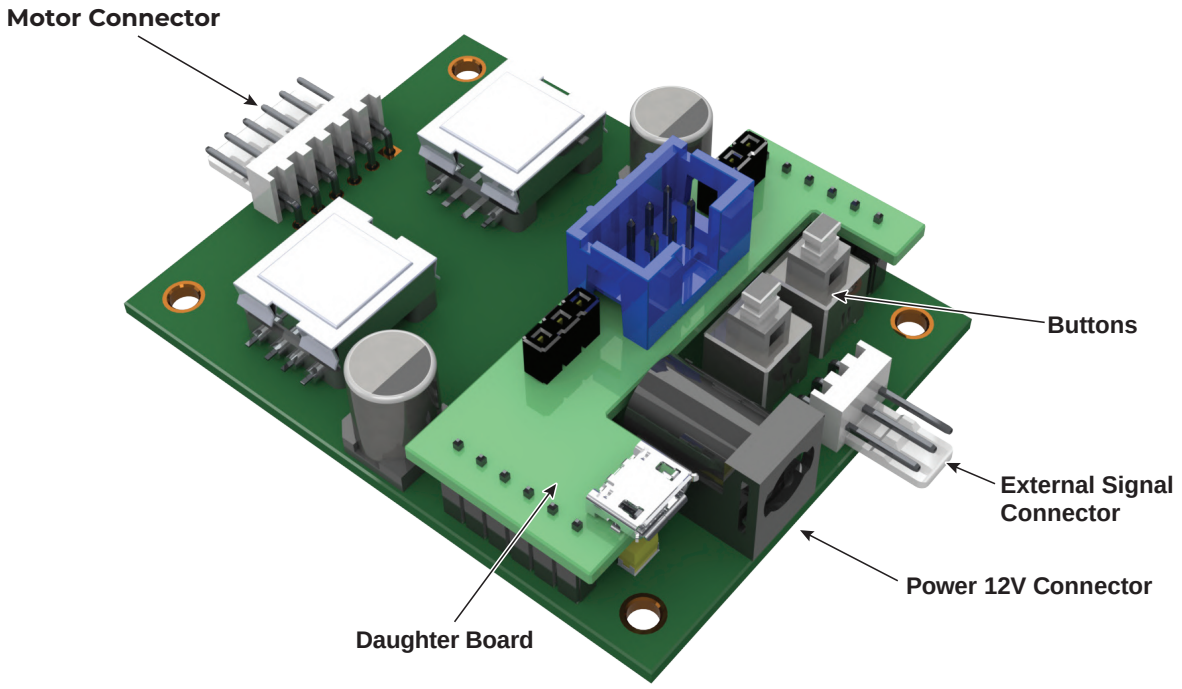
Standard Closed Loop Driver PCB
Part No.: ROLR-PPCB-1480-0000

In closed-loop control (feedback control) mode, an additional daughter PCB is mounted on driver PCB. Feedback from an external optical encoder, mounted on the piezo motor, is fed to the daughter board and used to close the loop. The position and speed of the motor can then be controlled through an elaborate set of commands via either a USB port (through Piezo Motor Company (PMC)'s GUI) or serial (RS 232) port commands.

The Close loop driver PCB is compatible with LRMO-LG-E (encoder-equipped) motors only and is designed for use with PMC's close loop software, enabling simple integration and high-precision motion control.

Control Interfaces	
PMC's PLC Software (Windows)	
RS 232	Serial commands

Additional Features:
- Manual control via two onboard push-buttons.
- Compact, low-overhead solution for cost-sensitive for open-loop applications using a single motor.



Performance Chart

and Ordering Information

Motor/Driver Part Configurations — All Variants

PART NUMBERING

LRMO	—	Material	—	Encoder	Driver	Firmware	Kit	—	Customisation
LRMO	—	P011	—	1	4	7	1	—	100**0**
LRMO		P011 = Plastic		0 = without 1 = with	4 = 12V	7 = Open Loop 8 = Close Loop	0 = Motor Only 1 = Eval Kit		0 = Standard

LRMO-P011-1471-1001: LRMO Series, Plastic, with Encoder, 12V Driver, Open Loop Firmware, Evaluation Kit

MOTOR CONFIGURATIONS

Model	Encoder	Push/Pull	Min Step	Max Speed	Power Supply	Part Number	Kit Available
LRMO-LG	Without	≥ 4.0 N	<0.05 µm	≥ 200 mm/s	12 V DC	LRMO-P011-0470-1000	✓
LRMO-E-LG	With	≥ 4.0 N	<0.05 µm	≥ 200 mm/s	12 V DC	LRMO-P011-1470-1000	✓

PART NUMBERS & EVALUATION KIT DETAILS

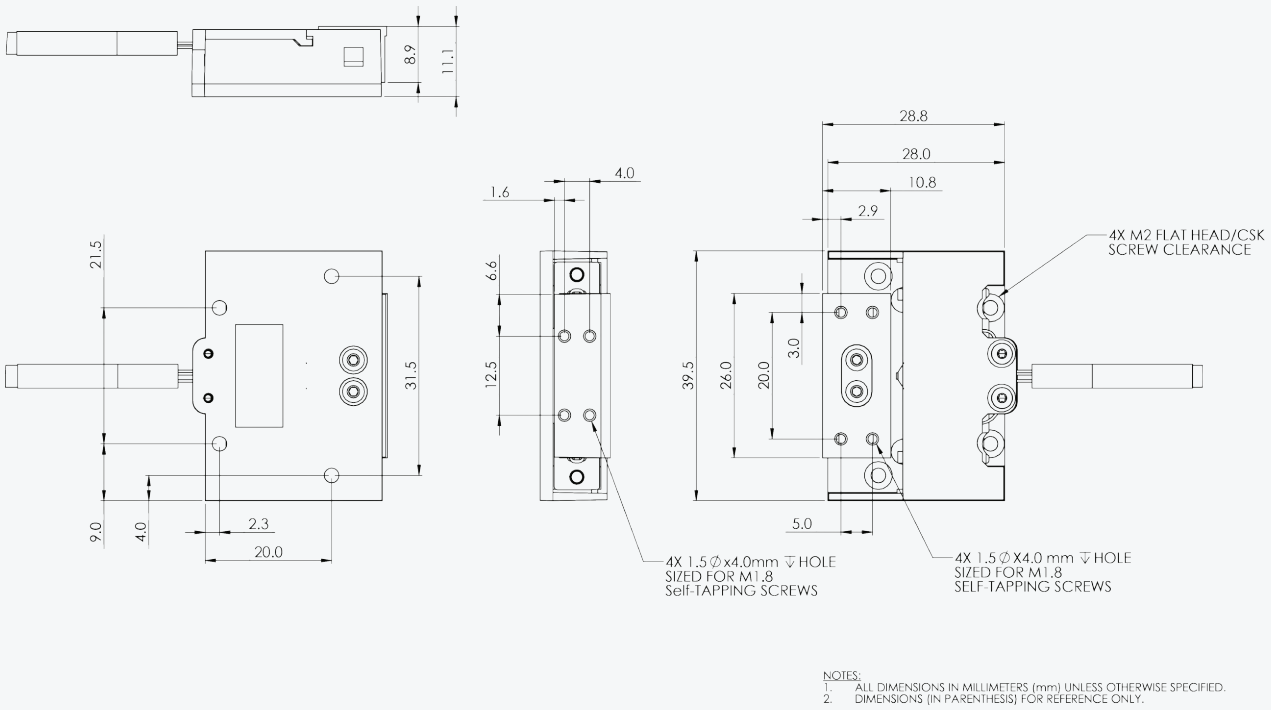
Model	Part Number	Kit Number	Evaluation Kit Description
LRMO-LG	LRMO-P011-0470-1000	LRMO-P011-0471-1000	Includes Motor without encoder, Electronic Driver PCB, Plastic Enclosure 110/240 VAC to 12 V DC Power Adapter, Cables.
LRMO-E-LG	LRMO-P011-1470-1000	LRMO-P011-1471-1000	Includes Motor with encoder, Electronic Driver PCB, Plastic Enclosure 110/240 VAC to 12 V DC Power Adapter, Cables.

For custom inquires, contact us at info@piezomotors.com

Mechanical Drawings

LRMO-LG Series

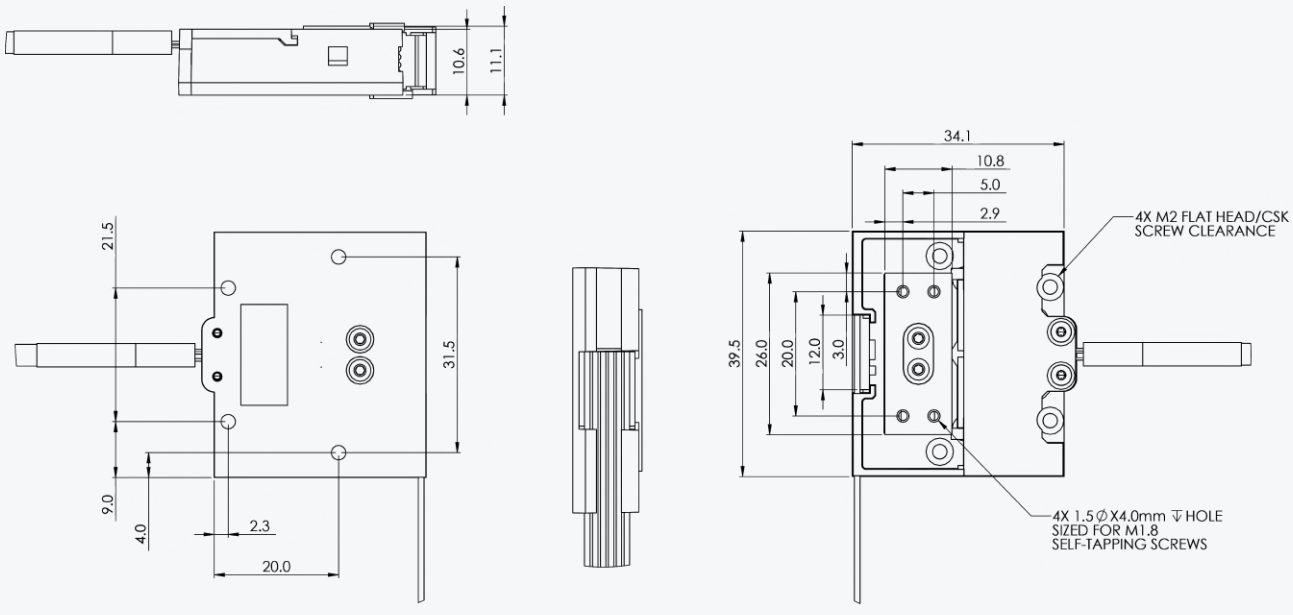
Standard and Encoder Models | All Dimensions in mm



NOTES:
1. ALL DIMENSIONS IN MILLIMETERS (mm) UNLESS OTHERWISE SPECIFIED.
2. DIMENSIONS (IN PARENTHESIS) FOR REFERENCE ONLY.

STANDARD MODEL

Dimensions in mm



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ENCODER MODEL

Dimensions in mm

Why Piezo Motors?

LRMO Series vs. Conventional Motor Technologies

TECHNOLOGY COMPARISON

Feature	LRMO-LG Series	DC Motor	Stepper Motor	Voice Coil
Zero holding power	✓ Zero current	— Continuous draw	— Current in hold	— Current in hold
Self-braking force	✓ ≥ 4.0 N	— None	— Detent only	— None
Non-magnetic*	✓ Yes	— No	— No	✓ Yes
Sub-30 µs response	✓ ~30 µs	■ ~ms range	■ Step limited	✓ Fast
Step resolution	✓ Excellent	■ Good	■ Moderate	— Low
Silent operation	✓ Yes	■ Brushless: yes	■ Acoustic noise	✓ Yes
Step resolution	✓ 50 nm	■ Encoder limited	■ Step limited	■ Sensor limited
Gearbox required	✓ No	■ Often yes	✓ No	✓ No
Voltage	✓ 12.0 V	■ Varies	■ Varies	■ Varies

***Contact PMC for details**

ABOUT PIEZO MOTOR COMPANY

Founded in 2024, Piezo Motor Company is at the forefront of innovation in the design and manufacturing of piezoelectric motors. Headquartered in the USA, we have a global reach through a network of international distributors, delivering cutting-edge technology to clients worldwide.

Our team comprises highly skilled experts with extensive experience in piezoelectric motor and actuator design and physics. We are passionate about harnessing the unique properties of piezoelectric materials to create motors that offer unmatched precision, efficiency, and reliability. Our solutions are tailored to meet the diverse needs of industries ranging from medical devices to aerospace and robotics.

We pride ourselves on our commitment to excellence and innovation, continuously pushing the boundaries of what piezoelectric technology can achieve. Our dedication to research and development ensures that we remain leaders in this dynamic field, providing our clients with the most advanced and effective solutions available. Join us on our journey as we revolutionize the world of motion control with piezoelectric technology.

CONTACT US: Order an evaluation kit or contact our engineering team to discuss your application.

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Applications

The LRMO series is engineered for demanding OEM applications where precision, compactness, and energy efficiency are critical. The hollow shaft, zero holding-power consumption, and sub-30 µs response time open up design possibilities that are not achievable with conventional electromagnetic motors.

PHOTONICS & FIBER OPTICS
Polarisation control, variable attenuators, wave-length-selective switches.

MICROSCOPY & IMAGING
Objective turrets, polarisation rotators, confocal beam scanners.

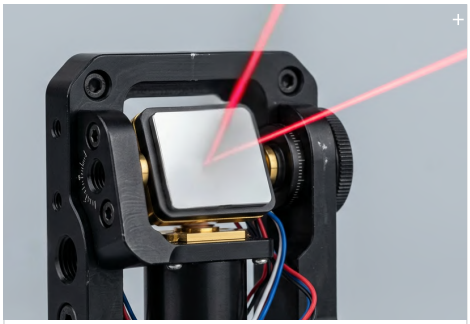
MEDICAL & DIAGNOSTIC
OCT scanners, surgical robotics, drug delivery micro-pumps

SCIENTIFIC INSTRUMENTATION
Cryogenic stages, vacuum-compatible mecha-nisms, spectroscopy platforms.

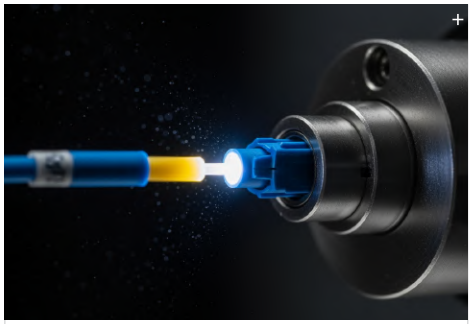
ROBOTICS & AUTOMATION
Pick-and-place, collaborative robot joints, gripper mechanisms.

AEROSPACE & DEFENCE
Antenna pointing, gimbal drives, electro-optical payloads.

OPTICAL FILTER WHEELS
Fast, silent filter changes in microscopy and spectroscopy.

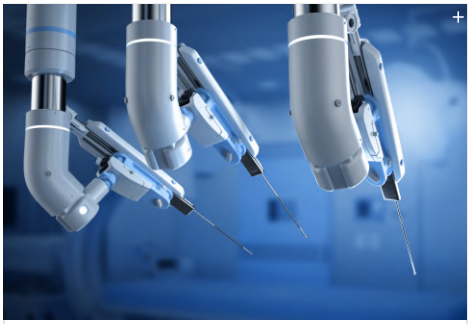


BEAM STEERING
Precision angular adjustment of optical paths and mirrors.

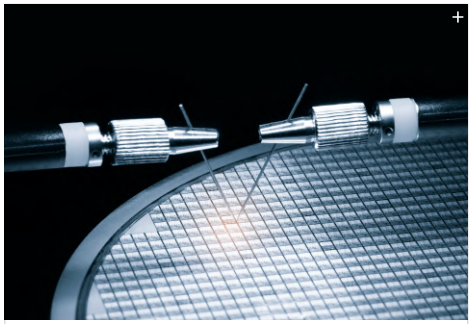


FIBRE ALIGNMENT
Sub-µrad alignment of fibre optic components.

MICRO ROBOTICS
Compact direct-drive joints and end-effectors.



MEDICAL DEVICES
Drug delivery, lab-on-chip, and surgical robotics.



SEMICONDUCTOR
Wafer handling and mask alignment systems.

+ = Stock Image