

- Direct drive backlash free
- Nanometer resolution
- No power draw in hold position
- Quick response
- Heavy loads

The LTC450 motor is intended for high force and precision applications. This includes applications in vacuum for the semiconductor industry. The advantage of using the Piezo LEGS technology is the very precise positioning resolution, as well as automatic locking giving true setand-forget performance. The technology is based on direct drive without any backlash.

The Piezo LEGS technology is characterized by its outstanding precision. Quick response time, as well as long service life are other benefits. In combination with the nanometer or even sub-nanometer resolution the technology is quite unique.

Operating modes

The motor can move in full steps (waveform-steps), or partial steps (microsteps) giving positioning resolution in the nanometer range. Speed is adjustable from single microsteps per second up to max specified.

Controlling the motor

PiezoMotor offers a range of drivers and controllers. The more advanced alternatives are the microstep drivers/ controllers in the 100- and 200-series. These products allow for closed loop control and precise positioning. The microstepping feature divides the wfm-step into thousands of small increments which results in microsteps in the nanometer range. The PMD units are straight forward to use, supports quadrature and serial sensors, and have multiple I/O ports.





PMD101

PMD206

Design your own driver

Some customers prefer to design their own driver for ease of integration. In this case PiezoMotor can provide information to assist in the design.

Ordering information				
Motor				
LTC45011-020	Standard			
Drivers and Controllers				
PMD101	1-axis microstepping driver			
PMD206	6-axis microstepping driver			
PMD236	36-axis microstepping driver			
Linear Encoders				
See senarerate data sheet				

See separerate data sheet

Operating Principle

The Piezo LEGS walking principle is of the non-resonant type, i.e. the position of the drive legs is known at any given moment. This assures very good control of the motion over the whole speed range.

The performance of a Piezo LEGS motor is different from that of a DC or stepper motor in several aspects. A Piezo LEGS motor is friction based, meaning the motion is transferred through contact friction between the drive leg and the drive rod. You cannot rely on each step being equal to the next. This is especially true if the motor is operated under varying loads, as shown in the diagram below. For each waveform cycle the Piezo LEGS motor will take one full step, referred to as one *wfm-step* (~6.5 µm at no load). In the schematic illustrations to the right, you can see one step being completed. The velocity of the drive rod is wfm-step length multiplied with waveform frequency (6.5 µm x 50 Hz = 0.3 mm/s).

Microstepping is achieved by dividing the *wfm-step* into discrete points. The resolution will be a combination of the resolution of the D/A converter, the number of points in the waveform, and the load. Example: at 225 N load the wfm-step length is ~3.5 μ m, and with 8192 discrete points in the waveform the microstep resolution will be ~0.4 nm.









1 When all four legs are electrically activated they are elongated and bending. As we shall see below, alternate legs move as pairs. Arrows show the direction of motion of the tip of each leg.

2 The first pair of legs maintains contact with the rod and moves towards the right. The second pair retracts and their tips begin to move left.

3 The second pair of legs has now extended and repositioned in contact with the rod. Their tips begin moving right. The first pair retracts and their tips begin to move left.

4 The second pair of legs has moved right. The first pair begins to elongate and move up towards the rod.



Figure 1 Typical motor performance with rhombic waveform (Rhomb S) at 50 Hz drive frequency. Wfm-step length is the average distance the drive rod moves when the legs take one step (i.e. for one waveform cycle). Using other waveforms than rhombic will give a different curve. Dotted line is guaranteed minimum for these drive conditions.

Main Dimensions LTC45011-020 Standard version



Note: Refer to drawings for details.

Electrical Connector Type

Motor has a connectors of type LEMO FGG-1B305-CLAM31.



Pin Assignment				
Pin	Terminal	Cable Color		
1	Phase 1	Yellow		
2	Phase 2	Green		
3	Phase 3	White		
4	Phase 4	Grey		
5	Ground (GND)	Black or brown		

Technical Specification					
Туре	LTC45011-020 (standard version)	Unit	Note		
Maximum Stroke	20	mm			
Speed Range	0-0.3	mm/s	recommended, no load		
Step Length	0.001ª 4	μm	 microstep, 8192^a per wfm-step, no load wfm-step, no load 		
Resolution	< 1	nm			
Recommended Operating Range	0-225	Ν	for best microstepping performance and life time		
Stall Force	450	Ν			
Holding Force	> 450	Ν			
Maximum Voltage	48	V			
Connector	LEMO FGG-1B305-CLAM31				
Mechanical Size	98 x 50 x 50	mm	see drawing for details		
Material in Motor Housing	Stainless Steel				
Weight	1060	gram	approximate		
Operating Temperature	+10 to +70	٥C			

a. Driver dependent - given values for driver in PMD200-series.

Note: All specifications are subject to change without notice.

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