- **Nanometer resolution**
- **Closed loop control**
- **Open loop mode**
- **Servo mode**
- **Chained RS485 for multiaxis**

The PMD301 is a 1-axis controller/driver for use with Piezo LEGS motors from PiezoMotor. Units can be chained to form multi axis systems. For linear motors it provides resolution down to sub-nanometer range and millimeters per second speeds. PMD301 is the ideal choice for system designs where one or several Piezo LEGS motors are used.

Functional principle

The PMD301 controls the Piezo LEGS motor by feeding waveform signals which elongate and bend each of the piezoelectric actuator legs within the motor. The waveforms are designed specifically to make the drive legs perform a precise walking motion. The motion of the drive legs is transferred via friction contact to a linear rod or a rotary disc.

For each waveform cycle the Piezo LEGS motor will take one full step, called a *waveform-step* (wfm-step). The wfm-step length is load dependant but typically a few micrometers for a linear Piezo LEGS motor, and less than one milliradian for a rotary motor.

The PMD301 gives a maximum resolution of 8192 microsteps per full wfm-step. One microstep equals ~0.5 nanometer (0.0005 μm) of linear motion, or ~0.1 microradian of angular motion.

Working with the PMD301

The PMD301 communicates with the host via 2-wire RS485 (115200n81) or USB virtual COM port. Communication with the controller is through ASCII commands, where a maximum of 127 units can be addressed over the same line.

The controller can operate closed loop (target mode) or open loop. Position sensors should be used to keep track of the precise position of the Piezo LEGS motors. The controller can read quadrature or serial encoder, analog sensor and limit switches. Acceleration and deceleration parameters are available in closed loop operation.

As an alternative, the PMD301 can be used like a servo amplifier together with an external motion controller. The external controller may control the speed via SPI or analog interface.

Ordering information	
Controller	
PMD301-01	1-axis microstep controller/driver for Piezo LEGS motors
Accessories	
105787-HK-ALL	Power supply 48V

150057-01

Technical Specification		
Type	**PMD301-01**	**Note**
Number of Axes	1	Units can be RS485-chained for multi-axis
Signal Voltage Range	0-45 V	
Resolution	8192 microsteps constitutes 1 wfm-step	example LT20 linear motor at no load: 1 microstep ≈ 0.0005 μm 1 wfm-step ≈ 5 μm
Maximum Stepping Rate	*Type of Motor* *Wfm-step Frequency [Hz]* LR80 2500* LL06 2500* LT20 2500* LT40 1500	Examples given for a few standard motors. Maximum number of wfm-steps per second [Hz] is based on power consumption at low duty cycle when motor is not heated. Controller makes measurement on motor during unpark and sets the maximum stepping rate.
Supported Sensors	Quadrature SSI BiSS Analog	- ABZ single ended, 15 MHz counting - 8/30/(32) bit, 130/750 kbps - 18/26/32 bit, 750 kbps - Analog ±10V (12 bit, 1 kHz)
Host Communication	Two-wire RS485 USB (virtual COM port)	Commands are sent in ASCII format, 115.2 kbps (n81)
Servo Control	SPI Analog	- Slave to external motion controller 16 bit (signed), max 15 Mbps - Analog interface ±10V (12 bit, 5 kHz)
General I/O	4 in 2 out	Depending on encoder type and use of limit switches
Motor Connector	5-pole, JST SM05B-SRSS-TB	Output motor phases and GND. Two connectors, parallel connection.
Sensor/Servo Connector	15-pole D-sub HD	Input for sensors or SPI servo interface
Power Connector	2-pole header, 2.54 mm, Molex 70543-0001	Input for 48V supply
Communication Connectors	3.5 mm audio jack USB mini type B	- Input for RS485 - Input for USB virtual COM port
Power Supply	48 VDC, 20 W	48 VDC ±5%
Dimensions	123 x 78 x 35 mm	

∗ Maximum frequency limited by controller to ensure good signal quality.

Note: *All specifications are subject to change without notice.*

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