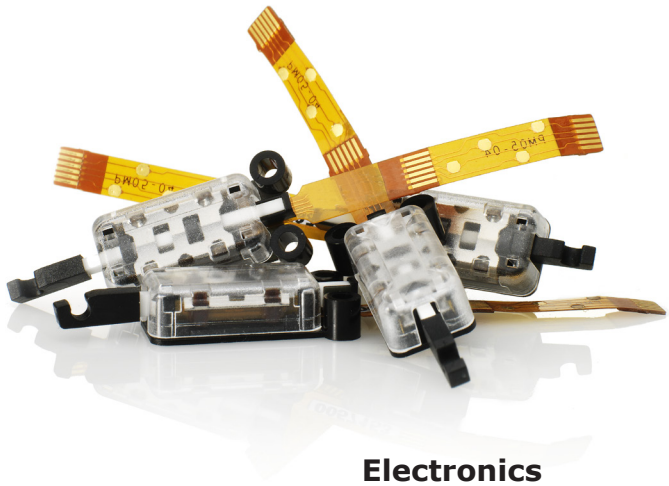


- **Small size**
- **High speed**
- **Very simple drive electronics**
- **Low power consumption**
- **Robust design**

PiezoWave is not only the smallest motor from PiezoMotor but also one of the smallest motors in the world. PiezoWave offers direct linear drive with variable speed in a very small package, ideal for precision applications where miniature size and low weight is important, such as portable devices. The design makes the motor very robust and insensitive to different environmental conditions as well as resistant to shock and vibrations. The motor has very low power consumption and operates on low voltage. The motor does not draw any power in hold position which further enhances battery life in many applications.

Integration

The PiezoWave motor comes as a complete motor ready to use and is easily implemented in many demanding applications. Two standard mechanical connectors are available – hook end and eye end.

Even though the PiezoWave motor performs a linear movement, the technology can easily be tailored to create a rotating motion. By simply replacing the drive rod with a rotating disc the advantages of the PiezoWave technology can be utilized for rotating dynamics. This is one example of how the mechanics around the PiezoWave elements can be modified to meet customer needs.

In some cases it is more suitable for the customer to integrate the core of the motor even closer into the design. The PiezoMotor design team can help with customer specific adaptations of the PiezoWave technology.

Electronics

The drive electronics to run the motor can be kept very simple. You need two phases A and B in addition to ground for driving the motor. The most straightforward way of driving the motor is to send a pulse train via an inductor to the piezo element phase electrodes. Since the piezo elements are capacitive this creates an LC circuit with a sinusoidal voltage across the piezo element. The direction of motion is determined by altering the phase shift between the phase signals A and B.

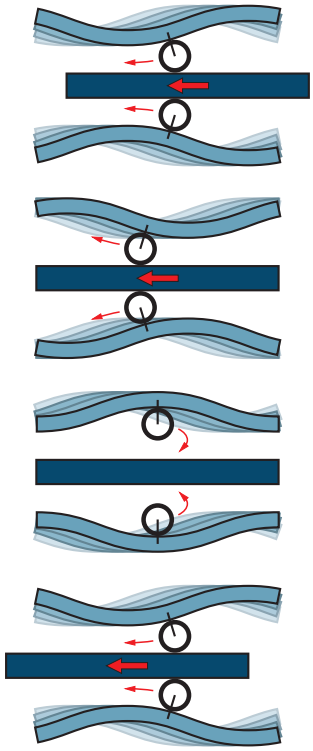
Compared with conventional electromagnetic motors, the PiezoWave motor has the great advantage of not consuming energy while holding position. The PiezoWave motor only consumes energy while moving. The overall energy consumption is kept low by using resonant drive electronics. To get you started PiezoMotor provides one handheld driver as well as a small resonant driver board. These are also suitable for prototyping.

Ordering information	
Motor	
WL0104A-08A	Hook end
WL0104A-08B	Eye end
Drivers and Controllers	
PMWD20	Handheld push button driver
PMWD10	Wave driver board
Accessories	
	RS232 interface board for PMWD20

Operating modes

The PiezoWave motor consists of very small piezo ceramic elements that are surface assembled on a flexible printed circuit board. The design is optimized for mass volume manufacturing. The piezo element can electrically be considered consist of two halves where each halves can be controlled separately. Two 90° phase-shifted sinusoidal signals are applied to the A and B phase electrodes. An applied voltage will introduce a strain in the piezo ceramic material in-between the electrodes. By alternating the voltage at a high frequency the element can be brought into resonance. The phase relationship between the two phase signals will determine the movement direction of the drive rod.

The PiezoWave motor is friction based, meaning the motion is transferred by contact friction between drive pads and drive rod. For each time the drive pads nudge the drive rod there is a small movement – the average step length is about 1 µm. The drive frequency is close to 100 kHz making the drive rod move very fast at full speed. Because the PiezoWave holding force is transferred by friction, there is no need to keep the motor electrically activated in order to hold its position. Should the drive rod be subjected to a large impact force, the drive rod will slide and the motor will not be damaged. Consequently, the PiezoWave motor is very durable.



1 *The motor consists of two piezo elements, each with a drive pad attached. When activated, the piezo elements and the drive pads move, which in turn cause the drive rod (the dark blue part with a red arrow) to move.*

2 *When the first motion cycle is complete, the drive pads have moved as far to the left as possible.*

3 *The drive pads are then lifted from the drive rod surface to allow the piezo elements to reposition.*

4 *Recommencing the motion, the motor can continue pushing the drive rod to the left.*

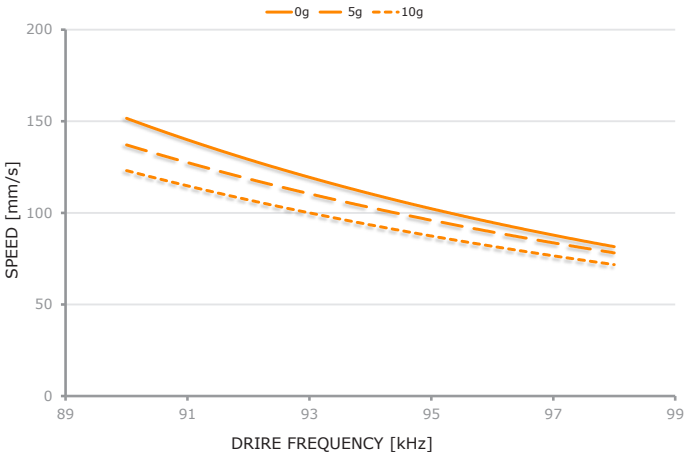


Figure 1 *Typical speed with different loads @ 8V, 23ºC.*

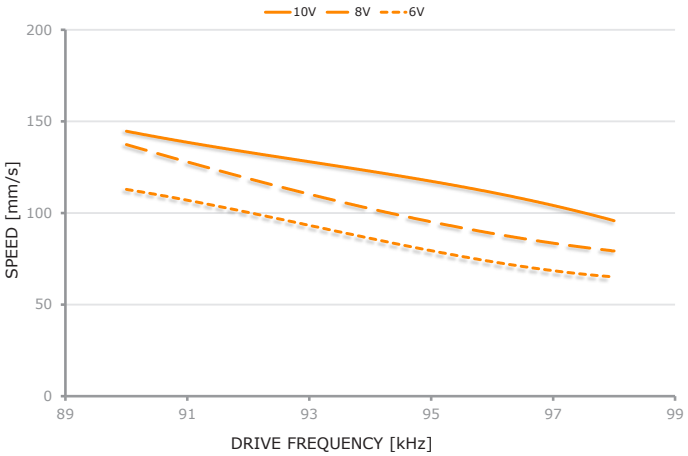
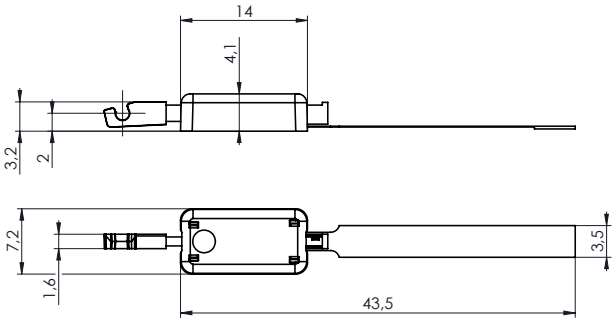


Figure 2 *Typical speed with different phase voltage U_{p-p} @ 5g load, 23ºC.*

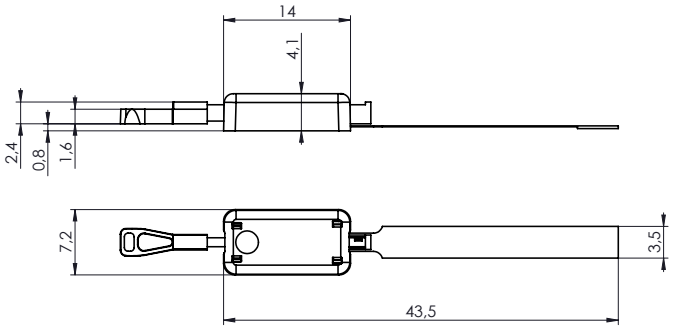
Main Dimensions WL0104A-08A

Hook end



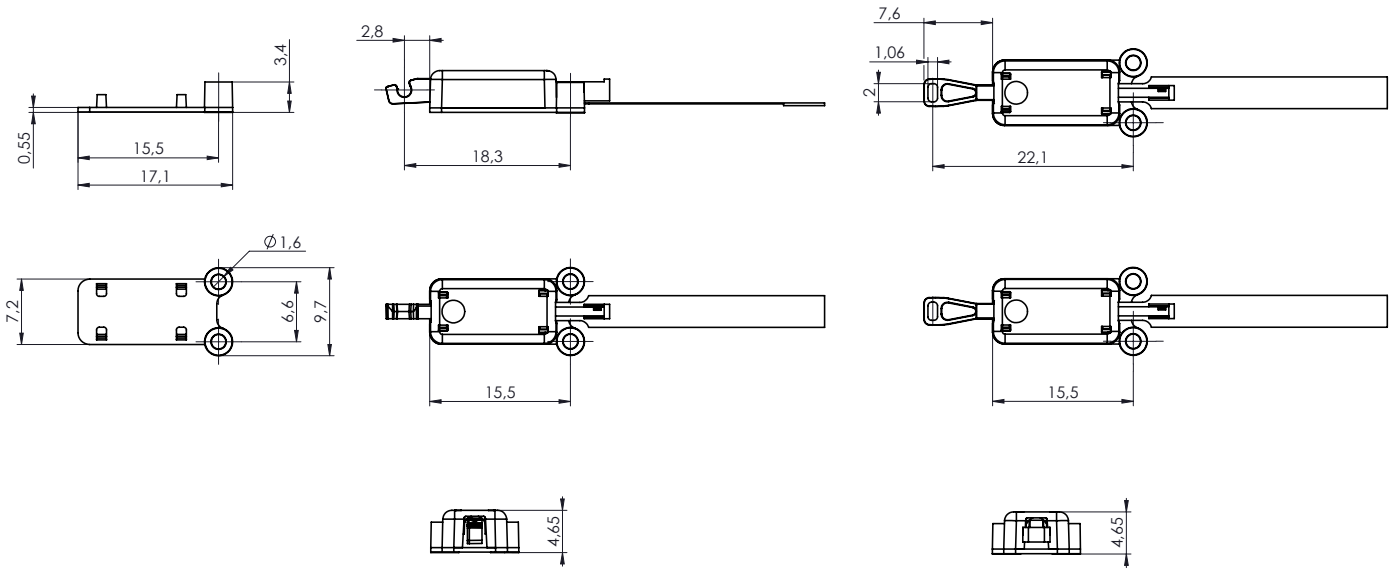
Main Dimensions WL0104A-08B

Eye end



Additional Dimensions with Fastening Plate

Hook and Eye end - drive rod in end position



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Technical Specification					
Type	**Min**	**Typical**	**Max**	**Unit**	**Note**
Phase Voltage	6	8	10	V	
Drive Frequency	91	92	93	kHz	
Power Consumtion		0.3		W	Using PMWD10 with 3.3 V supply voltage
Rated min Speed	50	115	150	mm/s	8 V phase voltage, 0.1 N load
Rated max Load	0.1			N	8 V phase voltage, 0.1 N load
Stall Force	0.1	0.3	0.5	N	8 V phase voltage, 0.1 N load
Holding Force	0.2	0.4	0.7	N	
Capacitance/phase		100		nF	
Connector	FFC/FPC-connector (ZIF, LIF) 6 contacts, 0.5 mm pitch				
Stroke		8		mm	
Mechanical Size	14 x 7.2 x 4.4			mm	
Material in Housing	Plastic				
Weight	0.7			gram	
Lifetime	400,000*	4,500,000**		full cycles	** MTTF, * T10
Operating Temp.	−10		+50	°C	

Contact Assignment	
Contact	**Terminal**
1	Not assigned
2	VCC
3	GND
4	Phase A
5	Phase B
6	Not assigned

Note: All specifications are subject to change without notice.

Visit our website for application examples, videos and more...

www.piezomotor.com

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