

# Product Data Sheet

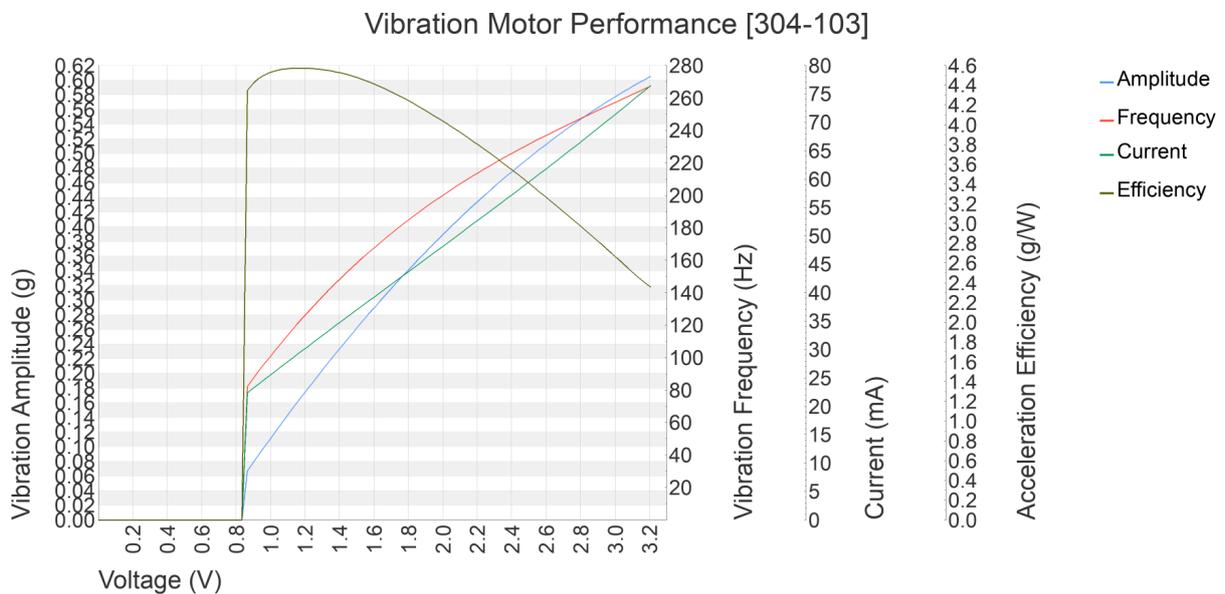
Range: Pico Vibe  
 Title: 4mm Vibration Motor  
 Type: Undefined  
 Model: 304-103

4mm Vibration Motor  
 6mm Type  
 Shown on 6mm Isometric Grid



KEY FEATURES	
Body Diameter	4.4 mm [+/- 0.2]
Body Length	6 mm [+/- 0.2]
Ecc. Weight Radius	1.7 mm [+/- 0.1]
Ecc. Weight Length	2.8 mm [+/- 0.1]
Shaft Orientation	Inline
Rated Operating Voltage	2.7 V
Rated Vibration Speed	14,000 rpm [+/- 3,000]
Typical Rated Operating Current	65 mA
Typical Norm. Amplitude	0.5 G

## TYPICAL DC MOTOR PERFORMANCE CHARACTERISTICS



## ORDERING INFORMATION

The model number fully defines the model, variant and additional features of the product. Please quote this number when ordering. For stocked types, testing and evaluation samples can be ordered directly through our online store.

**FIND OUT HOW THIS PART COULD MEET YOUR SPECIFICATIONS**

Email: [enquiries@precisionmicrodrives.com](mailto:enquiries@precisionmicrodrives.com)  
 Call: +44 (0) 1932 252482

# Looking for the perfect design? We can help.



Precision Microdrives is an ISO 9001:2015 trusted designer and manufacturer of miniature, cost-effective, and well engineered motors and mechanisms. We are specialists in,

- [Trusted precision motor design](#)
- [Flexible motor & mechanism manufacturing](#)
- [Dependable quality control & after-sales support](#)
- [Industry leading motor testing and validation](#)

Our UK based motor design engineers, will support you through the complex process of specifying, developing, validating, and mass manufacturing, a custom motor or mechanism. The result? A part perfect for your application.

Delivered, On-Time & To Spec.

## SPEAK TO OUR DESIGN ENGINEERS TODAY

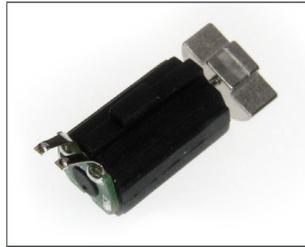
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### DESIGN FOR APPLICATION CASE STUDIES



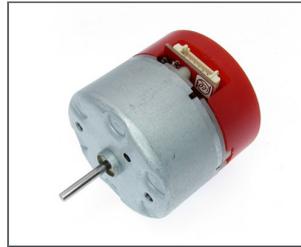
#### ENCAPSULATED VIBRATION MOTOR FOR A CPR TRAINING DUMMY

- Low volume, high value manufacturing
- Custom CNC machined enclosure
- Optimised haptic performance
- Custom PCB including EMI filters
- Part no. 334-401.001



#### VIBRATION MOTOR HIGHLY OPTIMISED FOR RUGGEDISED FIRE AND POLICE EMERGENCY RADIOS

- High volume production
- Optimised for emergency services application
- Ruggedised design with custom rubber 'suspension' cover
- Custom PCB with spring legs for simplified production assembly times
- Part no. 308-104.001



#### PRECISION SPEED AND TORQUE CONTROLLED SERVO WITH INTEGRATED TUNABLE PID LOOP FOR SINGLE-USE SCIENTIFIC INSTRUMENT.

- Medium volume, high value assembly
- Proprietary PID controller converts cost-effective motor design into a precision servo
- Adapted control software including digital IO (to customer's specification)
- Part no. 132-100.001



#### CUSTOMISED PRECISION GEAR MOTOR WITH ROBUST OPTICAL ENCODER

- High volume production
- Application specific output shaft
- Tailored motor performance curves
- Rear motor shaft with noise resistant optical encoder
- Part no. 212-116.001

**PHYSICAL SPECIFICATION**

PARAMETER	CONDITIONS	SPECIFICATION
Body Diameter	Max body diameter or max face dimension where non-circular	4.4 mm [+/- 0.2]
Body Length	Excl. shafts, leads and terminals	6 mm [+/- 0.2]
Unit Weight		0.6 g
Mounting	See drawing for details	PCB SMD Reflow
No. of Output Shafts		1
Ecc. Weight Radius	Radius from shaft for non-cylindrical weights	1.7 mm [+/- 0.1]
Ecc. Weight Length		2.8 mm [+/- 0.1]
Shaft Orientation		Inline

**CONSTRUCTION SPECIFICATION**

PARAMETER	CONDITIONS	SPECIFICATION
Motor Construction		Iron Core
Commutation		Precious Metal Brush
No. of Poles		3
Bearing Type		Sintered Bronze

**OPERATIONAL SPECIFICATION**

PARAMETER	CONDITIONS	SPECIFICATION
Rated Operating Voltage		2.7 V
Max. Start Voltage	With the inertial test load	1.8 V
Rated Vibration Speed	At rated voltage using the inertial test load	14,000 rpm [+/- 3,000]
Max. Rated Operating Current	At rated voltage using the inertial test load	75 mA
Max. Operating Voltage		3.2 V
Rated Inertial Test Load	Mass of standard test sled	100 g
Min. Insulation Resistance	At 50V DC between motor terminal and case	1 MOhm
Min. Vibration Amplitude	Peak-to-peak value at rated voltage using the inertial test load	0.35 G
Max. Start Current	At rated voltage	100 mA

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**Important:** The characteristics of the motor is the typical operating parameters of the product. The data herein offers design guidance information only and supplied batches are validated for conformity against the specifications on the previous page.

## TYPICAL PERFORMANCE CHARACTERISTICS

PARAMETER	CONDITIONS	SPECIFICATION
Typical Rated Load Power Consumption	At rated voltage and load	176 mW
Typical Rated Operating Current	At rated voltage using the inertial test load	65 mA
Typical Vibration Amplitude	Peak-to-peak value at rated voltage using the inertial test load	0.5 G
Typical Start Current	At rated voltage	85 mA
Typical Start Voltage	With the inertial test load	1 V
Typical Vibration Efficiency	At rated voltage using the inertial test load	2.8 G/W
Typical Norm. Amplitude	Peak-to-peak vibration amplitude normalised by the inertial test load at rated voltage	0.5 G
Typical Terminal Resistance		34 Ohm
Typical Terminal Inductance		600 uH

## TYPICAL HAPTIC CHARACTERISTICS

PARAMETER	CONDITIONS	SPECIFICATION
Typical Lag Time	At rated voltage using the inertial test load	27 ms
Typical Rise Time	At rated voltage using the inertial test load	39 ms
Typical Stop Time	At rated voltage using the inertial test load	30 ms
Typical Active Brake Time	Time taken from steady-state to 0.04 G under inverse polarity at max. voltage	18 ms

## TYPICAL DURABILITY CHARACTERISTICS

PARAMETER	CONDITIONS	SPECIFICATION
Typical Min. Counterweight Pullout		50 N

## ENVIRONMENTAL CHARACTERISTICS

PARAMETER	CONDITIONS	SPECIFICATION
Max. Operating Temp.		70 Deg.C
Min. Operating Temp.		-20 Deg.C
Max. Storage & Transportation Temp.		85 Deg.C
Min. Storage & Transportation Temp.		-40 Deg.C

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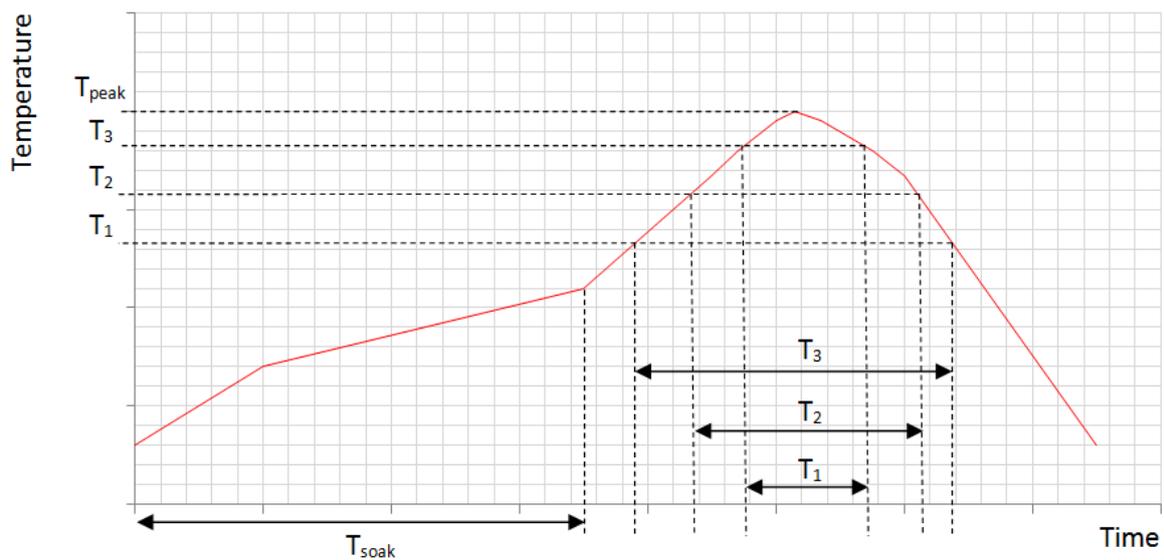
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## TYPICAL PACKING CONDITIONS

PARAMETER	CONDITIONS	SPECIFICATION
Carton Type		Reel (Ø33cm)

## REFLOW TEMPERATURE PROFILE

PARAMETER	REFERENCE	SPECIFICATION
Average Temp. Gradient in Preheating		2.5 Deg.C/s
Soak Time	T <sub>soak</sub>	2-3 mins
Max. Time above 217 Deg.C	T <sub>1</sub>	60 s
Max. Time above 230 Deg.C	T <sub>2</sub>	50 s
Max. Time above 245 Deg.C	T <sub>3</sub>	10 s
Peak Temp in Reflow	T <sub>peak</sub>	250 Deg.C [+5.0/-0.0]
Max. Temp. Gradient in Cooling		-5 Deg.C/s



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## Reliability Analysis

This section presents information regarding the longevity test performed on the motor. The Mean Time to Failure reported in this page should not be interpreted as a guaranteed lifetime. Please check our Application Notes for further information.

Our longevity test consists of powering the motors at their rated voltage for 2 seconds, then turning them off for 2 seconds. This cycle is repeated over the total test time.

The test is performed by our custom longevity machine which drives the motors and collects performance data. The test parameters and results can be seen below.



## Test Parameters

- Motors tested: 36
- Test time: 720 hours
- Cycle period: 4 seconds
- Duty cycle: 50%
- Test voltage: 3 V
- Temperature: 25 °C

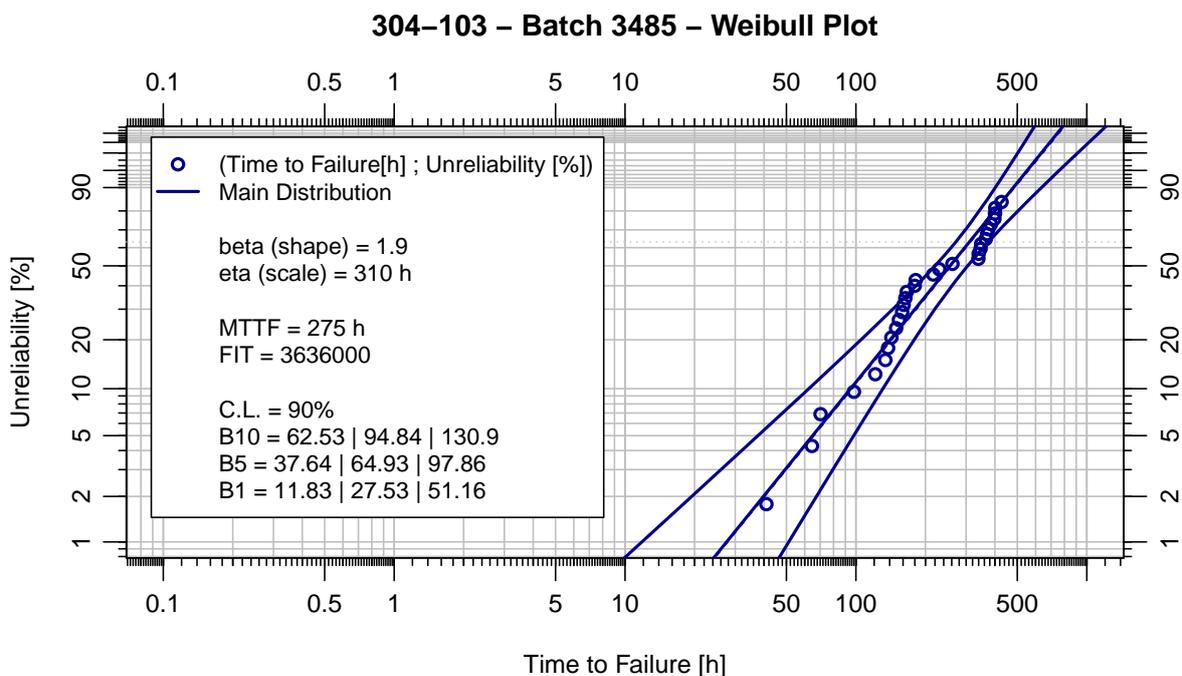
Formulas to derive the key reliability figures from a Weibull distribution:

$$MTTF = \eta * \Gamma\left(1 + \frac{1}{\beta}\right)$$

$$FIT = 10^9 / MTTF$$

## Test Result

The results for the longevity test are presented in a Weibull plot. From the fitting distribution it is possible to obtain an estimate of the Mean Time to Failure.



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## HOW TO ORDER

Call or email us with your order requirements at:

Email: **enquiries@precisionmicrodrives.com**

Phone: **+44 (0) 1932 252482**

Please quote the full part number when ordering or making an enquiry. Some products can be ordered in smaller volumes directly from our website: **www.precisionmicrodrives.com**

## DATASHEET REVISION AND VERSION NUMBERING

We aim to provide our customer with the most detailed product information available. Sometimes changes are necessary, and these will be controlled by our engineering change request and notification process. To track datasheet versions we use both a 'production revision number' and a 'document version number'. These can be found at the bottom of every page. In some cases, such as documentation errors, the document version number can increase without triggering a product revision.

## LIFE SUPPORT AND MISSION CRITICAL APPLICATION POLICY

PRECISION MICRODRIVES PRODUCTS ARE NOT AUTHORISED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR OTHER CRITICAL APPLICATION SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF PRECISION MICRODRIVES LIMITED.

As used herein:

1. Life support devices or systems are devices or systems which,
  - 1.1. are intended for surgical implant into the body, or
  - 1.2. support or sustain life, and whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user or a third party.
2. A critical component is any component of a life support device or any other system or machine whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

## BATCH NUMBERING, MANUFACTURING, TRACEABILITY AND LABELLING

Every part manufactured by Precision Microdrives is at minimum identified and traced via a batch number. Where physically practical, we try to make each part with a batch number. In addition, some parts carry a lot code or barcode serial numbers. If traceability is a core requirement for your purchase, let us know and we'll outline the production options for you.

## STANDARD QUALITY CONTROLS AND ISO 9001

Precision quality control is one of our 3 key competitive advantages. All motors that we produce undergo 100% line inspection followed by strict and detailed batch sample testing in accordance with ISO 2859. All of the processes operated at Precision Microdrives are managed within our ISO 9001 quality system.



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