

**PERFORMANCE SPECIFICATION
ACCELEROMETER
(MODEL 72-XXX-YY)**

Document Number	Rev	Date	Entered by	Description of Change	Change Accountable Engineer	ECO
74724	NR	5/3/21	NAD	Initial Release	JKN	51661

1.0 DESCRIPTION

The ENDEVCO® Model 72 series are low mass accelerometers suitable for SMT mounting. The accelerometer is intended to be used in a wide range of acceleration, vibration, and shock applications. The Model 72 features minimal mass loading, broad frequency response, minimum zero shift following a shock event and a Class 3 Rating (>4000 V – Human Body Model) for ESD Protection. For high g applications, the strength of the solder joints is not sufficient to withstand high forces, so the Model 72 must be epoxied (underfilled) to the PCB, or hard potted.

The Model 72 uses a unique micro-machined, piezoresistive sensor with light gas damping to attenuate resonant amplitudes, and mechanical stops to reduce breakage under overload conditions. The monolithic sensor incorporates the latest MEMS technology for ruggedness, stability and reliability. The accelerometer features a four-active arm bridge circuit. With a frequency response extending down to dc (steady state acceleration) and a minimum post shock zero shift, this accelerometer is ideal for measuring long duration shocks.

U.S. Patent 6,988,412 applies to this unit.

2.0 CERTIFIED PERFORMANCE

All specifications assume +75°F (+24°C) and 5 Vdc excitation unless otherwise stated. The following parameters are 100% tested. Calibration data, traceable to the National Institute of Standards and Technology (NIST), are supplied.

	<u>Units</u>	<u>-2K</u>	<u>-20K</u>	<u>-60K</u>
2.1 RANGE	g	±2000	±20000	±60000
2.2 SENSITIVITY (Calibration is performed at 1,000g for -2K, and 5,000g for -20K and -60K)				
Minimum/Typical/Maximum at 5 Vdc	μV/g	75.0/150.0/300.0	4.0/8.0/12.0	1.25/2.5/3.75
Minimum/Typical/Maximum	μV/V/g	15.0/30.0/60.0	0.8/1.6/2.4	0.25/0.50/0.75

A specification of μV/V provides a parameter specification that is independent of excitation voltage. Calculate the specification at any excitation voltage by multiplying the value by the excitation voltage. This applies to any parameter with a “unit”/V specification.

Example: 1.7 μV/V/g is the same as 1.7 x 10 = 17.0 μV/g at 10 Vdc excitation.

2.3	ZERO MEASURAND OUTPUT, maximum		mV/V	± 20		
		<u>Units</u>		<u>-2K</u>	<u>-20K</u>	<u>-60K</u>
2.4	RESISTANCE					
	Input	Ω		6500±2000	6500±2500	6500±2500
	Output	Ω		6500±2000	6500±2500	6500±2500

Resistance is measured at approximately 1 ma. Bridge resistance increases with applied voltage due to heat dissipation in the strain gage elements.

3.0 TYPICAL PERFORMANCE CHARACTERISTICS

The following parameters are established from testing of sample units and are not 100% tested:

3.1	NATURAL FREQUENCY	kHz	25	100	130
3.2	ZERO SHIFT				
	After Full Range Shock (Typ/Max)	μV/V	6/120	3/40	9/40
	After 4X Range Shock (Typ/Max)	μV/V	120/600	60/300	150/200
3.3	OVERRANGE LIMIT without damage	g	±10000	±80000	±240000

The overrange limit is a design safety margin; operating the unit above its rated range is not recommended.

See additional notes in paragraph 6.2.

3.4	FREQUENCY RESPONSE ± 1dB	kHz	dc to 10kHz	dc to 10kHz	dc to 20kHz
3.5	NON-LINEARITY & HYSTERESIS to full range	% F.S.O		3	
3.6	TRANSVERSE SENSITIVITY	%		3	

This specification is based on analysis. In actual installation, the flatness of the mounting surface as well as the thickness of the solder joints can affect the magnitude of this error.

3.7	DAMPING (over operating temp. range)	of critical	0.5	0.05	0.05
3.8	THERMAL ZERO SHIFT over operating temperature range	%FSO/°C %FSO/°F		0.06 0.033	

For short duration tests, auto zeroing prior to test is recommended to eliminate this error. For extended duration testing, it is possible to record the temperature and correct the acceleration data in post-processing.

3.9	THERMAL SENSITIVITY SHIFT over operating temperature range	%/°C %/°F		- 0.2 - 0.11	
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3.10	WARM-UP DRIFT (typical / maximum) From 1.0 sec to 2 min after turn-on Over operating temperature range	mV/V	0.01 / 0.5		
3.11	MOUNTING STRAIN SENSITIVITY	<u>Units</u> equiv. g	<u>-2K</u> 1	<u>-20K</u> 1	<u>-60K</u> 3
	Tested at 250 microstrain per ISA 37.2, paragraph 6.5.				
3.12	MECHANICAL OVERTRAVEL STOPS	g	2x range minimum		
4.0	<u>ELECTRICAL</u>				
4.1	EXCITATION VOLTAGE	Vdc	5.0		
	MAX. EXCITATION VOLTAGE WITHOUT DAMAGE	Vdc	15.0		
	For maximum accuracy, calibration data for sensitivity should be taken at the same excitation voltage as is used in service, e.g. the sensitivity of the unit at 5.0 Vdc is not exactly ½ of the sensitivity at 10.0 Vdc due to self heating of the gages. The excitation voltage to be used in the application should be specified at time of order. [1]				
4.2	NOISE maximum (dc to 10 kHz)	μV _{RMS}	10		
5.0	<u>PHYSICAL</u>				
5.1	CASE, LCC (Leadless Chip Carrier) with .002 inch bumps to facilitate epoxy underfill.				
	CASE, MATERIAL	Alumina (ceramic)			
	LID, MATERIAL	Kovar with nickel plating			
	PADS, SOLDER	Tungsten with ENIG plating			
	All materials in unit are compatible with normal SMT temperature profiles.				
5.2	WEIGHT	grams	0.16		
5.3	ELECTRICAL CONNECTIONS	Four Au-plated solder pads			
5.4	IDENTIFICATION	Model number and serial number engraved on top of unit; see drawing 74725 for Pin 1 identification.			
5.5	MOUNTING	Unit is compatible with normal SMT temperature Profiles with peak temperatures up to 250°C. Epoxy underfill is required, as the strength of the solder joints is not sufficient to withstand high acceleration shocks.			
6.0	<u>ENVIRONMENTAL</u>				
6.1	TEMPERATURE				
	Operating	- 54°C to + 71°C (- 65°F to + 160°F)			
	Storage	- 65°C to + 121°C (- 85°F to + 250°			

6.2 ACCELERATION LIMITS (any direction)

Random Vibration

Meets MIL-STD-202 w/ power spectral density 0.04 g²/Hz from 80 to 350 Hz, ramping up from 20 to 80 Hz at +3dB/ octave and down from 350 to 2000 Hz at -dB/octave.

Shock

Minimum haversine shock pulse duration

O/T 4X the rated range

O/T 5X the natural period

Example: The 72-20K has a typical natural frequency of 100 kHz and a natural period of 1/100 kHz, or 10µs. The minimum haversine shock pulse duration will be 5 X 10 µs, or 50 µs.

6.3 HUMIDITY

Package sealed to <10X⁻³ atm-cc/sec.

6.4 ALTITUDE

Unaffected.

6.5 ESD SENSITIVITY

Class 3B (> 8000 V) per Section 5.2 of MIL-STD-1686C.

7.0 **CALIBRATION DATA**

Data for range, sensitivity, ZMO, input resistance and output resistance are supplied on the Calibration Certificate. Calibration will be performed at the excitation voltage provided by the customer at the time of order (see Paragraph 8.0 for ordering information). Optional calibrations are available for any other parameters at an added cost.

8.0 **OPTIONAL ACCESSORIES/COMPATIBLE PRODUCTS**

Model 136

DC Differential Voltage Amplifier

9.0 **Notes**

[1] Model Number Definition:

