# PERFORMANCE SPECIFICATION
# ACCELEROMETER
# (74-XXX-YY)

| Document Number | Rev | Date | Entered by | Description of Change | Change Accountable Engineer | ECO |
|---|---|---|---|---|---|---|
| 76330 | A | 4/18/22 | NAD | Various Updates to Performance Specification | JKN | 54011 |

## 1.0 DESCRIPTION

The ENDEVCO® Model 74 series is a family of rugged, lightly damped, piezoresistive triaxial accelerometers designed for high-acceleration shock measurements in three mutually perpendicular axes. This family uses three sensors that are packaged in a mutually orthogonal arrangement in a leadless chip carrier (LCC) package that supports mounting by surface mount technology (SMT) re-flow soldering (with epoxy underfill) or adhesive mounting (with hand soldering).

The Model 74 utilizes the same sensing element as the Model 72, 7280A and 7284 accelerometer families. Each axis uses a unique micro-machined, piezoresistive sensor with light gas damping to attenuate resonant amplitudes, and mechanical stops to reduce breakage under over load conditions. The Model 74 is available in 2,000 g, 20,000 g and 60,000 g full scale ranges, with all three axes having the same range. Selectable ranges per axis are available by special request.

U.S. patent number 6,988,412 applies to this unit.

## 2.0 CERTIFIED PERFORMANCE

All specifications assume +75°F (+24°C) and 5 volts excitation, unless otherwise specified.

| | | Units | -2K | -20K | -60K |
|---|---|---|---|---|---|
| 2.1 | RANGE | g | ±2000 | ±20000 | ±60000 |
| 2.2 | SENSITIVITY | | | | |
| | min / typ / max at 5 Vdc | μV/g | 75/150/300 | 4/8/12 | 1.25/2.5/3.75 |
| | min / typ / max | μV/V/g | 15/30/60 | 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.

| | | | |
|---|---|---|---|
| 2.3 | ZERO MEASURAND OUTPUT | | |
| | maximum at +75°F (+24°C) | mV/V | ±20 |
| 2.4 | RESISTANCE | | |
| | input | Ω | 2200 ± 700 |
| | output, each axis | Ω | 6500 ± 2000 |

Bridge resistance increases with applied voltage due to heat dissipation in the strain gage elements.

| | | Units | -2K | -20K | -60K |
|---|---|---|---|---|---|
| **3.0** | **TYPICAL PERFORMANCE CHARACTERISTICS** | | | | |
| | The following parameters are established from testing of sample units and are not 100% tested: | | | | |
| 3.1 | NATURAL FREQUENCY | | | | |
| | Typical | kHz | 30 | 100 | 130 |
| 3.2 | ZERO SHIFT AFTER FULL RANGE SHOCK | | | | |
| | After full range shock | µV/V | 6 | 20 | 20 |
| | After 3X range shock | µV/V | 120 | 60 | 60 |
| 3.3 | OVERRANGE LIMIT | g | 10,000 | 60,000 | 180,000 |
| | The overrange limit is a design safety margin; operating the unit above its rated range is not recommended. See note at paragraph 6.2 for additional overrange limitations. | | | | |
| 3.4 | FREQUENCY RESPONSE | | | | |
| | ± 1 dB | kHz | 10 | 10 | 20 |
| 3.5 | AMPLITUDE LINEARITY | | | | |
| | typical, to full range | % of reading | | ±5 | |
| 3.6 | TRANSVERSE SENSITIVITY | % | | 5 | |
| | In actual installation, the flatness of the mounting surface can affect the magnitude of this error. | | | | |
| 3.7 | DAMPING | of critical | 0.5 | 0.05 | 0.05 |
| 3.8 | THERMAL ZERO SHIFT | | | | |
| | Over operating temperature range | %FSO/°C<br>%FSO/°F | | 0.06<br>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<br>%/°F | | -0.2<br>-0.11 | |
| 3.10 | WARM-UP DRIFT (typ/max) | | | | |
| | 1.0 sec to 2 min after turn-on<br>over operating temperature range | mV/V | | 0.02/0.5 | |
| | Warm-up drift is very sensitive to heat sinking from the mounting surface. Typical specifications listed above are for a unit mounted to a solid metal surface per Paragraph 5.5. | | | | |
| 3.11 | MECHANICAL OVERTRAVEL STOPS | g | | 2X range minimum | |

## 4.0 ELECTRICAL

| | | | |
|---|---|---|---|
| 4.1 | EXCITATION VOLTAGE (default) | Vdc | 5.0 |
| | MAX. EXCITATION VOLTAGE WITHOUT DAMAGE | Vdc | 12.0 |

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 (see Paragraph 9.0).

| | | | |
|---|---|---|---|
| 4.2 | NOISE (max, dc to 10kHz) | µVrms | 10 |

## 5.0 PHYSICAL

5.1 CASE, LCC (Leadless Chip Carrier)

| | |
|---|---|
| CASE, MATERIAL | Alumina (ceramic) |
| LID, MATERIAL | Nickel plated Kovar |
| METALIZATION, MATERIAL | Gold over nickel plated Tungsten |

| | | |
|---|---|---|
| 5.2 | WEIGHT | 0.04 ounce (1.2 gram) |
| 5.3 | IDENTIFICATION | Model number and branding on cover. Serial number and measurement coordinate system marked on sides. |
| 5.4 | MOUNTING | SMT re-flow solder with epoxy underfill or adhesive mount on base and hand soldering |

Refer to Instruction Manual IM74-IM75 for a more detailed discussion on accelerometer mounting.

5.5 MOUNTING STRAIN SENSITIVITY (250 microstrain per ISA 37.2, paragraph 6.5)

| | | |
|---|---|---|
| typical/maximum | µV/V | 15/50 |

## 6.0 ENVIRONMENTAL

6.1 TEMPERATURE

| | |
|---|---|
| operating and storage | -67°F to +250°F (-55°C to +121°C) |

See notes at paragraph 6.2 for additional temperature limitations.

6.2 ACCELERATION LIMITS (any direction)

| | |
|---|---|
| maximum shock amplitude | 3X the lowest rated range present |
| minimum haversine shock duration | Greater of 20 µs or 5X the natural period |

For the 74-60K, the over range limit is reduced to 120,000g when operating at temperatures above 60°C (150°F) and to 60,000g when operating at temperatures above 93°C (200°F)

| | | |
|---|---|---|
| 6.3 | HUMIDITY AND ALTITUDE | Hermetically sealed (<5 X $10^{-8}$ atm-cc/sec He) |
| 6.4 | ESD SENSITIVITY | Class 3B (>8000V) per Section 5.2 of MIL-STD-1686C. |

## 7.0 CALIBRATION DATA

Data for all parameters listed in Paragraph 2.0 (Certified Performance) are supplied on the Calibration Certificate. Sensitivity calibration is performed at full range or 5,000g, whichever is lowest, using a shock calibration system. Calibration will be performed at the excitation voltage specified by the customer at the time of order (see Paragraph 9.0 for ordering information).

Prior to final calibration, each accelerometer is given a shock in the z-axis approximately equal to its rated range.

## 8.0 MODEL NUMBER DEFINITION

[1] Model Number Definition: