



SENSORS FOR MOTORSPORT TESTING

 **PCB PIEZOTRONICS**
AN AMPHENOL COMPANY

 **ENDEVCO**
AN AMPHENOL COMPANY

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MOTORSPORT SENSORS

Motorsport encompasses more than just Formula 1 and NASCAR automobiles vying for first place glory as they power around a track at speeds topping 220 mph. The Motorsport industry also entails the racing of motorcycles, trucks, water craft, snowmobiles, go carts, and even lawn mowers.

In an industry where fractions of a second can mean the difference between victory and defeat, every effort is taken to gain and maintain a competitive advantage. To this end, motorsport companies routinely test and analyze current and newly developed materials, components, systems, and technologies to get increased efficiency and the highest performance possible, while also ensuring safety.

When seconds count, nothing should go into a vehicle unless it adds to its performance. PCB products are designed and manufactured in our state-of-the-art facilities.

Through our global distribution network and Total Customer Satisfaction guarantee, you can rely on us to deliver products and solutions for your demanding requirements.

COMMON APPLICATIONS:

- Ride & handling
- Powertrain development
- Component & system performance
- Vehicle and powertrain NVH
- Modal analysis

SENSOR TYPES:

- Triaxial and Single-Axis DC and ICP® Accelerometers
- Angular Rate and 6 DoF Sensors
- Piezoresistive Pressure Sensors



DC RESPONSE ACCELEROMETERS

PCB® series 3711F, 3713F, 3741F, and 3743F DC response sensors are used to measure low frequency motion down to zero hertz. These accelerometers are used in motorsport applications with low frequency and amplitude requirements, as well as NVH, road load data acquisition (RLDA), drivability, ride and handling, and vehicle performance testing. Each series includes a full scale measurement range from $\pm 2g$ to $\pm 200g$ and features low spectral noise with high resolution. DC response sensors feature capacitive, silicon MEMS sensing elements for uniform, repeatable performance and offer high frequency overload protection.



SINGLE-ENDED MEMS ACCELEROMETERS

SERIES 3711F & 3713F

- Sensitivities:
6.75 mV/g to 675 mV/g
- Measurement Ranges:
 $\pm 2g$ pk to $\pm 200g$ pk
- Frequency response
from 0 Hz up to 2500 Hz ($\pm 10\%$)
- Case isolated, hermetically sealed titanium housing
- Available with integral cable or multi-pin, threaded electrical connector
- Available in single-axis or triaxial configurations



DIFFERENTIAL OUPUT, SINGLE AXIS MEMS ACCELEROMETERS

SERIES 3741F

- Sensitivities:
13.5 mV/g to 1350 mV/g
- Measurement Ranges:
 $\pm 2g$ pk to $\pm 200g$ pk
- Frequency response
from 0 Hz up to 2500 Hz ($\pm 10\%$)
- Ground isolated, hard-anodized aluminum housing
- Integral, 4-conductor shielded cable



DIFFERENTIAL OUPUT, TRIAXIAL MEMS DC ACCELEROMETERS

SERIES 3743F

- Sensitivities:
13.5 mV/g to 1350 mV/g
- Measurement Ranges:
 $\pm 2g$ pk to $\pm 200g$ pk
- Frequency response
from 0 Hz up to 2500 Hz ($\pm 10\%$)
- Case isolated, hermetically sealed titanium housing
- 9-Pin threaded electrical connector

SINGLE AXIS AND TRIAXIAL ICP® ACCELEROMETERS

PCB® single axis accelerometers provide the measurement signals needed to control the vibratory input and to analyze the product's reaction to such testing. Triaxial accelerometers provide simultaneous measurements in three orthogonal directions, for analysis of all of the vibrations being experienced by a structure. Each unit incorporates three separate sensing elements that are oriented at right angles with respect to each other.



SINGLE AXIS PIEZOELECTRIC ACCELEROMETER

MODEL 352C22

- Sensitivity: 10 mV/g
- Measurement Range: ± 500 g pk
- Frequency Range ($\pm 10\%$): 0.7 Hz to 13k Hz



SINGLE AXIS PIEZOELECTRIC ACCELEROMETER

MODEL 352C23

- Sensitivity: 5 mV/g
- Measurement Range: ± 1000 g pk
- Frequency Range ($\pm 10\%$): 1.5 Hz to 15k Hz



TRIAxIAL ICP® ACCELEROMETER

MODEL 354C10

- Sensitivity: 10 mV/g
- Measurement Range: ± 500 g pk
- Frequency Range: ($\pm 5\%$) 2 to 8000 Hz



TRIAxIAL PIEZOELECTRIC ACCELEROMETER

MODEL 356A01/03

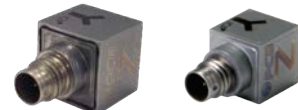
- Sensitivity: 5 mV/g
- Measurement Range: ± 1000 g pk
- Frequency Range ($\pm 5\%$) (y or z axis): 2 to 8000 Hz



TRIAxIAL ICP® ACCELEROMETER

MODEL 356A15

- Sensitivity: 100 mV/g
- Measurement Range: ± 50 g pk
- Frequency Range: ($\pm 5\%$) 2 to 5000 Hz



TRIAxIAL ICP® ACCELEROMETER

MODEL 356A43/44/45

- Sensitivity: 10 mV/g, 50 mV/g, 100 mV/g
- Measurement Range: ± 500 g pk, ± 100 g pk, ± 50 g pk
- Frequency Range: ($\pm 10\%$) 0.4 to 10000 Hz
- High Temperature & Ground Isolated Options Available

ICP® ACCELEROMETERS WITH EXCELLENT THERMAL STABILITY

These single and triaxial ICP® accelerometers are designed with a low temperature coefficient, wide operating temperature range, and good broadband measurement resolution, making them ideal for any vibration measurement requiring tight control of amplitude sensitivity over a wide thermal gradient. To alleviate the effects of high frequency overloads caused by metal-to-metal inputs, a low pass filter has been incorporated in all models, ensuring accurate data in the frequency range of interest.



UHT-12™ MINIATURE ICP® ACCELEROMETER

MODEL 320C52

- Sensitivity: 10 mV/g
- Measurement Range: ± 500 g
- Frequency Range: ($\pm 5\%$) 1 to 10000 Hz



UHT-12™ MINIATURE ICP® ACCELEROMETER

MODEL 320C53

- Sensitivity: 1 mV/g
- Measurement Range: ± 5000 g
- Frequency Range: ($\pm 5\%$) 1 to 5000 Hz



UHT-12™ LOW THERMAL COEFFICIENT ICP® TRIAXIAL ACCELEROMETER

MODEL 339A30

- Sensitivity: 10 mV/g
- Measurement Range: ± 500 g pk
- Frequency Range: ($\pm 5\%$) 2 to 8000 Hz



UHT-12™ LOW THERMAL COEFFICIENT ICP® TRIAXIAL ACCELEROMETER

MODEL 339B32

- Sensitivity: 10 mV/g
- Measurement Range: ± 500 g pk
- Frequency Range: ($\pm 5\%$) 2 to 10000 Hz



LOW THERMAL COEFFICIENT ICP® TRIAXIAL ACCELEROMETER WITH TEDS

MODEL TLD339A34

- Sensitivity: 50 mV/g
- Measurement Range: ± 100 g pk
- Frequency Range: ($\pm 5\%$) 2 to 5000 Hz



LOW THERMAL COEFFICIENT ICP® TRIAXIAL ACCELEROMETER WITH TEDS

MODEL TLD339A36

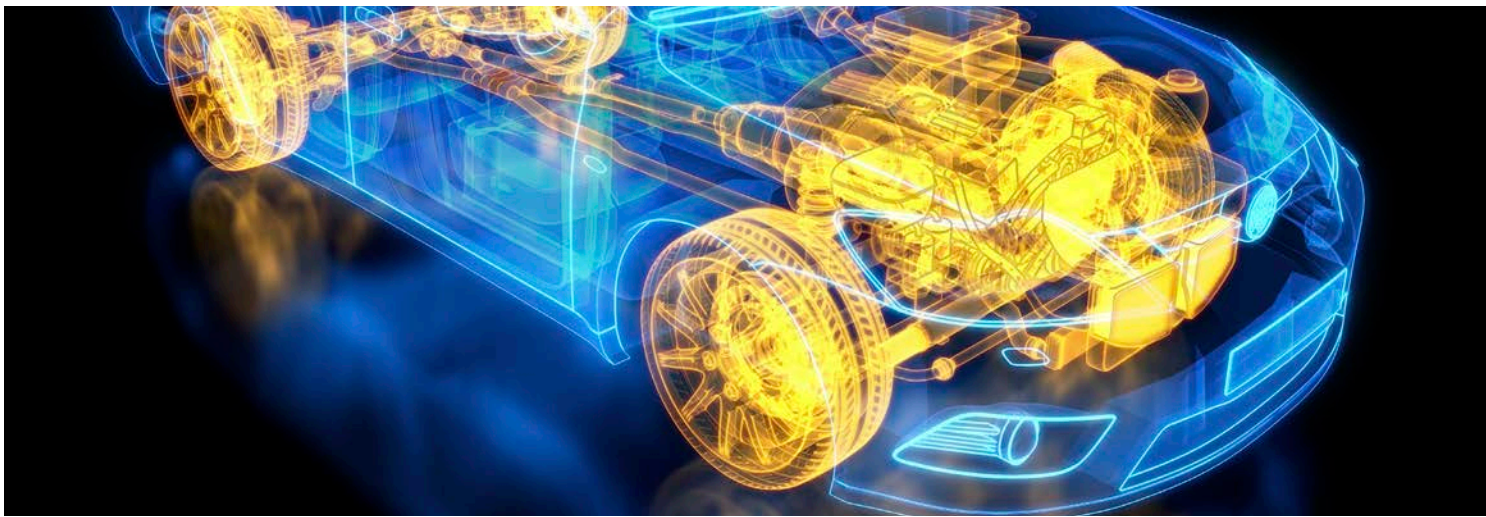
- Sensitivity: 10 mV/g
- Measurement Range: ± 500 g pk
- Frequency Range: ($\pm 5\%$) 2 to 5000 Hz



UHT-12™ LOW THERMAL COEFFICIENT ICP® TRIAXIAL ACCELEROMETER

MODEL TLD339A37

- Sensitivity: 100 mV/g
- Measurement Range: ± 50 g pk
- Frequency Range: ($\pm 5\%$) 0.3 to 4000 Hz



ANGULAR RATE AND 6DOF SENSORS

Endevco® models 7310A & 7330 are angular rate sensors that utilizes unique silicon MEMS gyroscope technologies with custom electronics and packaging, providing reliable sensing performance even under excessive shock and vibration environments. These angular rate sensors are designed specifically for automotive safety testing and other system designs requiring accurate measurement of angular velocity.

The model 7360A is a six degrees of freedom (6DoF) sensor that provides analog output for three axes of linear acceleration and three axes of angular rate in a compact, roughly one inch cube package. A sensor with analog output offers the advantage of being able to troubleshoot the data to its source and examine the output compared to its time history.

With this new 6DoF sensor, professionals in automotive development are now able to measure linear and rotational dynamics that previously required multiple sensors and much more space.



ANGULAR RATE SENSOR

MODEL 7310A

- 7 Angular Rate Ranges from 100 to 18K deg/sec
- Up to 2000 Hz bandwidth
- Lightweight, mass less than 3 grams



TRIAxIAL ANGULAR RATE SENSOR

MODEL 7330

- Ranges of 100, 500, 1500, 6K, 8K, 12K and 18K deg/sec
- Up to 2000 Hz bandwidth
- Weighs less than 10 grams



SIX DEGREE OF FREEDOM SENSOR

MODEL 7360A

- 5 Linear Acceleration ranges from ± 2 to ± 500 g
- 6 Angular Rate ranges from 100 to 18K deg/sec
- Shock limit 5000 g



PIEZORESISTIVE PRESSURE SENSORS

Endevco's 8500 series features a unique silicon diaphragm design, which produces an extremely high output signal and high resonant frequency. These pressure sensors feature quick response times and high output for excellent signal-to-noise ratio. They measure both static and dynamic pressure.



MINIATURE PIEZORESISTIVE GAGE PRESSURE TRANSDUCER

ENDEVCO 8507C

- 1, 2, 5, and 15 psig
- 300 mV full scale
- Ultra-miniature, high sensitivity, internal temperature compensation



MINIATURE PIEZORESISTIVE GAGE PRESSURE TRANSDUCER

ENDEVCO 8510B

- 200, 500, 2000 psig ranges
- 300 mV full scale output
- Miniature, high sensitivity, internal temperature compensation



LOW PROFILE PIEZORESISTIVE ABSOLUTE PRESSURE TRANSDUCER

ENDEVCO 8515C

- 15 and 50 psia ranges
- 200 mV full range
- Low profile, high sensitivity, internal temperature compensation



3425 Walden Avenue, Depew, NY 14043 USA

pcb.com | info@pcb.com | 800 828 8840 | +1 716 684 0001



10869 NC Highway 903, Halifax, NC 27839 USA

endevco.com | sales@endevco.com | 866 363 3826

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AUTO-Motorsport-0324