SENSORS FOR AUTOMOTIVE SAFETY TESTING

PCB PIEZOTRONICS
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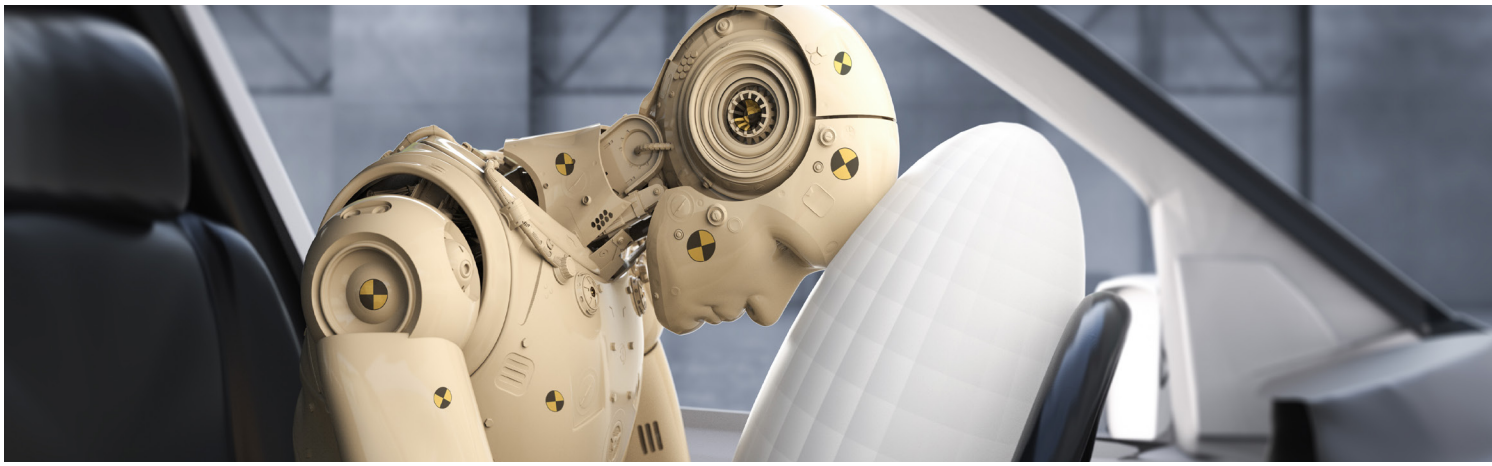
pcb.com/auto-safety



Since the earliest days of vehicle safety testing, Endevco® has worked with OEMs, test laboratories and ATD manufacturers' design and test personnel to ensure accurate measurements of front, side and rear impact; crush zones; in-vehicle occupant and pedestrian safety.

Endevco accelerometers were used to create the original safety standard specifications from the U.S. National Highway Traffic Safety Administration (NHSTA). Endevco 7264C Accelerometers are the only accelerometer that meets the NHTSA standard for certification tests. This accelerometer meets SAEJ211 specifications for instrumentation for impact testing and SAEJ2570 specification for anthromorphic testing. 7264C also features an undamped sensor design which meets the NHTSA SA572-S4 requirement of 0.005 damping ratio.

Endevco EuroNCAP compliant solution for pedestrian safety testing, Model 7264H, utilizes a unique and advanced micro-machined piezoresistive sensor which includes multi-mode damping for exceptional bandwidth with no significant resonance response in the usable range.

Endevco was also instrumental in the research and development of now standard safety features such as seat belts, dashboards, steering wheels and safety door locks.

A unique characteristic of Endevco damped piezoresistive accelerometers, are their use of multi-mode damping for exceptional bandwidth with no significant resonance. Endevco developed a gas damped MEMS sensor which effectively damps both the primary and secondary resonance. Because the two resonances are closely spaced, their damping characteristics overlap each other. The benefit of this interaction is an extended "flat" response up to a very high frequency that still retains a high degree of damping to control the amplification at its resonances. This allows a usable bandwidth up to 10kHz, which was unobtainable in previous generations of accelerometer design. Models 701AH/FH, 757AH/FH, 758H, 726CH, 713AL / 713FL, and 7264H all use multi-mode damping.

In 2019, PCB Piezotronics (PCB®) acquired Endevco's full line of automotive safety testing sensors. This means all Endevco sensors are now backed by PCB's Total Customer Satisfaction (TCS) guarantee.

APPLICATIONS

- Pedestrian safety study
- Frontal, rear and side impact
- Vehicle roll-over test
- Global regulatory compliance testing
- Anthropomorphic Test Device (ATD)
- Vehicle crush zones and crash sleds

PIEZORESITIVE ACCELEROMETERS

High-precision, DC responding Endevco piezoresistive accelerometers are widely specified within automotive safety applications, due to their high-output, low mass designs and compact size for mounting within difficult-to-reach areas. Their survivability, miniature size, and DC response measurement capabilities offer solutions for a diverse set of automobile testing requirements.

PIEZORESISTIVE ACCELEROMETERS					
Model Number	**7264B**	**7264C**	**7264D**	**726CH**	**7264H**
Description	Undamped accelerometer with center CG location	Undamped accelerometer; SAE J211 / J2570 compliant	low mass piezoresistive accelerometer	High sensitivity accelerometer with multi-mode damping; SAE J211/J2570 compliant	Accelerometer with multi-mode damping; SAE J211/J2570 compliant
Linear range (g)	±500 / ±2000		±2000		
Sensitivity (mV/g typical)	0.80 / 0.20		0.15	0.30	
Frequency response (±5%, Hz)	0-3000 / 0-5000		0-6000	0-5000	0-6000
Shock limit (g pk)	5000 / 10,000		10,000		
Typical Applications	In-dummy crash and shock measurements	Crash and shock measurements	Crash and sled testing	In-dummy crash and shock measurements	Passenger safety testing

PIEZORESISTIVE ACCELEROMETERS					
Model Number	**7268C**	**701AH/701FH**	**757AH/757FH**	**758H**	**713AL/713FL**
Description	Triaxial undamped accelerometer; WorldSID ATD	Accelerometer with multi- mode damping, rugged Al housing and 28 AWG cable	Small, lightweight accelerometer with multi- mode damping and flexible cable	Accelerometer with multi- mode damping and 28 AWG cable, for multiple mounting surfaces	Triaxial, high sensitivity accelerometer with multi-mode damping
Linear range (g)	±500 / ±2000	±1000	±2000		
Sensitivity (mV/g typical)	0.80 / 0.20		0.30		
Frequency response (±5%, Hz)	0-3000 (Z axis); 0-1500 (X & Y axis)	0-4000	0-3000	0-4000	0-3500
Shock limit (g pk)	5000 / 10,000		10,000		
Typical Applications	In-dummy crash and shock measurements	Automotive crash, front, rear and side impact, crush zones, sled testing, general shock and impact			

PIEZORESISTIVE PRESSURE SENSORS

Endevco's 8500 series features a unique silicon diaphragm design, which produces an extremely high output signal and high resonant frequency. It also results in extraordinary linearity and repeatability with virtually no hysteresis.

KEY FEATURES

- Measures Dynamic and Static Pressure
- Excellent linearity and broad frequency response
- Temperature compensated from 0 to 200°F (-18 to 93°C)
- Gage sensors range as low as 0–1 psig and as high as 0–20,000 psig
- Absolute pressure sensors range as low as 0–15 psia and as high as 0–2000 psia
- Supplied with calibration cert in compliance with the ISO/IEC 17025 standard

PIEZORESISTIVE PRESSURE SENSORS			
Model Number	**8510B**	**8530C**	**8530BM37**
Description	High sensitivity, gage, 10-32 thread	High resonance, absolute, 10-32 thread	High sensitivity, absolute, 10-32 thread
Full Scale Pressure (psig)	1 / 2 / 5 / 200 / 500 / 2000	15 / 50 / 100	200 / 500 / 1000 / 2000
Sensitivity (mV/psi)	200 / 100 / 60 / 1.5 / 0.6 / 0.15	15 / 4.5 / 2.25	1.5 / 0.6 / 0.3 / 0.3
Resonance Frequency (kHz)	55 / 70 / 85 / 320 / 500 / 900	180 / 320 / 500	750,000 / 1,000,000 / >1,000,000 / >1,000,000
Non Linearity (typ) %FSO	1.0 / 1.0 / 0.5 / 0.25 / 0.25 / 0.25	0.15 / 0.1 / 0.1	0.2 / 0.2 / 0.2 / 0.2
Typical Applications	Airbag & ABS testing	Side impact testing	Airbag & ABS testing

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 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. As opposed to inertial measurement units (IMU's) where the information has been digested and presented in a take-it-or-leave-it fashion, which is not user-friendly in a test and measurement or R&D environment.

INERTIAL SENSORS			
Model Number	**7310A**	**7330**	**7360A**
Description	Angular rate sensor	Triaxial angular rate sensor	Six degrees of freedom (6DoF) sensor
Linear Range	±100 / ±500 / ±1500 / ±6000 / ±8000 / ±12,000 / ±18,000 deg/sec		Accelerometers: ±2 / ±10 / ±50 / ±200 / ±500 g Angular rate sensors: ±100 / ±500 / ±1500 / ±8000 / ±12,000 ±18,000 deg/sec
Sensitivity (mV/psi)	20 / 4 / 1.333 / 0.333 / 0.25 / 0.167 / 0.111 mV/deg/sec		Accelerometers: 1000 / 200/ 40 / 10 / 4 mV/g Angular rate sensors: 20 / 4 / 1.333 / 0.25 / 0.167 / 0.111 mV/deg/sec
Frequency Response	0-1000 / 0-1000 / 0-1000 / 0-1000 / 0-1000 / 0-2000 / 0-2000 +1dB /-3dB Hz		Accelerometers: 0-300 / 0-1500 / 0-1800 0-1800 / 0-1800 ±1dB Hz Angular rate sensors: 0-1000 / 0-1000 / 0-1000 / 0-1000 0-2000 / 0-2000 +1dB /-3dB Hz
Shock Limit (g)	5000		
Typical Applications	Automotive safety and ATD testing, and other applications requiring accurate measurement of rotational velocity	Automotive testing requiring pitch, roll and yaw measurement, automotive roll-over ATD head, chest and leg positions	Vehicle dynamics, Automotive rollover

ADDITIONAL OPTIONS

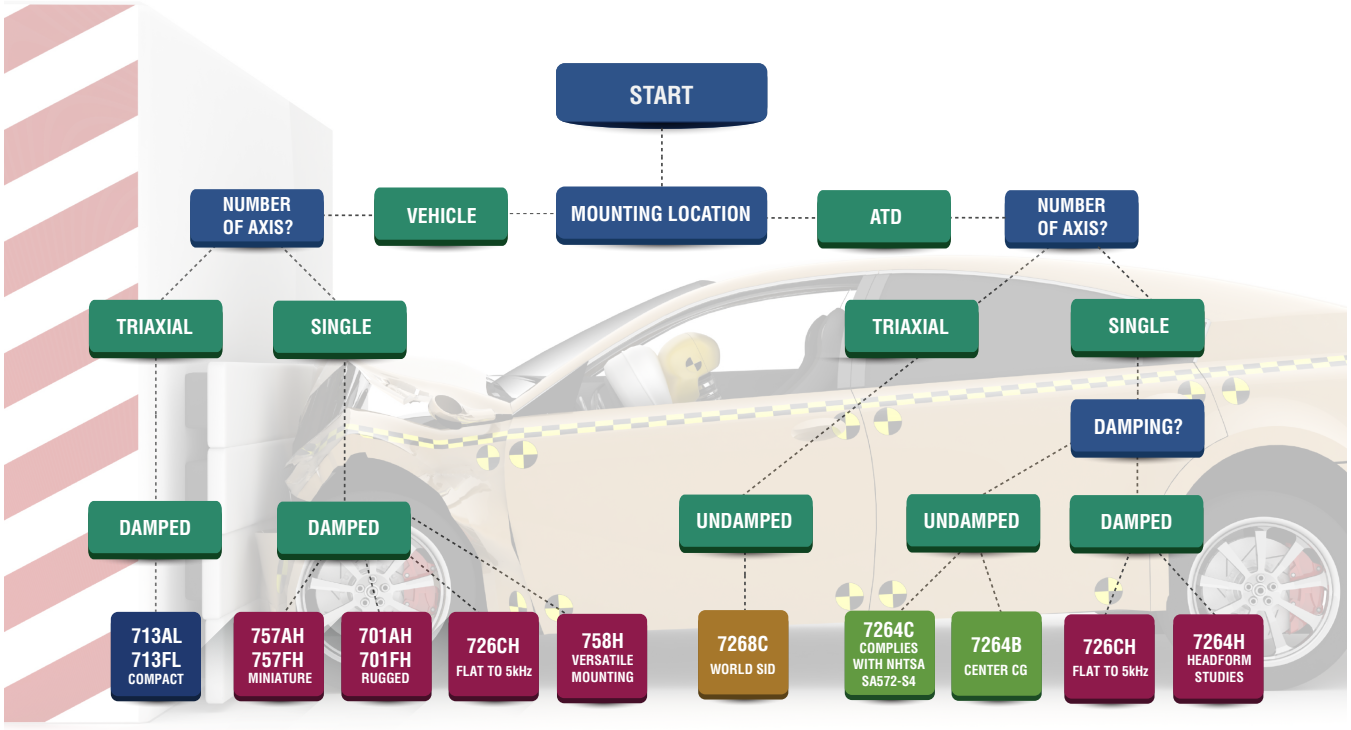
Connector & ID Chip Options

Automotive safety applications generally require connectors wired for the users unique data acquisition system setup. Endevco auto safety sensors come standard with pigtails to support connector installation by the customer. To save on technician time and recalibration, Endevco can create a model to your specifications with your desired connector and ID chip preinstalled. Please contact the factory for more details.

TZ Option

For applications requiring tighter specifications, many of the auto safety models have a "TZ" option. For 7264C, 7264D, 7264H, 726CH and 726CL, the TZ option includes <1% transverse sensitivity, compared to the standard 3%, AND +/-25mV ZMO, compared to the standard +/50mV. The <1% of full scale transverse Sensitivity is required by both SAEJ211/SAEJ2570 and the National Highway Traffic Safety Administration (NHTSA) SA572-S4. The NHTSA spec additionally requires the +/-25mV ZMO. The 7264B comes standard with +/-25mV ZMO, but you need to select the "T" option for <1% transverse sensitivity. The triaxial model 7268C also has a "TZ" option, but in this case the TZ option includes <2% transverse sensitivity, compared to the standard 3%, AND +/-50mV ZMO, compared to the standard +/-100mV. These specifications are more difficult to control in a triaxial configuration.

ENDEVCO AUTO SAFETY SELECTION CHART



Damped triax
Damped single axis
Undamped triax
Undamped single axis

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