ELECTRIC & HYBRID VEHICLE TESTING & DEVELOPMENT

Including **ENDEVCO** sensors, electronics, and cables

PCB PIEZOTRONICS
AN AMPHENOL COMPANY

pcb.com | 800 828 8840

ACOUSTICS

Noise sources are distinct between electric vehicles and conventional vehicles due to their different types of power. Electric vehicles have systems that contribute differently to the interior and exterior noise levels and quality. PCB offers a wide array of microphones specifically designed to meet many different exacting applications.

1/2" FREE-FIELD ICP® MICROPHONE SYSTEM

MODEL 378B02

- Sensitivity: 50 mV/Pa
- Frequency Range: 3.75 Hz – 20 kHz
- Dynamic Range: 137 dB re 20 µPa
- Cost effective
- TEDS
- Intrinsically safe (for battery testing) and high temperature versions available

1/2" LOW NOISE ICP® MICROPHONE SYSTEM

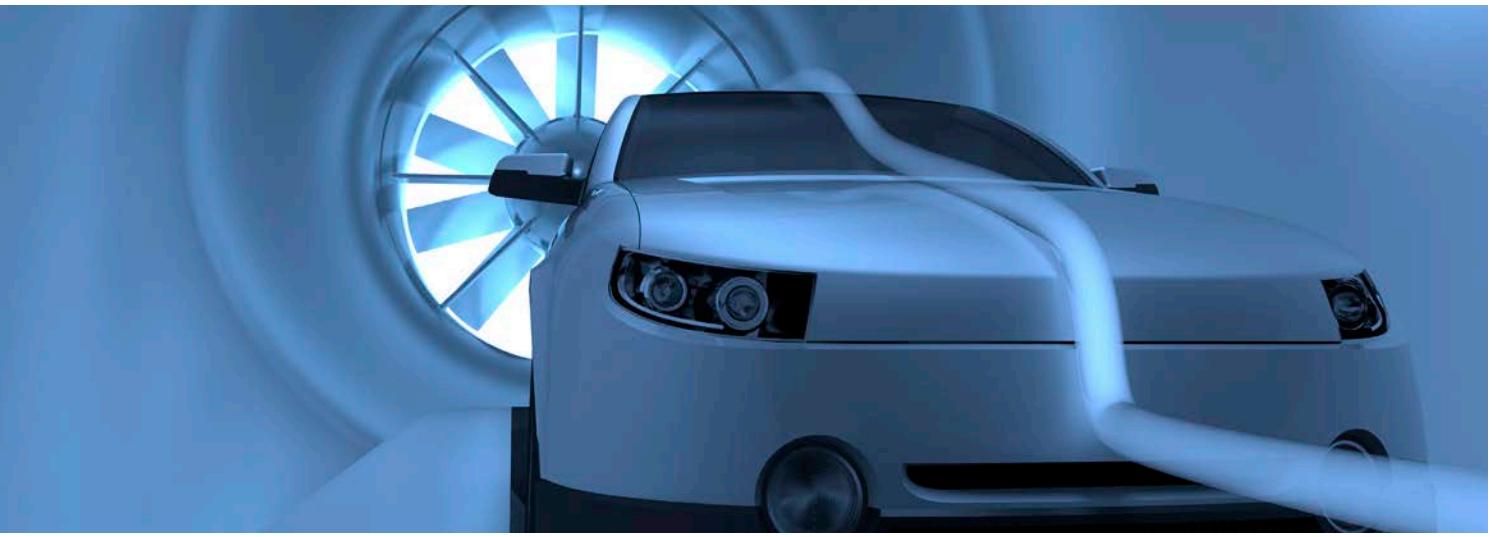
MODEL 378A04

- Prepolarized (industry's first)
- Frequency Range: 10 Hz - 16 kHz
- Less than 6.5 dBA noise floor
- High sensitivity, 450 mV/Pa
- TEDS
- Ideal for anechoic chamber applications

1/2" PREPOLARIZED RANDOM INCIDENCE MICROPHONE

MODEL 378C20

- Sensitivity: 50 mV/Pa
- Frequency Range: 3.75 Hz – 16 kHz
- Dynamic range: 16 dB(A) – 137 dB
- Excellent for vehicle interior sound measurements



APPLICATIONS INCLUDE:

- Cabin noise testing
- Wind noise testing
- Powertrain development
- Noise source location
- Sound system performance
- General noise reduction
- Vehicle and powertrain noise, vibration and harshness (NVH)
- Automotive component and system performance

1/4" LOW NOISE ICP® MICROPHONE SYSTEM

MODEL 378A08

- Prepolarized 0V (4-20 mA)
- Field Response: Free-field (capable of multi-field tests)
- Frequency Range: 12 to 20k Hz
- Noise Floor: 25 dBA (22 dBA typical)
- Sensitivity: 50 mV/Pa
- TEDS

1/2" WATER AND DUST RESISTANT ICP® MICROPHONE SYSTEM

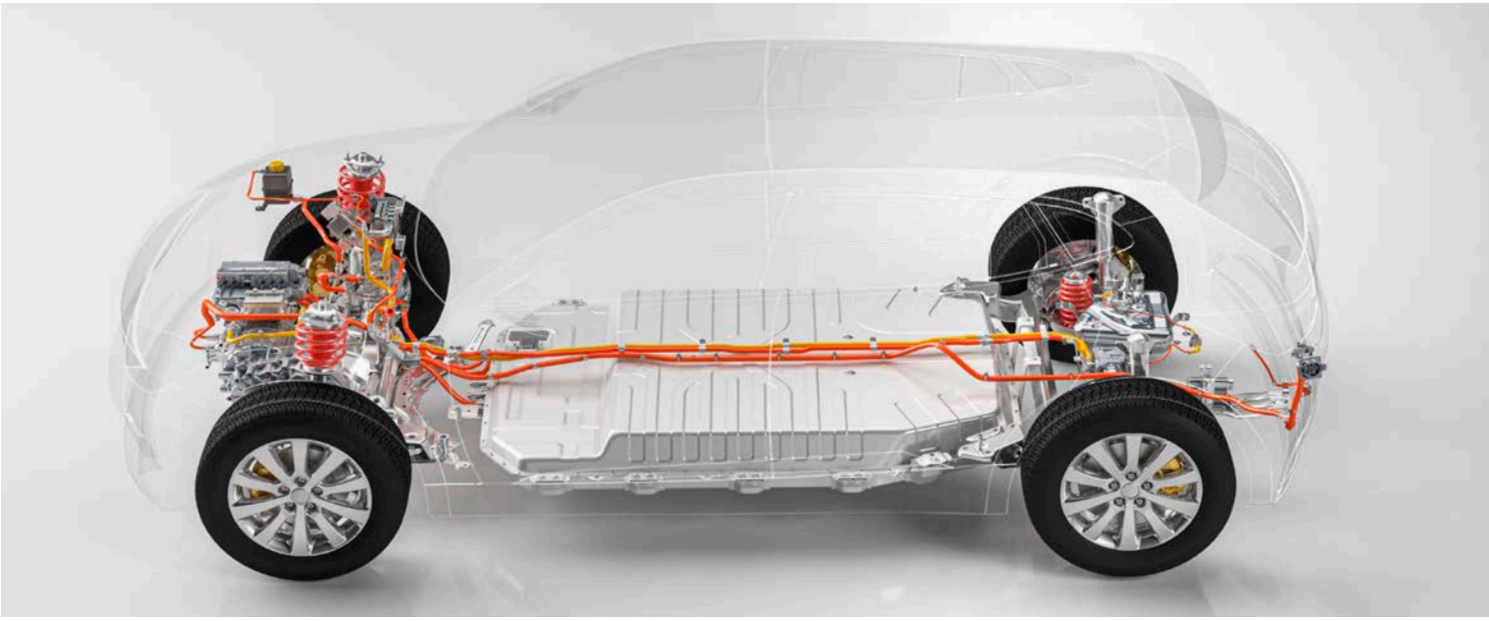
MODEL 130A24

- ICP® water resistant array
- IP55 rated
- Frequency Range: 20 Hz to 16 kHz
- IP55 Rated for harsh environments
- Cost effective
- Harsh testing environment applications

1/4" FREE-FIELD ICP® ARRAY MICROPHONE SYSTEM

SERIES 130F

- Low noise floor: 24 dBA
- Frequency Range: 10 Hz to 20 kHz (+/- 4 dB)
- Integral preamplifier & SMB jack connector
- TEDS
- High channel count applications



PIEZOELECTRIC VIBRATION SENSORS

Hybrid and electric vehicles present NVH testing challenges due to vehicle complexity and potential for problems with electrical isolation. NVH issues related to the addition of new electrical devices, gear whine, and vehicle resonances increase the number of NVH areas to be tested. Our broad line of piezoelectric accelerometers is engineered to meet these challenges by incorporating ground and case isolation. Electrically isolated accelerometers help avoid measurement errors and poor test data that can result when ground loops and stray electrical signals are present during testing.

HIGH-VOLTAGE TRIAXIAL ICP® ACCELEROMETER

MODEL HV356A03

- Sensitivity: 10 mV/g
- Measurement Range: ±500 g pk
- Frequency Range (±5%): 2 to 6.8k Hz
- Rated for direct contact up to 2000 VDC

HIGH-VOLTAGE TRIAXIAL ICP® ACCELEROMETER

MODELS HV356A44 & HV356A45

- Sensitivity: 50 / 100 mV/g
- Measurement Range: ±100 / ±50 g pk
- Frequency Range (±5%): 0.7 to 5k Hz
- TEDS compliant
- Rated for direct contact up to 2000 VDC

CASE ISOLATED HIGH SENSITIVITY TRIAXIAL ICP® ACCELEROMETER

MODELS 354B04 & 354B05

- Sensitivity: 10 / 100 mV/g
- Measurement Range: ±500 / ±50 g pk
- Frequency Range: 10k Hz

MINIATURE CERAMIC SHEAR ICP® ACCELEROMETER

MODEL 352A24

- Sensitivity: 100 mV/g
- Measurement Range: ±50 g pk
- Frequency Range: 8k Hz

HIGH SENSITIVITY ICP® ACCELEROMETER

MODEL 352C33

- Sensitivity: 100 mV/g
- Measurement Range: ±50 g pk
- Frequency Range: 10k Hz
- Ground isolation model available

MINIATURE TRIAXIAL ICP® ACCELEROMETER

SERIES 356A03

- Sensitivity: 10 mV/g
- Measurement Range: ±500 g pk
- Frequency Range: 8k Hz (y or z axis) 5k Hz (x axis)
- Ground isolated model available

HIGH FREQUENCY IEPE ACCELEROMETER

ENDEVCO MODELS 7250B-2/7250B-10

- Sensitivity: 2 / 10 mV/g
- Measurement Range: ±2500 / ±500 g pk
- Frequency Range: 20k Hz

RING SHEAR IEPE ACCELEROMETER

ENDEVCO MODELS 7251A-10/7251A-100

- Sensitivity: 10 / 100 mV/g
- Measurement Range: ±500 / ±50 g pk
- Frequency Range: 8k Hz

MINIATURE TRIAXIAL ICP® ACCELEROMETER

MODEL 356A09

- Sensitivity: 10 mV/g
- Measurement Range: ±500 g pk
- Frequency Range: 8k Hz (y or z axis) 5k Hz (x axis)

TRIAXIAL ICP® ACCELEROMETER

MODELS 356A15, 356A25, 356A02

- Sensitivities: 100 / 25 / 10 mV/g
- Measurement Ranges: ±50 / ±200 / ±500 g pk
- Frequency Ranges: 5 to 5000 Hz / 1 to 5000 Hz / 1 to 5000 Hz
- Electrical Connectors: 1/4-28 4-Pin

GROUND ISOLATED TEDS TRIAXIAL ACCELEROMETER

MODELS J356A43, J356A44, J356A45

- Sensitivity: 10 / 50 / 100 mV/g
- Measurement Range: ±500 / ±100 / ±50 g pk
- Frequency Range: 10k Hz

INTRINSICALLY SAFE ACCELEROMETER

MODEL EX639A91

- Sensitivity: 100 mV/g
- Measurement Range: ±50 g pk
- Frequency Range: 13k Hz

MEMS VIBRATION SENSORS

PCB® and Endevco variable capacitance MEMS (VC MEMS) accelerometers are used to measure low frequency motion down to zero hertz. The units feature capacitive, silicon MEMS sensing elements for uniform, repeatable performance and offer high frequency overload protection. A wide selection of ranges, single axis and triaxial package configurations, and single-ended or differential output are offered to suit many applications.

VC MEMS ACCELEROMETERS

MODEL 3711F

- Sensitivities (±3%): 6.75 mV/g to 675 mV/g
- Measurement Range: ±2 g pk (±19.6 m/s² pk) to ±200 g pk (±1962 m/s² pk)
- Frequency Range: (±5%) 0 to 250 Hz to 0 to 1500 Hz

TRIAXIAL VC MEMS ACCELEROMETERS

MODEL 3713F

- Sensitivities (±3%): 6.75 mV/g to 675 mV/g
- Measurement Range: ±2 g pk (±19.6 m/s² pk) to ±200 g pk (±1962 m/s² pk)
- Frequency Range: (±5%) 0 to 250 Hz to 0 to 1500 Hz

DIFFERENTIAL VC MEMS ACCELEROMETERS

MODEL 3741F

- Sensitivities (±3%): 13.5 mV/g to 1350 mV/g
- Measurement Range: ±2 g pk (±19.6 m/s² pk) to ±200 g pk (±1962 m/s² pk)
- Frequency Range: (±5%) 0 to 250 Hz to 0 to 1500 Hz

DIFFERENTIAL, TRIAXIAL VC MEMS ACCELEROMETERS

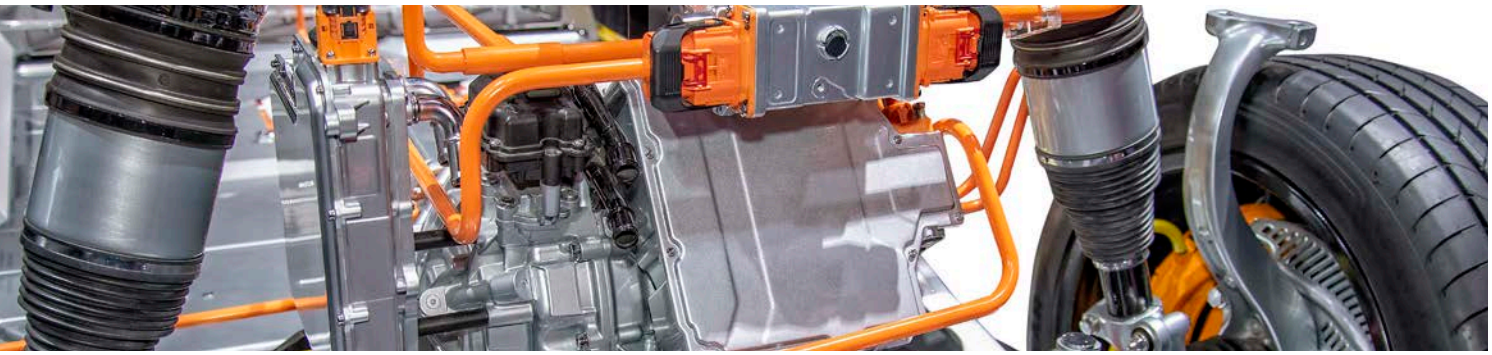
SERIES 3743G

- Sensitivities (±3%): 13.5 mV/g to 1350 mV/g
- Measurement Range: ±2 g pk (±19.6 m/s² pk) to ±200 g pk (±1962 m/s² pk)
- Frequency Range: (±10%) 0 to 250 Hz to 0 to 1500 Hz

COMPACT TRIAXIAL VC MEMS ACCELEROMETER

MODEL 3753A

- Sensitivities: 50 mV/g to 1000 mV/g
- Measurement Range: ±2 g pk (±19.6 m/s² pk) to ±40 g pk (±392 m/s² pk)
- Frequency Range: (±5%) 0 to 550 Hz to 0 to 750 Hz



VIBRATION ACCESSORIES

PCB® offers a wide selection of signal conditioners, accessories, and cables that complement our sensors for testing electric vehicles, hybrid electric vehicles, and fuel cell vehicles. See our website for the complete offering of these products.

4-CONDUCTOR, SHIELDED, FEP CABLE

MODEL 010GXX

- Used with triaxial ICP® accelerometers
- 4 conductor, shielded, FEP jacket
- 1/4-28, 4-socket plug to 3 BNC plugs

4-CONDUCTOR, SHIELDED, FEP CABLE

MODEL 034WXX

- Used with triaxial ICP® accelerometers
- 4 conductor, shielded, FEP jacket
- IP68 Rated 1/4-28, 4-socket plug to 3 BNC plugs

4-CONDUCTOR, SHIELDED, POLYURETHANE CABLE

MODEL 078WXX

- Used with triaxial ICP® accelerometers
- 4 conductor, shielded, flexible polyurethane jacket
- IP68 Rated 1/4-28, 4-socket plug to 3 BNC plugs

NF CABLE

4-CONDUCTOR TERMINATION

- Connector Style: Triple Splice
- Connector Style: BNC
- Connection Type: Plug (male pin)
- Temperature Range: -40 to +176 °F (-40 to +80 °C)
- Grounded shield

ICP® SIGNAL CONDITIONER

MODEL 483C15

- 8 individual channels
- ICP® and voltage sensor input
- Selectable gain of x1, x10, x100

LOW-NOISE COAXIAL CABLE

SERIES 003CXX

- Used with single axis ICP® accelerometers
- Low-noise coaxial cable
- 10-32 coaxial plug to BNC plug

High-precision, DC responding Endevco piezoresistive accelerometers are widely specified for vehicle safety testing 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.

AUTO SAFETY SENSORS

UNDAMPED PIEZORESISTIVE ACCELEROMETER

MODEL 7264C

- DC response and wide bandwidth
- Undamped - meets NHTSA SA572-S4
- Mechanical stops
- Passenger safety testing

PIEZORESISTIVE TRIAXIAL ACCELEROMETER

MODEL 7268C

- 500 and 2000 g ranges
- DC response
- 12 wire integral cable
- Original equipment for WorldSID ATD

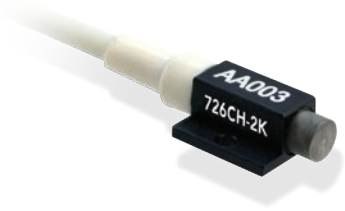
ANGULAR RATE SENSOR

MODELS 7310A & 7330

- Ranges of 100, 500, 1500, 6K, 8K, 12K and 18K deg/sec
- Up to 2000 Hz bandwidth
- Weighs less than 3 grams (7310A) Weighs less than 10 grams (7330)
- Operates with 5 to 16 V input

APPLICATIONS INCLUDE:

- Anthropomorphic test devices (ATD) - DC accelerometers and angular rate sensors meeting J211/J2570/ISO6487, NHTSA SA572 designed for use inside various dummies
- On-vehicle crash test - Rugged accelerometers with a wide variety of form factors for use in on-vehicle crash environments
- SLED testing - DC accelerometers designed specifically for sled track test environment
- Pedestrian safety testing - Highly damped accelerometers meeting EuroNCAP directives, suitable for installing inside headform
- ABS/Airbag Testing - Miniature pressure transducers with broad frequency response, perfect for airbag design and tests
- Side impact testing - Small pressure sensors that fit inside doors and other tight locations



PIEZORESISTIVE ACCELEROMETER

MODEL 726CH

- High sensitivity 600mV FSO
- Multi-mode damping
- DC response and wide bandwidth
- In-dummy application

PIEZORESISTIVE ACCELEROMETER

MODEL 701AH - 701FH

- High sensitivity, 0.3 mV/g
- Multi-mode gas damping
- Flat frequency response
- Rugged housing and cable with 28 AWG conductors

PIEZORESISTIVE ACCELEROMETER

MODEL 757AH - 757FH

- High sensitivity, 0.3 mV/g
- Multi-mode gas damping
- Crash and shock testing
- Miniature for tight spaces
- Survives up to 10,000 g shock

TRIAXIAL PIEZORESISTIVE ACCELEROMETER

MODEL 713 - 713F

- High sensitivity, 0.3 mV/g
- Multi-mode damping
- Compact package, eliminates mounting block

DAMPED PIEZORESISTIVE ACCELEROMETER

MODEL 7264H

- DC response and wide bandwidth
- Multi-mode damping
- High sensitivity
- Passenger safety testing

PIEZORESISTIVE ACCELEROMETER

MODEL 758H

- High sensitivity, 0.3 mV/g
- Multi-mode gas damping
- Mountable on x, y, or z axis

PIEZORESISTIVE PRESSURE TRANSDUCER

MODEL 8510B

- 200, 500, 2000 psig ranges
- Airbag testing
- Rugged, miniature

PIEZORESISTIVE PRESSURE TRANSDUCER

MODEL 8530C

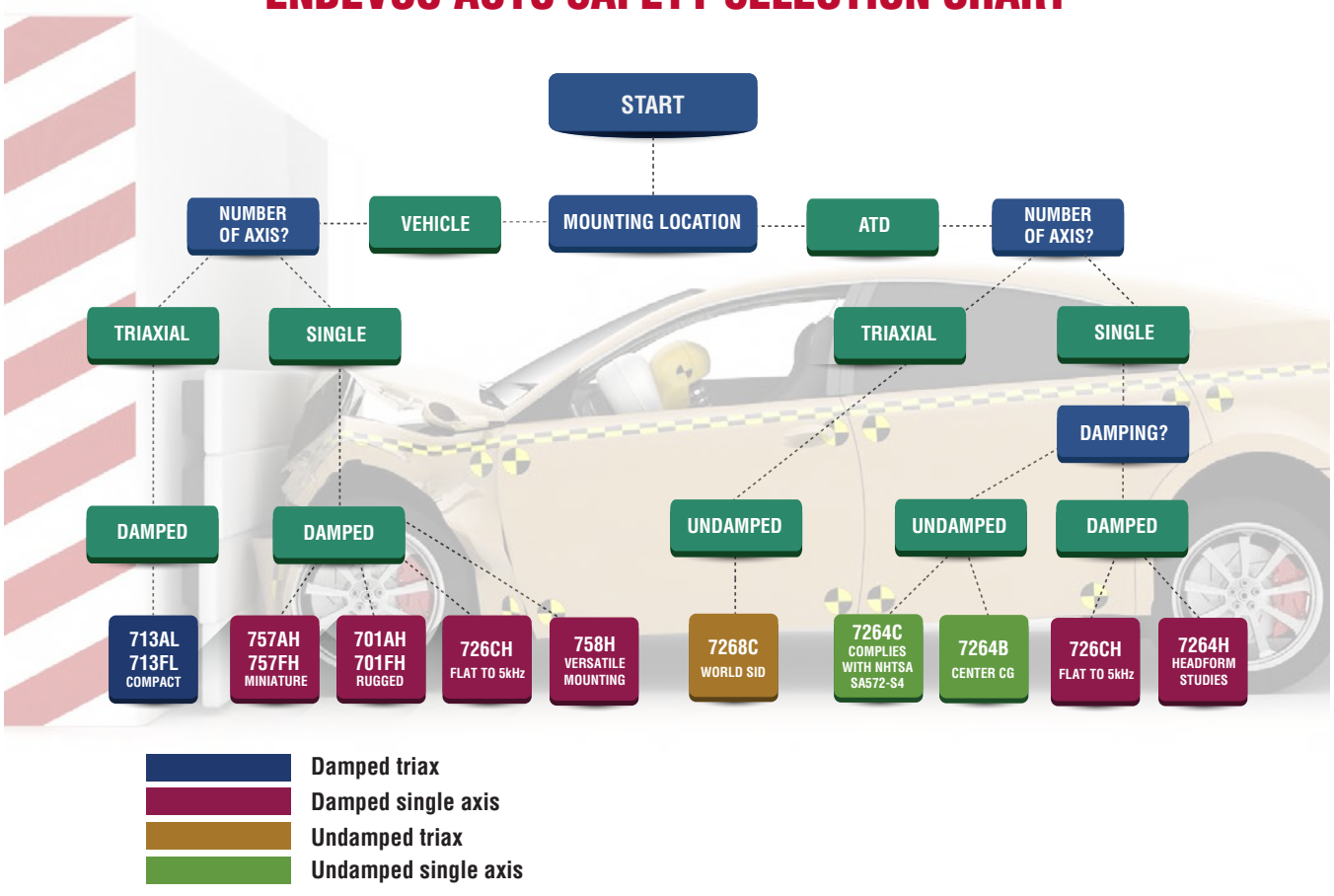
- 15, 50 and 100 psia ranges
- Side impact testing
- Absolute reference

PIEZORESISTIVE PRESSURE TRANSDUCER

MODEL 8530BM37

- 200, 500, 1000, 2000 psia ranges
- Detachable cable
- ABS studies

ENDEVCO AUTO SAFETY SELECTION CHART



- Damped triax
- Damped single axis
- Undamped triax
- Undamped single axis

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