

Sensors for vehicle crash test and passenger safety testing

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Since the 1970s, the Meggitt Sensing Systems Endevco® range of crash test accelerometers have been helping automotive manufacturers to meet the SAEJ211 standard for impacting instrumentation and SAEJ2570 standard for anthropomorphic test devices (ATDs). These high-reliability sensors have also been used to conduct vehicle crash and passenger safety tests, in accordance with EuroNCAP, US Federal Motor Vehicle Safety Standards (FMVSS) and other global legislative and safety testing regulations.

Endevco® high-reliability sensors and instrumentation are used to support a wide range of crash test requirements, ranging from rollover detection, to vehicle front, side and rear impact, to crush zone testing and passenger safety testing applications. These high-precision sensors are offered in low weight, low mass designs, minimizing mass loading effects and facilitating easy mounting within challenging or space limited environments.

For rotational acceleration measurements, such as those most typically encountered in crash testing, suspension and chassis vibration monitoring and vehicle rollover detection applications, the Endevco® model 7302BM4 accelerometer is recommended. This temperature compensated piezoresistive accelerometer is uniquely designed to reject cross-axis angular and linear accelerations within automotive safety testing applications. The sensor is fluid-damped to optimize frequency and phase response throughout its operating temperature range of -18°C to +121°C (0°F to +250°F), with a stable frequency response from 0 to 1600 Hz. Model 7302BM4 also offers high angular and linear shock resistance, and is offered with a nominal sensitivity of 5.0 mV per krad/sec² at 10 Vdc excitation voltages with a nominal 250 mV full-scale output. The Endevco® model 7302BM4 may also be used within typical ATD applications to measure body acceleration experienced during impact.

For vehicle side, rear and frontal crash testing, the Endevco® 7264 series is known as the industry's gold standard. Offered in weights as low as just one gram, with a full-scale output of 400 mV and 10 Vdc excitation, these piezoresistive sensors utilize an advanced MEMS sensor with integral

mechanical stops in a monolithic design, for ruggedness, stability and reliability. With a frequency response extending down to dc or steady state acceleration, they are ideal for measuring both short- and long-duration transient shocks, with stable measurement performance over a temperature range of -40°C to +93°C (-40°F to +200°F). This series is offered in both undamped and lightly damped versions, which helps minimize phase shift over the useful frequency range and to attenuate resonance. Models are available with less than 1% transverse sensitivity ("T" option), as well as optional input voltage. The design versatility and unique performance characteristics of the Endevco® 7264 series also allow it to be used for rough road testing and shock testing of lightweight systems or structures, two applications for which minimal mass loading and a broad frequency response are absolute requirements.

In addition, crash sled testing, often incorporating the use of ATD's, requires use of precision accelerometers to simulate the typical effects of a high-impact event within vehicle crush zones. This testing is used to help ensure the effectiveness of in-vehicle safety components and systems, such as airbags and seatbelts, and their abilities provide sufficient passenger protection and restraint. For ATD testing, crash test and crash sled testing applications in which the direction or source of vehicle impact may be unclear, the highly rugged Endevco® model 7268C, an undamped, high output miniature piezoresistive triaxial accelerometer, is often specified. Offered with full-scale measurement ranges of either 500 g, rugged to 5,000g shock or 2000 g, rugged to 10,000 g shock, this accelerometer offers simultaneous high-shock measurement on three axes within a

single small package size with broad frequency response. The sensors feature integral mechanical stops for added durability, with two fixed resistors to enable shunt calibration on each axis. Units are supplied with integral cable, and offered with customer ability to specify both excitation voltage and cable length. In addition, the Endevco® model 7268C is world SID dummy approved, and meets EuroNCAP, SAEJ211 and SAEJ2570 testing standards.

Crush zone testing installations typically incorporate a crash test sensor that is designed for use in areas of a vehicle which deform under high shock inputs, thus requiring a sensor that is not intended for re-use. To satisfy application requirements, the sensors must be rugged enough to withstand a high shock impact event, sensitive enough to trigger a vehicle's passive restraint system when impacted and able to record critical data to a high degree of accuracy, while cost-effective enough to justify and support its one-time use. To meet these challenging requirements, Meggitt Sensing Systems offers Endevco® models 7286 and 7287. With frequency responses extending down to dc (steady state acceleration), these accelerometers are ideal for measuring the long duration transient shocks typically encountered within vehicle crush zones. Both models incorporate MEMS sensing technology with integral mechanical stops and offer a high degree of ruggedness, stability and reliability with minimum damping, thereby producing no phase shift over the useful frequency range. Input and output of the model 7286 is specifically tailored to 2 Vdc excitation systems, while the model 7287 uses 10V input.

In addition to high-reliability sensors and instrumentation for crash test, Meggitt Sensing Systems offers a full range of sensors, signal conditioning and accessories for other areas of automotive testing. These range from piezoelectric sensors for automotive modal analysis, body-in-white testing, and automotive component durability testing, to acoustic sensors for NVH, to high-temperature charge mode sensors for engine monitoring applications and piezoelectric and servo accelerometers for vehicle dynamics and ride handling applications.

For more information on sensing technologies available from Meggitt Sensing Systems, please visit www.endevco.com.