automotive testing expo 2010 north america EXHIBITOR

Using double-sided tape for accelerometer mounting

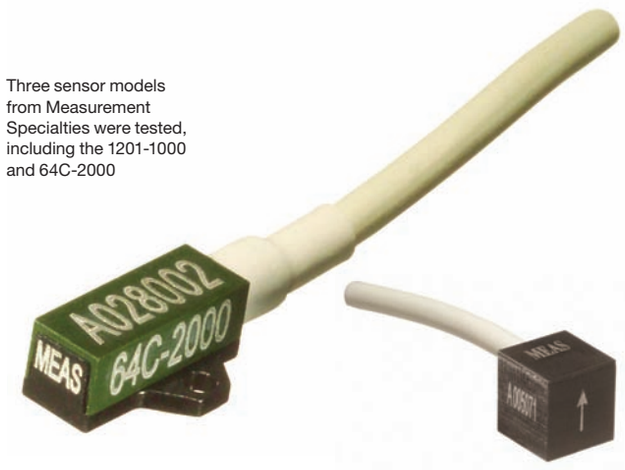
Measurement Specialties, Inc
Tel: +1 949 716 5377
Email: ron.poff@meas-spec.com
Web: www.meas-spec.com

With double-sided tape increasing in popularity as a quick and easy method of accelerometer mounting, users must be able to trust the fidelity of test data obtained from sensors mounted in this way

Accelerometers measure shock and vibration by providing an electrical output signal proportional to the motion of the object on which they are attached. The stiffer the mounting, the better its transmissibility, and the higher the accelerometer mounted resonance frequency. Consequently, magnetic mounting of accelerometers is generally viewed as providing the worst coupling, while screw or stud mounting provides the best.

For applications where holes cannot be drilled into the structure, or the design of the accelerometer does not allow for screw/stud mounting, adhesives are usually seen as practical. For best performance, many experts suggest using cyanoacrylate adhesives – a generic name for methyl-2-cyanoacrylate, which can be purchased under such trademarks as Super Glue, Loctite, or Krazy Glue. For temporary installation, hot glue or bee's wax is often recommended, but these provide inferior mechanical coupling.

Each of these mounting techniques has its own unique challenges. For example, stud or screw mounting requires skill in drilling/tapping holes that are perpendicular within 1° to the surface, are deep enough to accommodate all screws, and are free from burrs, debris or foreign material; care needs to be taken to ensure that the presence of the drilled hole will not weaken the structure. On the other hand, adhesive mounting is not as strong as screw mounting, all parts must be free from contaminants, curing time may be long, the liquid can irritate skin, and storage can be a problem.



Three sensor models from Measurement Specialties were tested, including the 1201-1000 and 64C-2000

These mounting methods all require considerable preparation for desired results. But there is another option: double-sided tape, which can be a good compromise if properly used.

For instance, the accelerometer should not weigh more than a few grams. Although there is no strict rule, double-sided tape should only be applied to heavy accelerometers if the measured G level is relatively low and/or only low frequencies are of interest. Furthermore, double-sided tape is only applicable to near room-temperature measurements. At elevated temperature, tape loses its adhesion rather quickly.

Despite the need to keep the mounting surfaces free from oil and grease, installation and removal of double-sided tape from accelerometers is quick, easy, and requires no special training or tools. If accelerometers need to be repositioned, this can be done with little effort. It is also possible to mount in confined areas where other methods might be impossible.

Recognizing that we are witnessing increasing use of double-sided tape due to its convenience, the question of fidelity of test data when sensors are tape mounted (versus screw mounted) is of interest. To help answer the question and truly understand the effects of tape mounting, considerable testing was performed using three sensor models from Measurement Specialties Inc. The sensors tested were the 1201-1000, 52M30-2000, and 64C-2000.

These silicon MEMS, low-mass sensors are typically installed on vehicles for front-/rear-impact studies (1201), side-impact testing (52M30), or in-dummy monitoring during automotive crash or sled testing (64C). The 1201 and 52M30 were designed as adhesive-mounted sensors; the 64C was for screw mounting.

The tape selected for mounting was a 3M double-coated tape 444 that uses a high-tack acrylic adhesive on a 0.5mm clear polyester backing (total thickness is 3.9mm). Each sensor's frequency response was calibrated with a fresh tape mounting. Then the mounting assembly was exposed to two -500g half-sine shock pulses to put the adhesive in tension, and followed by a repeat of frequency response calibration. This was repeated for -1,000g and -1,500g pulses on the adhesive mounting assembly. The 64C-2000 was also tested with screw mounting for comparison. All frequency response calibration curves were checked for deterioration due to the shock stresses.

There was no indication that the fidelity of the sensor response has been much compromised by the use of double-sided tape. It appears from this testing that tape mounting is very acceptable for achieving good data within its application limits.

Those interested in obtaining the actual data and response curves can request them from the contact information above. ❮