Extensometer 'Handling' Sensitivity

Differential diagnosis can be challenging in typical applications.

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'Noise' or sensitivity to physical manipulation of an extensometer or its cable may indicate a real problem, such as fatigue damage to the cable, broken flexures, etc. However, some sensitivity to manipulation is normal, and is often misinterpreted as an indication of damage – this typically happens when an extensometer is getting a 'closer inspection' during troubleshooting of an unexpected test result, where it may be unrelated to the original problem. As a rule, some sensitivity to physical manipulation is not by itself an indication of damage. Diagnosing these problems can be challenging.

The zero pin is inserted, and the extensometer is mounted at its gauge length to a solid specimen. Shouldn't the output be noise-free at 0.000 when I manipulate it? (No.)

Load cells are typically designed to be fairly *rigid*. Extensometers, however, are of necessity designed to be very *compliant*. For this reason, they are also sensitive to minute physical forces resulting from handling of the extensometer or manipulation of the cable near the extensometer. This is also the reason that it is necessary that the extensometer must not be touched or handled during the calibration process.

The extensometer is designed to minimize these forces during actual use.

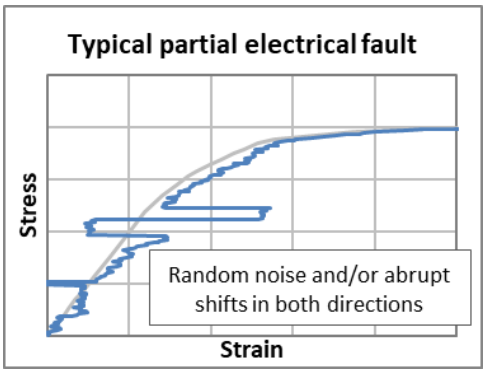
This intrinsic sensitivity does not degrade typical testing results, because testing best practices ensure that physical loads on the extensometer and cable are minimized – even in dynamic applications.

Distinguishing typical sensitivity to manipulation from extensometer damage

Typical new and undamaged extensometers, with zero pin inserted and when mounted at GL to a solid specimen, may exhibit fluctuations in indicated strains on the order of ~0.5-5%ε due to physical manipulation of the extensometer or cable – even with the zero-pin installed. The magnitude varies somewhat between models, making comparisons between devices difficult.

Fluctuations exceeding the extensometer's range due to moderate manipulation generally do indicate damage to the instrument.

In less severe cases, the magnitude of 'typical' sensitivity to manipulation can be as much as or larger than the effects of either intermittent or partial cable damage, or other common unrelated testing problems. This makes diagnosis difficult when considering only the magnitude of the fluctuation. However, intermittent or partial cable damage can often be diagnosed visually on a stress-strain plot due to the distinct typical characteristics as shown here.



Note that thermomechanical noise, dirty electrical connections, and contamination by conductive debris can also cause qualitatively similar test curves. Other common problems are described in an additional technical note on *Test Curve Nonlinearity*.

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