Calibration of Accelerometers: Why?

When measuring vibrations during a vibration survey or a balancing job, the physical quantity of vibrations is converted into an electrical signal, which is being understood by the analyzer. This conversion is done by the accelerometer. The analyzer will then convert the electrical signal into a number, representing a vibration level.

But, as we know, a chain is only as strong as its weakest link….

The analyzer can only show us a number, representing the level of vibrations, within the required tolerance, when both conversions are done within tolerances set by the manufacturer of the equipment.

This means that both analyzer and accelerometer have to be periodically checked and calibrated.

Calibration of Accelerometers: What and How?

The most important characteristics of accelerometers are the sensitivity and the frequency range.

The sensitivity tells us how much electrical signal is produced by a certain amount of vibration. Typically, the sensitivity is expressed in millivolts per unit of gravity, mV/g.

Now, it is important that we know in which frequency range the sensitivity of the accelerometer is within certain limits.

Some handheld portable shakers allow you to check the functionality of an accelerometer by verifying the response on a frequency in the centre of the range and on preset amplitude of vibration level.

This tells us something, but it does not tell us anything on the precision over the whole frequency scale of the accelerometer.

Accelerometers are known to be very stable over time when used in 'normal' conditions. However, when dropped or when used outside its operation range, its characteristics can change permanently, resulting in faulty readings on the analyzer.

During a balancing job, we are usually measuring at one specific RPM and it is our purpose to reduce the vibrations step by step, ending usually far below max limits…

AeroTecs NV
Voortstraat 12B
B-3560 Lummen • Belgium
BE 0463717012
RPR HASSELT
Tel. : +32 (0)11 424 066
Fax: +32 (0)11 428 902
www.aerotecs.com

But during a vibration survey, we measure vibrations over a broad range of the spectrum, with sometimes different limits in function of the frequency, which all makes correct calibration **over the whole frequency range** extremely important. Indeed, you will use the indicated figures to decide if the aircraft can be released or not!

We can offer either a 'single point' check of the sensitivity (one frequency-one amplitude) or a calibration on several points of the frequency spectrum and on several amplitudes.

Bibliography: Accelerometer Calibration; Ernst Schontal and David M. Lally; SAE-1997.

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