Human vibration response instrumentation

By Martin Armstrong

For those performing vibration measurements according to human response criteria there is a new revised issue of the ISO 8041 measuring instrumentation.

The revision has been quite extensive in several aspects. The standard is now *Human response to vibration - Measuring instrumentation – Part 1: General-purpose vibration meters*. This standard has been published in May as ISO 8041-1:2017. As the initial revision of the old ISO 8041 in the mid 1990's was important for the EU Regulation on H&S at Work it was a joint working group with CEN, led by ISO in ISO/TC 108/SC 3/JWG1.

Therefore CEN are going to publish and by the time this article appears in print there should be, on or just after 8 June, a UK publication BS EN ISO 8041-1:2017.

The first thing I hope you will have noted is this is now Part 1: General-purpose vibration meters. A following standard will cover what are commonly called vibration dose meters as Part 2: Personal vibration exposure meters. Everyone can get used to referring to PVEM's. This Part 2, following the format of Part 1, has been commenced in ISO/TC 108/SC 3/WG1. As there is no formal ISO CEN joint working group then a CEN standard for Part 2 is not planned.

A short update on the ISO committee concerned in mechanical vibration, SC3 covered instrumentation in WG 1 and calibration in WG6. At the end of 2016 this sub-committee was disbanded and respectively these working groups moved directly to the technical committee ISO/TC 108 as WG 33 and WG 34 respectively from 1 January 2017.

First noted change in ISO 8041 Part 1. There is a new Section 13, Validation of one-off instruments. Many laboratories investigating human response to vibration need to evaluate specific parameters and this section ensures full traceability and the assessment of measurement uncertainty. Could this departure help a new part for the acoustic instrument standard?

Second change to note is in Section 14, Periodic verification. Many testing laboratories had feedback from their customers that the periodic verification, which needs to be carried out on a two-year cycle, was costing too much. The working group was tasked with simplifying the requirements and to this end many electrical tests have been reduced and mechanical vibration, with reduced test frequencies, is the specified test procedure.

Thirdly the Section 15, *In-situ* checks is now extended. The key new wording is: *In-situ* checks are intended for application in the field prior to and following a measurement or series of measurements. They act as a check of the instrument's basic calibration and functionality. The instrument documentation shall include instructions for routine *in-situ* checks.

This section now specifically states that: The instrument documentation shall define an *in-situ* check of vibration sensitivity. This shall include the following: a procedure for checking the mechanical vibration sensitivity of the vibration measuring instrument, to be carried out at the reference vibration value on the reference measurement range and at the calibration check frequency using the specified field vibration calibrator. For hand-arm vibration *in-situ* checks only, a check frequency of 159,15 Hz is permissible; the expected indication value can be derived from Table B.6.

A big change from the current practice and for those performing Whole-body measurements they may find they need to consider their current calibration instrumentation requirements. The Annex A has a slight change of title as it is now entitled *A specification for field vibration calibrator*. More on this later on.

Finally, in this short update, there is a completely new Annex to note. This is Annex I (informative) Guidelines for the estimation of the instrumental measurement uncertainty. This is the first stage in generating an uncertainty budget for any measurement. It is important to know your instrument and the conditions under which the transducer is working. As for the future it was recently proposed that CEN should consider a guidance document on measurement uncertainty. There is already, in English, a document *DIN SPEC 45660-2:2015-08 (E) Guide for dealing with uncertainty in acoustics and vibration - Part 2: Uncertainty of vibration quantities*. In September 2016 CEN/TC 231 *Mechanical vibration and shock* discussed the issue of measurement uncertainty informally but did not take a resolution relating to the general treatment of the uncertainty in vibration measurements.

Regarding the Field Vibration Calibrator, the Annex A is the only specification and the Table A.1 lists the reference values and frequencies as well as a procedure for Pattern Evaluation, then a comprehensive approach is required. Calibration is important to provide full traceability and therefore ISO/TC 108/WG 34 is developing a standard entitled *Methods for the calibration of vibration and shock transducers – Part 44: Calibration of field vibration calibrators*.

Having reviewed the situation there is no need to "think it out again", as in my last article which appeared in the January-February 2016 issue.

A new guidance document was published in June that will be of specific interest in those using instrumentation to assess health and safety. *ISO/TR 19664 - Human response to vibration — Guidance and terminology for instrumentation and equipment for the assessment of daily vibration exposure at the workplace according to the requirements of health and safety.*

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