

CTL DECISION SHEET (DSH)

Standard(s) (incl. year)	Subclause(s)	Tracking No.	Year
IEC 60065:2014 IEC 60950-1:2005/AMD 1:2009/ AMD2:2013	Click here to enter text.	DSH 2106	2018
Category			
TRON, OFF			
Subject	Keywords	Developed by	Approved at
Effectiveness of measuring instrument	- Measuring instrument - Measurement accuracy - Calibration - Uncertainty	WG1	2020 CTL Plenary Meeting

Question

There are three factors we deem necessary to consider in terms of accuracy when using measuring instruments.

1. Measurement accuracy of instrument specified by its manufacturer
2. Error of calibration
3. Uncertainty of calibration

Generally we mainly consider the first factor when first purchasing a measuring instrument and determining its conformity to OD-5014.

However, it is not clear which factor to consider after the first and annual calibrations of an instrument in order to check its effectiveness of accuracy according to OD-5014,

Do we have to consider all of the three factors, or only two of them, or just one factor?

We suggest the latter two factors (error of calibration and uncertainty of calibration) to be considered together. The following table is an example of a part of calibration report of a scale.

	Reference value	Indication of scale	Measurement uncertainty (95 % confidence level, $k=2$)
Mass	100 kg	99 kg	1 kg

Since the measurement result is $99 \text{ kg} \pm 1 \text{ kg}$ (95 % confidence level, $k=2$), maximum difference between the reference and the indication value is $100 \text{ kg} - 98 \text{ kg} = 2 \text{ kg}$. Therefore the measurement accuracy at 100 kg is $2 \text{ kg} / 100 \text{ kg} = 2 \%$, and this 2 % is applied to OD-5014 to check the effective accuracy of the scale.

Decision
<p>The first factor is relevant. The present practice in CTL is to apply the “accuracy method” (refer to Guide 115 par 4.4.3). In this method, the accuracy that is stated by the equipment manufacturer, as confirmed through calibration, is the value that is applied directly to the default accuracy criteria in OD 5014, or the equipment specification that may be given in the test standard, when selecting measuring equipment.</p>
Explanatory notes
<p>(DSH 251 was replaced by OD 5014)</p> <p>While there may be other factors in considering equipment selection, OD 5014 provides default accuracy when the test standard does not offer criteria for equipment.</p> <p>OD 5014 is not intended to address measurement uncertainty. When test results may be influenced significantly by the test equipment, the test standard is responsible for specifying the required accuracy or other selection criteria.</p> <p>With regard to measurement uncertainty, the customer must provide a decision rule where conformance statements are made, or the test method must identify measurement uncertainty as an equipment specification if MU is to be of value. Measurement uncertainties could be developed by laboratories, but there would be inconsistencies among laboratories concerning how measurement uncertainty is applied to test data when determining conformance. For example, would a 95% CI $k=2$ be required or is a lower CI / k factor acceptable? Is measurement uncertainty even considered with any results or conformance decisions?</p> <p>An example of general hierarchy for instrument selection criteria may be as follows:</p> <ol style="list-style-type: none">1) Equipment criteria as given in the test standard;2) Applicable equipment default accuracies (e.g. OD 5014)3) A best attainable accuracy determined by the testing laboratory (usually with agreement by the customer).