Operation of the CEPI-CTS and interpretation of the reports

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Participants

The CEPI-CTS is organized through three kinds of laboratories: Coordinating Labs (CLs) which prepare the samples, collect the results and calculate the reports. Distributing Labs (DLs) which purchase the samples sets from the CLs, distribute these to their national Clients, collect the client data and send this data to the CLs.

Additionally, use is made of Qualified Labs (QLs). For each property a number of QLs are selected, based on their experience and/or accreditation for that property. These QLs perform a pre-test that enables to calculate the CEPI Assigned Value and its associated Warning and Action Limits, as described under the Pre-test paragraph below.

Selection of materials

The sample material is selected by the CLs for each property such that the full scale of the testing instrument can be checked. For this two or more, mostly four, sets of samples are prepared per property. These materials are tested thoroughly by the CL to get an indicative range of values for each batch of samples. All samples of one level in one round must be from the same batch. From round to round the materials come from different batches and may differ in the indicative range.

Randomisation

After a batch of material is selected it is cut into the right size of samples for distribution and the samples are randomized. For this the CL stacks the samples three times on a different prime number of stacks between 11 and 31.

Pre-test and the Report A

Each CL prepares a Report A summarising the data issuing from the pre-test round, for all the properties for which it is responsible.

For each property, a pre-test is carried out by a meaningful number of QLs (preferably more than ten), which undertake to carry out the test exactly in accordance with the specified method or Standard. After the exclusion of any statistically improbable or unreliable results, using the Cochran and the Grubbs analysis on respectively the variance and the mean of the QLs results, the CEPI Assigned Value x_{pt} (the grand mean), and the standard deviation for proficiency assessment, σ_{pt}, between the QLs means are calculated. On the basis of this information, warning limits are set at $\pm$ 2,0 σ_{pt}

and action limits at ± 2,6 σ_{pt}, and information concerning these limits are given to the clients together with the sets of test pieces (see Handbook 6:1, Statistics treatment of measurement data).

An example is given in the following table.

CEPI Assigned Value	**CEPI standard deviation for proficiency assessment**	**Warning limits**	**Action limits**
x_{pt}	σ_{pt}	$x_{pt} \pm 2{,}0\ \sigma_{pt}$	$x_{pt} \pm 2{,}6\ \sigma_{pt}$
58,0	2,0	54,0 – 62,0	52,8 – 63,2

There is a statistical probability of only 1% that a laboratory carrying out the test correctly will lie outside the action limits. If the mean value obtained at your laboratory does lies outside the action limits you are in statistical terms an ”outlier” and you should take action to determine the cause and correct your procedures or your instrument accordingly.

If you lie within these extreme limits but outside the warning limits, you are a statistical ”straggler” and you should check your routines and instrument but not necessarily make any change. The statistical probability of lying outside the warning limits if the test is carried out correctly is 5%. It is also valuable to record and monitor your results in relation to the CEPI limits for a number of CEPI-CTS rounds in order to follow the long-term pattern of behaviour of your own procedures and equipment.

Main test and the Report H

The Report H shows the grand mean and total standard deviation of all client laboratory means.

The number of clients reporting results outside the CEPI action limits, outliers, is also indicated, but all the results are included in the calculation of the grand mean.

In addition, the results are shown in the form of a histogram illustrating the distribution of the client laboratories means; this histogram includes the results of all client laboratories. When the number of such client laboratories is not sufficient to obtain a meaningful histogram, QLs results are added to the histogram: if this is the case, this is mentioned in the Report H.

This enables you to see how your measurements compare with those at other laboratories and will help you to reach a decision as to what steps you should perhaps make to improve your measurements.

The report also provides useful data for the assessment of your measurement uncertainty and gives valuable background information of importance in trade relationships between buyer and seller, indicating the variations normally prevailing among different laboratories when a test is carried out.