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DICTIONARY OF METROLOGY

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Aa

ADJUSTMENT (OF A MEASURING INSTRUMENT)

The act of bringing a measuring instrument to a state of operation corresponding to its intended use.

NOTE: Adjustment may be automatic, semi-automatic or manual.

AUTOMATIC ADJUSTMENT

A set of operations to bring a measuring instrument to a state of operation corresponding to its intended use carried out without operator intervention.

ACCREDITATION

is a formal confirmation of competence of a given body by a third party to perform specific tasks within the scope of conformity assessment. The only institution in Poland entitled to grant accreditation to laboratories is the **Polish Centre for Accreditation** (PCA).

An accredited laboratory must meet system and technical requirements included in **PN-EN ISO/IEC 17025** "General requirements for the competence of testing and calibration laboratories." These requirements are systematically evaluated during audits conducted by the certification body (PCA).

The main benefits of accreditation are increased confidence in the results and the removal of international barriers.

ACCURACY OF MEASUREMENT

The degree of conformity of the result of a measurement with the true value of the measurand.

NOTES:
1. The term 'accuracy' is qualitative in nature.
2. The term 'precision' should not be used instead of 'accuracy.'

ACCURACY OF A MEASURING INSTRUMENT

The property of a measuring instrument of providing a value close to the true value.

ACCURACY CLASS

A class of measuring instruments that meet specific metrological requirements and whose errors are contained within prescribed limits.

NOTE: Accuracy class is generally indicated by a conventionally accepted number or sign and called a class designation.

Bb

BIAS (OF A MEASURING INSTRUMENT)

Systematic error in the indication of a measuring instrument.

NOTE:
Bias is usually determined by averaging the indication error of an appropriate number of repeated measurements.

Cc

CALIBRATION CERTIFICATE

is a document issued during the manufacturing process of a meter, confirming metrological properties and maintaining measurement coherence.

CORRECTED RESULT

The result of the measurement after correction for systematic error.

CALIBRATION CERTIFICATE ISSUED BY A LABORATORY

Proof that certifies the metrological characteristics of a calibrated measuring instrument.

In other words, a calibration certificate is a document that defines the relationship between a standard and an indication of an instrument and provides the uncertainty of measurement. When calibrating measuring instruments, the uncertainty of measurement should be estimated in accordance with the document EA-4/02 (“Determination of Uncertainty of Measurement in Calibration”). It is a guide that unifies the requirements for the expression of the uncertainty of measurement throughout Europe.

CORRECTION

The algebraic value added to the raw measurement result to compensate for the systematic error. The correction is equal to the value of the estimated systematic error with the opposite sign.

CALIBRATION

An operation that, under specified conditions, in a first step establishes a relationship between the values represented by a measurement standard together with their uncertainties of measurement and the corresponding indications together with their uncertainties, and in a second step uses this information to establish a relationship to obtain the measurement result from the indication (2.39 PKN-ISO/IEC Guide 99:2010-VIM 2010).

The calibration process consists of comparing the indication of the calibration instrument with the indication of the calibrated instrument. A calibration instrument should be significantly more accurate than a calibrated instrument.

Dd

DECLARATION OF VERIFICATION

A document issued for equipment that is not of a calibration nature and therefore not subject to calibration. The appropriate form of control for this type of instrument is verification.

DEVIATION

The difference between a given value and a reference value.

DRIFT

Slow change in the metrological characteristics of a measuring instrument.

DISPLAYING (MEASURING) INSTRUMENT, INDICATING (MEASURING) INSTRUMENT, METER

A measuring instrument by which an indication is obtained.

Ee

ERROR (OF INDICATION) OF A MEASURING INSTRUMENT

The indication of a measuring instrument minus the true value of the relevant input value.

ERROR OF MEASUREMENT

The difference between the result of a measurement and the true value of the measurand.

Ii

INTRINSIC ERROR (OF A MEASURING INSTRUMENT)

Error of a measuring instrument determined under reference conditions.

INDICATION (OF A MEASURING INSTRUMENT)

Value displayed by a measuring instrument.

INTERNATIONAL (MEASUREMENT) STANDARD

A unit standard recognised by international agreement as the basis for assigning values to other unit standards.

Ll

LEGALIZATION

In accordance with the Act of 11 May 2001 – Law on Measures (Journal of Laws of 2004, No. 243, item 2441, as amended) legalization is a set of activities comprising verification, statement and certification with a verification document, that a measuring instrument meets the requirements. The verification evidence, which confirms that verification has been carried out, is the verification certificate or the verification mark placed on a measuring instrument.

LIMITING CONDITIONS

Extreme conditions that a measuring instrument should withstand without damage and degradation of its specified metrological characteristics when subsequently used under rated operating conditions.

NOTES:
1. Limiting conditions may vary for storage, transport and operation.
2. Limiting conditions may include limitations of the value of the measurand and influencing values.

Mm

METHOD OF MEASUREMENT

Logical sequence of operations performed during a measurement, described in general terms.

METROLOGY

The science of measurement.

MANUAL ADJUSTMENT

A set of operations to bring a measuring instrument to a state of operation corresponding to its intended use carried out with the intervention of the operator.

MEASURING SYSTEM

The complete set of measuring instruments and other assembled devices intended to perform a specific measurement. E.g. calibration apparatus.

MEASUREMENT PROCEDURE

A set of operations described in detail and carried out when making measurements according to a particular method.

NOTE:
Measurement procedure is usually described in a document that itself is called “measurement procedure” (or “measurement method”) and which is sufficiently detailed that the operator can carry out the measurement without needing additional information.

MEASURAND

A specified quantity that is the subject of measurement.

MAXIMUM BOUNDARY ERRORS (OF A MEASURING INSTRUMENT)

The maximum error allowed by the technical conditions or requirements for a measuring instrument.

MEASUREMENT

Set of operations to determine the value.

MEASURING RANGE, WORKING RANGE

The set of values of a measurand for which the error of a measuring instrument is assumed to be within specified limits.

Nn

NATIONAL (MEASUREMENT) STANDARD

A unit of measurement standard officially recognised in a country as the basis for assigning values to other unit standards.

Pp

PRIMARY STANDARD

Standard of a unit of measurement that is established or generally recognised as being of the highest metrological quality and whose value is accepted without reference to other standards of the same value.

Rr

REPRODUCIBILITY (OF RESULTS OF MEASUREMENTS)

The degree of conformity between the results of measurements of the same measurand made under different conditions of measurement.

1. For the expression of reproducibility to be unambiguous, all the conditions subject to change must be specified.

2. Conditions subject to change may include:
   - principle of measurement,
   - method of measurement,
   - observer,
   - measuring instrument,
   - reference etalon,
   - location,
   - conditions of use,
   - time.

3. Reproducibility may be quantified by the scatter characteristics of the results.

4. The results considered are usually the corrected results.

REPEATABILITY (OF A MEASURING INSTRUMENT)

The property of a measuring instrument that its readings are close to each other when the same measurand is measured repeatedly under the same measurement conditions.

NOTES:

1. these conditions include:
   - reducing to a minimum the variation caused by the observer,
2. the same measurement procedure,
3. the same observer,
4. the same measuring instrument used under the same conditions,
5. the same location,
6. repetition over a short time,
7. repeatability may be quantified by the scatter characteristics of the results.

REFERENCE VALUE

The value that provides a basis for comparison with values of the same kind. It is important in assessing the accuracy of measurements.

REFERENCE STANDARD

A standard of measurement of the highest metrological quality available in a particular location or organisation, which serves as the reference for measurements taken there.

REPEATABILITY (OF RESULTS OF MEASUREMENTS)

The degree of conformity between the results of successive measurements of the same measurand made under the same measurement conditions.

NOTES:

1. These conditions are called repeatability conditions.
2. Repeatability conditions include:
   - the same measurement procedure,
   - the same observer,
   - the same measuring instrument used under the same conditions,
   - the same location,
   - repetition at short intervals.
3. Repeatability may be quantified by the scatter characteristics of the results.

RESULT OF MEASUREMENT

The value attributed to the measurand obtained by measurement.

NOTES:

1. When a result is given, it should be clearly indicated whether it refers to:
   - indication
   - raw result
   - corrected result and whether it is an average obtained from multiple observations.
2. The total expression of the result of the measurement includes the uncertainty of measurement.

RATED OPERATING CONDITIONS

Conditions of use for which the specified metrological characteristics of a measuring instrument are assumed to be within specified limits.

REFERENCE CONDITIONS

Conditions of use intended for testing a measuring instrument or comparison of measurement results.

RESPONSE TIME

The time interval between the moment when the input signal undergoes a sudden, specified change and the moment when the output signal reaches and retains a determined final value within specified limits.

RELATIVE ERROR (OF MEASUREMENT)

The ratio of the error of measurement to the true value of the measurand.

RESOLUTION (OF A DISPLAYING DEVICE)

The smallest difference in the indication of a displaying device that can be perceived clearly.

RANDOM ERROR

The difference between the result of a measurement and the average of an infinite number of measurements of the same measurand made under repeatability conditions.

NOTES:
1. Random error is equal to error of measurement minus Systematic Error.
2. Since only a finite number of measurements can be made, therefore only an estimate of the random error can be obtained.

Ss

STABILITY

The ability of a measuring instrument to maintain stable metrological characteristics over time.

SENSITIVITY

The quotient of the response increment of a measuring instrument the corresponding increment of the input signal.

SEMI-AUTOMATIC ADJUSTMENT

A set of operations to bring a measuring instrument to a state of operation to its intended use carried out partially without operator intervention.

SYSTEMATIC ERROR

The difference between the average of an infinite number of measurements of the same measurand made under repeatability conditions and the true value of the measurand.

NOTES:
1. Systematic error is equal to error of measurement minus random error.
2. error and its causes cannot be known exactly, as in the case of the true value.

SECONDARY STANDARD

A standard of a unit of measurement whose value is established by comparison with a primary standard of the same quantity.

(MEASUREMENT) STANDARD

A standard of measurement, measuring instrument, reference material or measuring system intended to define, implement, preserve or reproduce a unit of measurement or one or more values and serving as a reference.

Tt

TRACEABILITY

The property of a measurement result or unit standard that can be associated with specific references, usually national or international unit standards, through an unbroken chain of comparisons, all of which have specific uncertainties.

NOTES:
1. The concept is sometimes expressed by the adjective “consistent.”
2. An unbroken chain of comparisons is called a chain of linkages.
3. The way in which the linkage to the measurement unit standard is realised is called referencing to the measurement unit standard or referencing to etalons.

TRANSFER STANDARD

A unit standard used as an intermediary to compare unit standards.

Uu

UNCERTAINTY OF MEASUREMENT

Parameter associated with the result of a measurement that characterises the scatter of the values that can reasonably be attributed to the measurand.

It may be, for example, the standard deviation (or a multiple thereof) or half of the width of the interval corresponding to a specified confidence level. Uncertainty of measurement generally includes many components. Some of them can be determined from the statistical distribution of the results of a series of measurements and characterised by the experimental standard deviation. Other components, which may also be characterised by standard deviations, are estimated from assumed probability distributions based on experience or other information. It is assumed that the result of measurement represents the best estimate of the value of the measurand and that all uncertainty components, including those occurring due to systematic effects, such as components occurring due to corrections or reference etalons, contribute to the scatter.

This definition is taken from the “Guide to the expression of uncertainty in measurement” (“Przewodnik do wyrażania niepewności pomiaru” *) where the basis of the definition is presented in detail (see in particular section 2.2.4 and Appendix D [10]). *) See Literature [10] (GUM note).

USER ADJUSTMENT (OF A MEASUREMENT INSTRUMENT)

Adjustment in which only the means at the user's disposal are used.

UNCORRECTED RESULT

The result of measurement before the systematic error correction.

Ww

WORKING STANDARD

A standard of measurement unit usually used for calibration or checking measurement standards, measuring instruments or reference materials.

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