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Glossary of

Terms used in metrology (incorporating BS 2643)

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Foreword

This glossary, having been prepared under the direction of the Quality, Management and Statistics Standards Committee, supersedes BS 5233:1975 and BS 2643:1955, both of which are withdrawn.

The majority of the terms in this glossary have been taken unchanged from the International Vocabulary of basic and general terms in metrology (available from BSI as PD 6461-1:1985). These terms have reference numbers consisting of two groups of numbers (e.g. 4.11) which are the same as those of the terms in the International Vocabulary. Other terms have reference numbers consisting of three groups (e.g. 5.24.2) and are additional to the terms in the International Vocabulary. Most of the notes following the definitions are taken directly from the International Vocabulary; however, some additional notes have been added and these are marked with an asterisk(*).

All terms which are defined, together with some terms in the definitions and notes, are printed in italics; this means that they appear in the index.

The use of parentheses (...) around words of some terms means that these words may be omitted if it is unlikely that this will cause confusion.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 25 and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

Section 1. Quantities and units

No.	Term	Definition
1.01	(measurable) quantity	An attribute of a phenomenon, body or substance, which may be distinguished qualitatively and determined quantitatively. NOTE 1 The term “quantity” may refer to a <i>quantity</i> in a general sense [see examples a)] or to a specific <i>quantity</i> [see examples b)]. NOTE 2 Quantities that are mutually comparable, also called <i>quantities of the same kind</i>, may be grouped together into <i>categories of quantities</i>, for example: work, heat, energy; thickness, circumference, wavelength. NOTE 3 <i>Symbols for quantities</i> are given in ISO 31. Examples: a) <i>quantities</i> in a general sense: length, time, mass, temperature, electrical resistance; b) specific <i>quantities</i>: length of a particular rod, electrical resistance of a particular wire.
1.02	base quantity	One of the <i>quantities</i> which, in a <i>system of quantities</i> , are conventionally accepted as independent of each other.
1.03	derived quantity	A <i>quantity</i> defined, in a <i>system of quantities</i> , as a function of <i>base quantities</i> of that system.
1.04	dimension of a quantity	An expression which represents a <i>quantity</i> of a system of <i>quantities</i> as the product of powers of the <i>base quantities</i> of the system. Example: LMT^{-2} is the dimension of force in the system of <i>quantities</i> length, mass and time (l, m, t).
1.05	dimensionless quantity	A <i>quantity</i> in the expression of which the exponents of the <i>base quantities</i>, in a given system, are zero. Examples: linear strain, coefficient of friction, refractive index are <i>dimensionless quantities</i> in the system of <i>quantities</i> l, m, t.
1.06	unit (of measurement)	A specific <i>quantity</i> , adopted by convention, used to express quantitatively <i>quantities</i> which have the same dimension.
1.07	symbol of a unit (of measurement)	A conventional sign designating a <i>unit of measurement</i>. Examples: a) m is the symbol for metre; b) A is the symbol for ampere.
1.08	system of units (of measurement)	A set of <i>units</i> established for a given system of <i>quantities</i>. NOTE A <i>system of units</i> comprises a set of chosen <i>base units</i>, together with <i>derived units</i> determined by their defining equations and proportionality factors. Examples: a) <i>International System of Units, SI</i>; b) CGS system of units.
1.09	coherent system of units (of measurement)	A <i>system of units</i> composed of a set of <i>base units</i> and <i>coherent derived units</i>. Example: the following <i>units</i> (expressed by their symbols) form part of the <i>coherent system of units</i> in mechanics within the <i>International System of Units, SI</i>: m; kg; s; m^2; m^3; $\text{Hz} = \text{s}^{-1}$; m s^{-1}; m s^{-2}; kg m^{-3}; $\text{N} = \text{m kg s}^{-2}$; $\text{Pa} = \text{kg m}^{-1} \cdot \text{s}^{-2}$; $\text{J} = \text{kg m}^2 \cdot \text{s}^{-2}$; $\text{W} = \text{kg m}^2 \cdot \text{s}^{-3}$.

No.	Term	Definition
1.10	International System of Units, SI	The <i>coherent system of units</i> adopted and recommended by the General Conference on Weights and Measures (CGPM). NOTE The SI is based at present on the following seven <i>base units</i>: - the metre, unit of length - the kilogram, unit of mass - the second, unit of time - the ampere, unit of electric current - the kelvin, unit of thermodynamic temperature - the mole, unit of amount of substance - the candela, unit of luminous intensity
1.11	base unit (of measurement)	A <i>unit of measurement</i> of a <i>base quantity</i> in a given system of <i>quantities</i> .
1.12	derived unit (of measurement)	A <i>unit of measurement</i> of a <i>derived quantity</i> in a given system of <i>quantities</i>. NOTE 1 In a given <i>system of units</i>, a <i>derived unit</i> can be expressed in terms of <i>base units</i> and proportionality factors. NOTE 2 Some <i>derived units</i> have special names and symbols: for example, in the SI: - newton (N), unit of force; - joule (J), unit of energy; - volt (V), unit of electric potential.
1.13	coherent unit (of measurement)	A <i>derived unit of measurement</i> which is expressed in terms of <i>base units</i> by a formula in which the proportionality factor is 1. NOTE This term is an abbreviation of the more exact denomination “<i>derived unit of measurement in a coherent system of units</i>”, for, with an isolated <i>unit</i>, the concept of coherence is meaningless. Example: the newton is the <i>coherent unit</i> of force in the SI: $1 \text{ N} = 1 \text{ Kg m s}^{-2}.$
1.14	off-system unit (of measurement)	A <i>unit of measurement</i> which does not belong to a given <i>system of units</i>. Examples: a) the electronvolt ($1.602 \text{ } 19 \times 10^{-19} \text{ J}$) is an <i>off-system unit</i> of energy with respect to the SI; b) day, hour, minute are <i>off-system units</i> of time with respect to the SI.
1.15	multiple of a unit (of measurement)	A larger <i>unit of measurement</i> which is formed from a given <i>unit</i> according to scaling conventions. Examples: a) one of the decimal multiples of the metre is the kilometre; b) one of the non-decimal multiples of the second is the hour.
1.16	sub-multiple of a unit (of measurement)	A smaller <i>unit of measurement</i> which is formed from a given <i>unit</i> according to scaling conventions. Example: one of the decimal sub-multiples of the metre is the millimetre.
1.17	value (of a quantity)	The expression of a <i>quantity</i> in terms of a number and an appropriate <i>unit of measurement</i>. Examples: 5.3 m; 12 kg; -40°C.
1.18	true value (of a quantity)	The <i>value</i> which characterizes a <i>quantity</i> perfectly defined, in the conditions which exist when that <i>quantity</i> is considered. NOTE The <i>true value</i> of a <i>quantity</i> is an ideal concept and, in general, cannot be known exactly. Indeed, quantum effects may preclude the existence of a unique <i>true value</i>.

No.	Term	Definition
1.19	conventional true value (of a quantity)	A <i>value of a quantity</i> which, for a given purpose, may be substituted for the <i>true value</i>. NOTE A <i>conventional true value</i> is, in general, regarded as sufficiently close to the <i>true value</i> for the difference to be insignificant for the given purpose. Example: within an organization, the <i>value</i> assigned to a <i>reference standard</i> may be taken as the <i>conventional true value</i> of the <i>quantity</i> realized by the standard.
1.20	numerical value (of a quantity)	The number in the <i>value of a quantity</i>. Examples: In the examples in 1.17, the numbers: 5.3; 12; – 40.
1.21	reference-value scale (of a quantity or property)	For a given <i>quantity</i> or property, a series of <i>values</i> determined in a defined manner and adopted by convention. Examples: a) the International Practical Temperature Scale based on the freezing and boiling points of a series of specified pure substances and on the use of specified <i>measuring instruments</i> and interpolation formulae; b) the Mohs hardness scale based on the hardnesses of a series of specified minerals; c) the Richter earthquake scale.

Section 2. Measurements

No.	Term	Definition
2.01	measurement	The set of operations having the object of determining the <i>value of a quantity</i> .
2.02	metrology	The field of knowledge concerned with <i>measurement</i> . NOTE <i>Metrology</i> includes all aspects both theoretical and practical with reference to <i>measurements</i> , whatever their level of accuracy, and in whatever fields of science or technology they occur.
2.02.1	legal metrology	That part of <i>metrology</i> which treats of <i>units of measurement</i> , <i>methods of measurement</i> and of <i>measuring instruments</i> , in relation to the mandatory technical and legal requirements which have the object of ensuring a public guarantee from the point of view of the security and of the appropriate <i>accuracy of measurements</i> . NOTE This term is taken from PD 6461-2.
2.03	static measurement	The <i>measurement</i> of a <i>quantity</i> whose <i>value</i> can be considered constant for the duration of the <i>measurement</i> . NOTE The qualifier “static” applies to the <i>measurand</i> and not to the <i>method of measurement</i> .
2.04	dynamic measurement	The determination of the instantaneous <i>value of a quantity</i> and, where appropriate, its variation with time. NOTE The qualifier “dynamic” applies to the <i>measurand</i> and not to the <i>method of measurement</i> .
2.05	principle of measurement	The scientific basis of a <i>method of measurement</i> . <i>Examples:</i> a) the thermoelectric effect applied to the <i>measurement</i> of temperature; b) the Josephson effect applied to the <i>measurement</i> of voltage; c) the Doppler effect applied to the <i>measurement</i> of velocity.
2.06	method of measurement	The set of theoretical and practical operations, in general terms, involved in the performance of <i>measurements</i> according to a given principle.
2.07	measurement procedure	The set of theoretical and practical operations, in detailed terms, involved in the performance of <i>measurements</i> according to a given method.
2.08	measurement process	All the information, equipment and operations relevant to a given <i>measurement</i> . NOTE This concept embraces all aspects relating to the performance and quality of the <i>measurement</i> ; it includes for example the principle, method, procedure, <i>values of the influence quantities</i> and the <i>measurement standards</i> .
2.09	measurand	A <i>quantity</i> subjected to <i>measurement</i> . NOTE As appropriate, this may be the <i>measured quantity</i> or the <i>quantity to be measured</i> .
2.10	influence quantity	A <i>quantity</i> which is not the subject of the <i>measurement</i> but which influences the <i>value</i> of the <i>measurand</i> or the <i>indication of the measuring instrument</i> . <i>Examples:</i> ambient temperature; frequency of an alternating measured voltage.

No.	Term	Definition
2.11	transformed value (of a measurand)	A <i>value of a quantity</i> which represents the <i>measurand</i> and which is functionally related to it. NOTE The <i>transformed value</i> may be internal to a <i>measuring system</i> or may be provided as an output from the system. Examples: a) the <i>value</i> of the electrical output signal of a pressure transducer; b) an <i>indication</i> of a measured force as “per cent of full load”; c) the <i>value</i> represented by a binary train within a digital electronic system or computer.
2.12	measurement signal	A representation of a <i>measurand</i> within a <i>measuring system</i>. NOTE The input signal to a <i>measuring system</i> may be called the <i>stimulus</i>; the output signal may be called the <i>response</i>.
2.13	direct method of measurement	A <i>method of measurement</i> in which the <i>value</i> of a <i>measurand</i> is obtained directly, rather than by <i>measurement</i> of other <i>quantities</i> functionally related to the <i>measurand</i>. NOTE The <i>method of measurement</i> remains direct even if it is necessary to make supplementary <i>measurements</i> to determine the <i>values of influence quantities</i> in order to make corresponding corrections. Examples: a) <i>measurement</i> of a length using a graduated rule; b) <i>measurement</i> of a mass using an equal-arm balance.
2.14	indirect method of measurement	A <i>method of measurement</i> in which the <i>value</i> of a <i>measurand</i> is obtained by <i>measurement</i> of other <i>quantities</i> functionally related to the <i>measurand</i>. Examples: a) <i>measurement</i> of a pressure by <i>measurement</i> of the height of a column of liquid; b) <i>measurement</i> of a temperature using a resistance thermometer.
2.15	fundamental method of measurement	A <i>method of measurement</i> in which the <i>value</i> of a <i>measurand</i> is determined by <i>measurement</i> of the appropriate <i>base quantities</i>.
2.16	definitive method of measurement	A <i>method of measurement</i> of a <i>quantity</i> in accordance with a definition of the <i>unit</i> of that <i>quantity</i>.
2.17	direct-comparison method of measurement	A <i>method of measurement</i> in which the <i>measurand</i> is compared directly with a <i>quantity</i> of the same kind having a known <i>value</i>. Example: <i>measurement</i> of a length using a graduated rule.
2.18	substitution method of measurement	A <i>method of measurement</i> in which the <i>measurand</i> is replaced by a <i>quantity</i> of the same kind, of known <i>value</i>, and chosen so that the effects on the <i>indicating device</i> are the same. Example: determination of a mass by means of a balance and known masses using the Borda substitution method.