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Country Code[1]	Clause	Paragraph/ Figure/Table	Type of comment[2]	Comments	Proposed change	Convener's responses
0001 **ILAC**	2.1		te	The notes now occupy 13 lines (was 5 in VIM3) while the definition only 2 lines. That is an unacceptable development, if those notes indeed are needed to understand what something that obvious as a measurement is. Actually all those notes does make the definition of the term in-operational.	Consider the number of notes here and if they add value. On the ILAC side we have never had a need for any of the notes except the one relating to nominal properties. Delete however also the last part of the sentence starting with "where the process….. is called "examination" as this relates to what is happening with chapter 6.	Consideration given, but these Notes are found to add value. Disagree about "examination" since this just provides cross-reference to Chapter 6.
0002 **ILAC**	2.1	definition	ed	In the definition of "measurement", it is recommended to use "individual quantity" instead of "quantity" and consequently delete Note 1. If this distinction is maintained	Change to: "process of experimentally obtaining one or more values that can reasonably be attributed to an individual quantity……"	Disagree. Note 1 addresses this, and 1.1 now provides a single definition of 'quantity'.
0003 **ISO 209** **0004**	2.1	definition	te	No value can be attributed to "other available relevant information"	Change to…obtaining one or more values together with any other available information that can be attributed to a quantity…	Disagree. A value is not meant to be attributed to "other available information". Rather, the "other available relevant information" is meant to elaborate on what is believed to be known about the values obtained empirically. "together with any other available information" is used to be in parallel with the same phrase in 'measurement result'.
0005 **ILAC**	2.1	definition & note	ed	poor construction: reads as "process… together with any other available relevant information" This qualifier was not previously needed	delete "together with any other available relevant information" and delete Note 2. Consider defining as "process of experimentally obtaining one or more measurement results"	Disagree. 'measurement result' already includes the phrase proposed to be deleted. Further, the proposed new definition would be circular with 'measurement result'.
0006 **ISO 210** **0008**	2.1	Note 1	te	measurement process of experimentally obtaining one or more values that can reasonably be attributed to a quantity together with any other available relevant information	This definition is correctly excluding that a "value" is an "individual quantity", as stated in NOTE 1.And Note 1	Noted. It is not clear what is being proposed however? (This comment seems to confirm VIM4 1CD wording.)
0007 **RNMF_FR** **0040** **RNMF_FR**	2.1	Note 1	te	See comment on "general" and "individual" §1.1	To remove note 1 if only quantity	Disagree. "individual quantity" is used in Note 1 and the Table in 1.1.
0009 **IUPAC**	2.1	Note 2	ed	'may' in inappropriate context	change 'may to 'can'	Accepted.
0010 **ISO 211**	2.1	Note 3	ge	With this Note that confuses measurement and examination, the central notion of the VIM (MEASUREMENT) is unnecessarily blurred.	NOTE 3 should be deleted.	Disagree. This Note highlights that there are sometimes different uses of the term "measurement".

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0011 **ISO 212** **0013**	2.1	Note 4	te	NOTE 4 Measurement requires both experimental comparison of quantities or experimental counting of entities at some step of the process and the use of models and calculations that are based on conceptual considerations.	Quantities are not also “entities” “e.g. Table in 1.1; 2.25 Note 6; 6.4 Note 1. If not “entity” should be defined.	Disagree. This Note does not say that quantities are the same thing as countable entities.
0012 **IUPAC**	2.1	Note 4	te	The note is hard to read, not very helpful, and does not relate to the use of the term ‘measurement’	delete note 4	Disagree. The Note has been edited, but very much relates to ‘measurement’.
0014 **ISO 213** **0017**	2.1	Note 5	te	“Moreover, a maximum permissible error and/or a target uncertainty may be specified, […].” In the given context, the “error” would correspond to a “measurement error”. The term “target uncertainty” gives the erroneous impression that a laboratory should aim for a measurement uncertainty as close as possible to the target uncertainty (see further comment related to 3.10).	Please replace by: “Moreover, a maximum permissible measurement error and/or an uncertainty limit may be specified, […].”	Perhaps, but an ‘uncertainty limit is not defined, whereas a ‘target uncertainty’ is.
0015 **IUPAC**	2.1	Note 5	te	Recommendation on practice of measurement included in Notes to Entry for definition of term	At the end, delete “, and the measurement procedure and the measuring system should then be chosen in order not to exceed these measuring system specifications.”	Accepted.
0016 **IUPAC**	2.1	Note 5	ed	‘may’ in inappropriate context	change ‘may to ‘can’	Accepted.
0018 **ISO 214** **0020**	2.1 and 2.3		te	Why not write “individual quantity” in the definition and avoid NOTE 1?	Write “individual quantity” in the definition, delete NOTE 1, and reorder the notes.	Disagree. Note 1 addresses this, and 1.1 now provides a single definition of ‘quantity’.
0019 **ISO 215**	2.1		te	2.1 [VIM3: 2.1; VIM2: 2.1; VIM1: 2.01] measurement process of experimentally obtaining one or more values that can reasonably be attributed to a quantity together with any other available relevant information. Consider using the definition of verification from ISO 9000:2015 Quality management systems — Fundamentals and vocabulary: 3.11.4 measurementprocess (3.4.1) to determine a value Note 1 to entry: According to ISO 3534-2, the value determined is generally the value of a quantity. Note 2 to entry: This constitutes one of the common terms and core definitions for ISO management	Consider using the definition of measurement used in ISO 9000:2015	Disagree. The proposed replacement definition is for ‘verification’, not ‘measurement’, which is not appropriate.

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				system standards given in Annex SL of the Consolidated ISO Supplement to the ISO/IEC Directives, Part 1. The original definition has been modified by adding Note 1 to entry.		
0021 ISO 216 0025 IEC-DE 28	2.2		ed	The wording of the Note should be improved.	Write "... and the field of application is."	Partially accepted. Changed to "... and the field of application may be."
0022 ISO 217	2.2		ed	"Science of measurement and its application" – in some secondary literature and in attempts to translate, it can be seen that some of these authors do not understand to which noun the word "its" refers. Please make this clearer	Suggest to reword:"Science of measurement and the application of this science."	Partially accepted. New definition clarifies this.
0023 NMIJ3	2.2	definition	ed	We couldn't identify the meaning of definition whether "science of (measurement and its association)" or "(science of measurement) and (its application)".	Clarify the definition.	Partially accepted. New definition clarifies this.
0024 RNMF_FR	2.2	definition	ed	One may assume that there are many applications of metrology and not only one.	To modify "Application" in "applications "Science of measurement and its applications (will be required in FR)	Accepted.
0026 ILAC	2.3		te	This definition is straight forward. The need for neither notes nor examples is not seen. They actually reduce the strength of the definition and creates more confusion than help. The word "intended" tells it all.	Consider the number of notes here and if they add value.	Considered. No specific proposal.
0027 ISO 218 0035 ISO 223 0036 0038 0052	2.3		ed	Note 3 concerns only special cases ("in some cases") and should therefore be listed as the last note.	Move it to the end.	Disagree. This Note is important to the nominal properties community.
0029 ILAC	2.3	definition	ed	In the definition of "measurand", it is recommended to use "individual quantity" instead of "quantity" and consequently delete Note 1. (If "individual quantities" are maintained.)	individual quantity intended to be measured	Disagree. As-written keeps the definition simpler. "individual quantity" is maintained in Note 1 and Table in 1.1.

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0030 ISO 220 0032	2.3	definition	te	It is striking that the VIM seems to have no interest in what actually measured: It has a definition of what is intended to be measured, but misses a definition of what is actually measured.	Add a definition of what is actually measured.	Disagree. An interesting idea, but this has never been introduced in earlier editions of the VIM, and might lead to confusion. What would it be called?
0031 RNMF_FR	2.3	definition	te	Note 1: what is “individual quantity”? Is it applied to the phenomenon, body or substance or to the result?	-	No proposal given. See 1.1 for what an ‘individual quantity’ is.
0033 ISO 221 0068 ISO 232	2.3	Examples	ge	The V4 notes around "measurand" created some amount of confusion with myself and my staff. Constraining to "quantity to be measured" only is an improvement to the definition. However, the additional notes muddied the general clarity.	If possible, can an example be added (or existing one revised) for clarity such that it addresses the constraint of the definition? It would be helpful to have an additional example, or counter-example to reinforce note 2. For instance, example 1 might be worded for clarity as: EXAMPLE 1: The potential difference between the terminals of a battery may decrease when using a voltmeter with a significant internal conductance to perform the measurement. A valid (or adequately defined?) measurand would account for the internal resistances of the battery and the voltmeter, thus allowing the open-circuit potential difference to be calculated from such resistances by applying suitable theoretical considerations.	Partially agree. New wording has been added to provide elaboration.
0041 ISO 224 0047	2.3	Note 2	te	Measurand quantity intended to be measured NOTE 2 The specification of a measurand requires knowledge of the kind of quantity, description of the state of the phenomenon, body, or substance carrying the quantity, including any quantity having a relevant effect on the quantity being measured, and, if required, the chemical entities involved.	Proposal of a new clause State (2.3, 4.19), Condition (2.3): a quantity can be in different “states” or “conditions”, meaning that some attributes of its property can be ‘out-of-reference’, e.g., non-calibrated. This has an effect on the measurement results, and is typical of cases when a “correction” is needed. See the Reference in comment ISO 008:Reference: F. Pavese: “On the classification in random and systematic effects”, AMCTM XI, 2018, in A.B. Forbes, N.F. Zhang, A.G. Chunovkina, S. Eichstädt, F. Pavese, (Eds.): "Advanced Mathematical and Computational Tools in Metrology and Testing XI”, vol.11, Series on Advances in Mathematics for Applied Sciences vol 89, World Scientific, Singapore, October 2018, pp. 58–69	Disagree. It is not clear what is being proposed; no specific proposal is provided.
0042 ISO 225 0048	2.3	Note 2	te	The definition of “measurand” refers explicitly to the quantity intended to be measured. In that context, the following statement does not seem to fit: “[…] any quantity having a relevant effect on the quantity being measured” Indeed, there is always a risk that the	Please change to:“[…] any quantity having a relevant effect on the quantity intended to be measured”	Accepted.

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				quantity which is actually being measured differs from the (target) measurand (quantity intended to be measured). This is of course an unknown uncertainty and hence it is impossible to specify any quantity that may affect the quantity that is being measured.		
0043 IUPAC	2.3	Note 2	te	The note is unrelated to use of the defined term	delete Note 2	Disagree. The Note elaborates on things that need to be considered/specified when defining a measurand.
0044 IUPAC	2.3	Note 2	ed	The note seems to overstate the requirement.	Insert “typically” before “requires”	Accepted.
0045 IUPAC	2.3	Note 2	ed	“state” unclear (liquid, gas??) This probably relates to any necessary measurement conditions rather than the physical state In addition, since an individual quantity will already relate to a specific substance, body, phenomenon etc, there is no need to list these possibilities	Change to The specification of a measurand typically requires specification of the kind of quantity and the specification of any conditions (such as temperature) having a relevant effect on the measurand	Disagree. Proposed rewording is less clear, including why temperature should be regarded as a “condition”.
0046 IUPAC	2.3	Note 2	ed	The reference to chemical entities, while welcome from a chemical perspective, might not be necessary (the kind of quantity would usually cover that for a particular measurement – eg “concentration of lead”) but more importantly begs the question of why the note does not mention at least biological entities, and perhaps particle type in particle counting, vehicle type in auto engineering and many others.	Either add ‘or biological’ after ‘chemical’ or remove “and, if required, the chemical entities involved”.	Accepted.
0049 UO	2.3	Note 2	General	Although ‘kind of quantity’ is an option, is there a reason for not using ‘general quantity’?	“...knowledge of the general quantity, description...”	Accepted, since ‘kind of quantity’ is no longer a VIM4 entry.
0050 ISO 226 0058 EC-065	2.3	Note 3	ge	“ISO REMCO refers to this as an operationally defined measurand […].”ISO REMCO may not be understood by all readers. Additionally, REMCO is being converted into a Technical Committee (ISO/TC 334).	Please consider replacing the given sentence by: “For instance, related to reference material this is referred to as operationally defined measurand (see ISO 17034:2016, General requirements for the competence of reference material producers, definition 3.7).”	Partially accepted. See revised wording.
0051 ISO 227 0057	2.3	Note 3	te	In addition to the terms “operationally defined” and procedure defined” measurands, also the term method-defined is commonly used.	Please consider mentioning that “method-defined measurand” has an equivalent meaning to “operationally defined” and “procedure defined” measurand.	Partially accepted. “or method” is added after “procedure”.

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0054 IUPAC	2.3	Note 3	ed	Unnecessary word; definition by reference to a procedure is not “additional” – it is the whole definition	delete “additionally”	Accepted.
0055 IUPAC	2.3	Note 3	ed	Note covers two unrelated points – the idea of an operationally defined measurand and the IFCC system for naming a measurand	Divide into two Notes: NOTE 3 In some cases the measurand is specified additionally by a documented and accepted measurement procedure. ISO REMCO refers to this as an operationally defined measurand (see ISO 17034 …. NOTE XX In laboratory medicine the IUPAC-IFCC format for the name of a measurand is “System—Component; kind-of-quantity”. For an operationally defined measurand, the format becomes “System—Component; kind-of-quantity(procedure)”EXAMPLE …..	Partially accepted. Wording adjusted.
0053 IUPAC 0056 IUPAC	2.3	Note 3	te	It would be practically useful to include the ISO 17034 definition for ‘operationally defined measurand’ in the VIM	Include the ISO 17034 definition for ‘operationally defined measurand’ in the VIM, and omit the first part of Note 3 from the VIM.	Not accepted. The reference is provided, and this would put a definition in a Note, which is not allowed.
0059 ISO 229 0060	2.3	Note 3, example	ed	“catalytic concentration (IFCC 2002) is equal to 1,2 □kat/L”	Please replace the comma by a decimal point.	Accepted.
0061 IUPAC	2.3	Note 4	ed	The note is not easy to understand because “quantity being measured” is, for most people, the quantity they intend to measure. Past definitions perhaps did not see a need to include ‘intended’ because no measurement scientist would intentionally measure a quantity they did not intend to determine. Similarly, ‘subject to measurement’ and simply ‘quantity being measured’ were, in common sense terms, always the ‘intended’ quantity. The note accordingly only helps those who feel that the quantity being measured is not the intended quantity. Further, if there are really two different concepts (intended and actually measured) the present VIM does not provide a distinct term (perhaps “blunder”?) for the second concept. The fact that it does not suggests that it is not often needed in practice.	Change to a note solely focused on the reason for the present definition. For example: NOTE 4 The reference to intent in the definition is included to emphasise that the measurand is always the desired outcome of a measurement, and that incomplete or incorrect realisation of the required quantity does not change the measurand. Optionally, add a second sentence: [It is understood that descriptions such as ‘quantity subject to measurement’ and ‘quantity being measured’ are equivalent to the above definition unless stated otherwise, since no measurement practitioner would intentionally measure the wrong quantity.]	Not accepted. The proposed rewording does not seem any clearer than the existing wording, and “... the measurand is the desired outcome of a measurement …" is less precise.
0062 ISO 230 0066	2.3	Note 5	te	measurand quantity intended to be measured NOTE 5 The measurement, along with the measuring system and the conditions under which the measurement is	See above. See the Reference in comment ISO 008.:Reference: F. Pavese: “On the classification in random and systematic effects”, AMCTM XI, 2018, in A.B. Forbes, N.F. Zhang, A.G. Chunovkina,	No concrete proposal is provided, it is not clear what is being proposed. A measurement model includes a correction for systematic effects, including to the measurand, if

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				carried out, might change the phenomenon, body, or substance such that the quantity being measured may differ from the measurand as defined. In this case, adequate correction to the measured value may be necessary depending on the target uncertainty.	S. Eichstädt, F. Pavese, (Eds.): "Advanced Mathematical and Computational Tools in Metrology and Testing XI", vol.11, Series on Advances in Mathematics for Applied Sciences vol 89, World Scientific, Singapore, October 2018, pp. 58–69	necessary. 'Measurand model' is not used in this document.
0063 **ISO 231** **0067**	2.3	Note 5	te	Due to changing conditions during a measurement, a measuring system may unintentionally target a quantity that is not intended to be measured. Often, the quantity being measured will be very similar to the measurand potentially leading to a significant or insignificant bias. The given note requires an adequate correction. It should be noted that correction is only possible if one can unambiguously identify and specify the quantity that is actually being measured. Also, the uncertainty of any correction made must be included in the measurement uncertainty.	Please revise Note 4 Note 5	Not accepted. No explicit proposal is provided.
0064 **IUPAC**	2.3	Note 5	te	The note is unrelated to use of the defined term	delete Note 5	Not accepted. The Note is highly relevant.
0065 **IUPAC**	2.3	Note 5	ed	See also remarks on Note 4. The note is not easy to understand because "quantity being measured" is, for most people, the quantity they intend to measure. The potential for confusion can be substantially reduced by referring, instead, to the effect on the measured value.	Amend to: NOTE 5 The [act of] measurement, along with the measuring system and the conditions under which the measurement is carried out, might change the phenomenon, body, or substance such that the measured value may differ systematically [and significantly] from the value of the measurand as defined. In this case, adequate correction to the measured value may be necessary depending on the target uncertainty.	Not accepted. This amended wording does not seem any clearer than the existing wording.
0069 **ISO 233** **0070**	2.3	Note 5, example 2	te	"[…] ambient Celsius temperature of 20 °C […]" In material science (and dimensional metrology), a temperature of 20 °C is considered as "reference".	Please consider replacing by: "[…] reference temperature of 20 °C […]"	Accepted.
0071 **ISO 234** **0028** **ISO 219** **0034**	2.3	Note 6	ed	It is not clear what NOTE 6 wants to express. Why is it misleading to use the different term "analyte" if it is not a measurand?	Cancel or rewrite it.	Accepted, Note is rewritten.

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0072 **IUPAC**	2.3	Note3	te	The note is unrelated to use of the defined term	delete Note 3	Not accepted. The Note is related to what a measurand is.
0073 **ILAC**	2.4		te	Consider if the 3 examples are needed at all. The example 3 about the rabbit seems very specific to very few metrologists.	Delete example 3	Not accepted. There are 8 cosponsoring organizations in the JCGM, including IFCC, to which this is relevant.
0074 **ISO 235** **0075**	2.4		ge	The word “process” in the definition may not be well chosen, as substituting with the definition of entry 2.1 gives the following overall definition: “Process serving as a basis of a <<process of experimentally obtaining one or more values that can reasonably be attributed to a quantity together with any other available relevant information>>”	Please consider deleting “or process”, i.e., keep VIM3 definition	Accepted.
0076 **ISO 236** **0077**	2.4	definition	te	The process is not a measurement principle. Example: The measurement principle is “weighing of the mass fraction extracted by a-polar solvents”. The measurement process is “Take 2 g of sample. Add 5 mL hexane. Shake. Filter. Evaporate the hexane. Weigh the residue”.	Correct	Accepted.
0078 **ILAC**	2.5		te	Consider adding method as a synonym to measurement method. “Method” needs to be established as a synonym somewhere in the VIM as this word is widely used in practice in metrology and testing.	Add “method” as synonym to “measurement method”	Not accepted, there is too much possibility for confusion.
0079 **ILAC**	2.5		te	Consider clarifying the definition by deleting “a generic description” that anyway is a fluffy term.	Delete “generic description” and leave definition as: “a logical organization of operations used in a measurement”.	Not accepted. “generic description” conveys the fluffiness that is intended.
0080 **ILAC**	2.5		te	The word “method” is used widely among regulators and in the scientific community, but unfortunately has various understandings and interpretations. In some fields of metrology it is understood as the generic process performed in a measurement while in other cases, especially in testing, it is understood as the specific standardized method (eg. ISO XYZ). This ambiguity is rather unfortunate. Eg. the term “method” or “measurement procedure” does even not comply with the use in other ISO publications e.g ISO 5725-series and ISO/IEC 17025. Those standards even specifically declare this and NOTE 2 in VIM 4 is based on that fact. Further a procedure is actually a word defined in the	Consider to include 2.7 in 2.5 by changing NOTE 2 to be: A documented measurement method may include a detailed description of a measurement according to one or more measurement principles with detailed instructions on how to perform the measurement. In some areas of metrology this is called a measurement procedure, a calibration procedure or a standard operating procedure (SOP). NOTE 3: Method in testing is a broad concept that …..	Partially accepted. While 2.7 ‘measurement procedure’ is kept, it is edited to be shorter and less prescriptive.

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				CASCO vocabulary ISO/IEC 17000:2000 clause 5.2 as "specified way to carry out an activity or a process Note 1 to entry: In this context, a process is defined as a set of interrelated or interacting activities that use inputs to deliver an intended result. " As that definition also is relevant in metrology and 2.7 in VIM 4 therefore duplicates this definition which it may be good to avoid. It is therefore needed to reconsider the two terms "measurement method" and "measurement procedure" jointly for the VIM. We believe this is best done by deleting the individual definition of the "measurement procedure" (2.7) and revising NOTE 2.		
0081 ISO 237 0082	2.5	Note 2	te	The terms "(measurement) method" and "measurement procedure" are often used interchangeably, without making a distinction on possible intrinsic differences regarding metrological principles. Also, making a clear distinction between both terms requires making a distinction in "method validation" and "procedure validation". To the best of my knowledge, the latter is not commonly used (if used at all).	Please consider replacing Note 2 by: "The terms "measurement method" and "measurement procedure" are often used interchangeably. However, from a metrological perspective both terms differ in scope. In general, a measurement method specifies a broader category of operations than does a measurement procedure, which requires a detailed set of instructions."	Partially accepted. Text of Note 2 has been augmented.
0083 ISO 239	2.6		ge	To bring clarity in the new inclusion as it may be primarily be used by NMI's. Include 'Usually in realization of SI units' to the definition.	measurement method used to obtain a measurement result without reference to a measurement standard for a quantity of the same kind usually in realization of SI units.	Not accepted. This concept is not restricted to SI units.
0084 ISO 240 0095	2.6		ge	BIMP SI Unit Guide https://www.bipm.org/en/publications/si-brochure: 2.3.2 Practical realization of SI units The highest-level experimental methods used for the realization of units using the equations of physics are known as primary methods. The essential characteristic of a primary method is that it allows a quantity to be measured in a particular unit by using only measurements of quantities that do not involve that unit	To define Primary Method of Measurement as per SI Unit Guide: 2.3.2The highest-level experimental methods used for the realization of units using the equations of physics are known as primary methods.	Not accepted. The VIM4 1CD definition already conveys this same concept. Besides, "highest-level" is only a secondary consideration.
0085 ISO 241 0086	2.6	definition	te	"primary reference measurement procedure" and "primary method" do not appear to differ	Review and change to ensure that the two concepts can be distinguished	Not accepted. Note 2 clarifies this.
0087 ISO 243	2.6	definition	te	While the introduction of this term is appreciated, the proposed definition is incomplete, as it lacks any quality requirements. This means that even very poor	Add that the method must be fully understood that a (realistic) uncertainty budget that explains the really observed deviations can be drawn up based on the measurement equation and the uncertainties related	Not accepted. Even methods providing relatively large uncertainties can qualify as primary methods, although this is not usually the case.

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0091				measurements get the de-facto quality label “primary method of measurement”.	to the input factors and that the measurement equation must not contain purely empirical factors like “recovery rates”.	
0088 **NMIA submission to OIML 0090**	2.6	Definition	ge	It is understood that the intent of the term and definition is to capture the highest order experimental methods for the realisation of units. However, as currently worded it also potentially captures any number of indirect or non-traceable measurement methods; which should not be considered primary methods of measurement.	We suggest the term is revised to more explicitly refer to those methods being used to realise primary standards of measurement.	Not accepted. No replacement term or definition is provided.
0089 **RNMF_FR**	2.6	Definition	te	The addition of this definition is really helpful to explain/support the NMIs role and it is a real improvement but the idea of highest-level of uncertainty or highest-level of expertise is missing in the definition (even if expressed in the notes).	To modify as follows: “Measurement method used to obtain a measurement result associated to the best achievable uncertainty for a quantity without reference to a measurement standard of same kind”	Not accepted. Best achievable uncertainty is only a secondary consideration here and is not required.
0092 **NPL, UK**	2.6	Note 1	ed	Nowadays it is more normal to refer to ‘the equations of chemistry and physics’.	Change text to “…using the equations of chemistry and physics.”	Accepted.
0093 **ISO 244 0094**	2.6		te	In 1998 the CCQM defined a primary ratio method as measuring the value of a ratio of an unknown to a standard of the same quantity. The definition of primary ratio method is not consistent with the proposed definition.	Add a note describing an existence of primary ratio method.	Accepted. New Note added.
0096 **AU**	2.6	term	te	We seek clarification of “highest level experimental methods”. There is a potential inconsistency between (a) section 2.6 “Primary method of measurement”, (b) now section 2.9 “Primary reference measurement procedure” and (c) the current conventional understanding of the term “primary measurement method” that associates the measurement result of an ‘indirect’ method (I.e. one that obtains a measurement result without reference to a measurement standard for a quantity of the same kind) with the lowest measurement uncertainty”. Section 2.6 (note 1) uses the SI brochure definition of “highest level experimental methods”, whereas section 2.9 uses the example of a gravimetric volume determination of a pipette. The latter may typically achieve 400 ppm for the unit of volume, whereas gravimetric determination for a solid-density-standard such as a ULE block or Sphere	We suggest possible adoption of the term “Indirect reference measurement procedure” to cover the instances where these are not “high-level”, i.e. to distinguish these from “primary method” or “primary reference measurement procedure” where these more typically mean “high-level” measurements, particularly in the chemical and biological communities. We also suggest providing clearer differentiation of “Primary method” compared with “Primary reference measurement procedure”.	Partially accepted. It is unfortunate that ‘primary’ is used in the two different ways described here. 2.6 Note 1 is intended to point out the dual usage, while not requiring “highest-level” to be part of the concept in the definition. The use of “indirect” here does not seem appropriate, since “primary” has long been associated with not referencing a quantity of the same kind.

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				can achieve a few ppm. A similar example could be the realisation of low-current measurements from a calibrated voltmeter and high-value resistor, vs a direct realisation of the Ampere using single electron tunnelling standards. Both “primary” under section 2.9, but with vastly different uncertainties. Another example may be the industrial use of noise-thermometry or direct radiometric temperature measurement at fit-for-purpose but nonetheless quite large uncertainties, well above those conventionally considered “primary standards” by the metrology community.		
0097 UO	2.6	term	ge	For some concepts in the CD, the preferred (main) term is the short form, and the alternative (synonym) term is a longer form. In this and some other cases, it’s the opposite. As a non-native English speaker, I don’t immediately see why, here, the short form could not be the main term.	Let ‘primary measurement method’ be the preferred (main) term and ‘primary method of measurement’ an alternative (synonym) term.	Accepted.
0098 RNMF_FR	2.6 & 2.9	definition	ge/te	It seems difficult to see a difference between the two definitions 2.6 « primary method of measurement » & 2.9 « primary reference measurement procedure ». As the notion of « primary reference measurement procedure ». Generally, it is the method which is the reference. The procedure is a description on the way which method is applied.		No proposal is provided. There is a difference in the definitions of ‘measurement procedure’ and ‘reference measurement procedure’.
0099 ISO 238	2.6	definition	te	measurement method used to obtain a measurement result without reference to a measurement standard for a quantity of the same kind	measurement method used to obtain the absolute value of a quantity, that is, a measurement result without reference to a measurement standard for a quantity of the same kind	Not accepted. Don’t understand what is meant by the “absolute value of a quantity”.
0100 ILAC	2.7		te	It is rather unfortunate that the term “method” or “measurement procedure” does not comply with the use in other ISO publications e.g ISO 5725-series and ISO/IEC 17025. Those standards even declare that specifically and NOTE 2 is based on that fact. Further a procedure is actually a word defined in the CASCO vocabulary ISO/IEC 17000:2000 clause 5.2 as “specified way to carry out an activity or a process Note 1 to entry: In this context, a process is defined as a set of interrelated or interacting activities that use inputs to deliver an intended result.” As that definition also is relevant in metrology and 2.7 in VIM 4 duplicates this definition which should be avoided. It is therefore needed to reconsider the two terms “measurement	Consider to delete this separate definition from the VIM and include it as a note in 2.5 as it is a logical combination of the definition of “method” and “procedure”. Further consider to add a note in 2.5 to accommodate this change: “ NOTE: A documented measurement method may include a detailed description of a measurement according to one or more measurement principles with detailed instructions on how to perform the measurement. In some areas of metrology this is called a measurement procedure, a calibration procedure or a standard operating procedure (SOP).”	Partially accepted. See reply to 0080 above.

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				method" and "measurement procedure" jointly for the VIM. This is best done by deleting the definition of the term "measurement procedure" and revising the NOTE 2. It shall be noticed that the term "measurement procedure" is only used in notes around VIM 4 except for definition relation to reference materials in definitions 2.8, 2.9, 3.24 and 5.15.		
0101 **ISO 245** **0104** **ILAC**	2.7	Note 4	ed	Note 2 in clause 2.5 and Note 4 in clause 2.7 are same. Proposed to refer the earlier Note to avoid repetition.	Note 4: See Note 2 in clause 2.5	Partially accepted. Both Notes are kept because of their importance, but are harmonized.
0102 **IUPAC**	2.7	definition	ed	definition unnecessarily verbose	reduced to (at most) "detailed description of a measurement according to one or more measurement principles and to a given measurement method," and include a note to say that the procedure usually includes instructions for calculating the measurement result	Partially agree. New wording has been provided.
0103 **IUPAC**	2.7	definition	ed	'measurement result' includes more than a calculated value or values (other relevant information cannot generally be calculated)	amend 'measurement result' to to 'measured value.	Disagree. However, this part of the definition is proposed to be removed anyway.
0105 **ILAC**	2.7	note	te	Many measurement procedures include the sampling step, but this is often inadvertently overlooked in the estimation of measurement uncertainty. However it need to be considered if testing - including sampling - is really metrology. And if testing is metrology, then the JCGM might need to consider to involve more organisations involved with testing to ensure covering the field of testing satisfactorily.	Consider to add a Note: 'Can include the primary sampling process where the measurand is defined in terms of a sampling target, such as a lot or batch of material'	Disagree. Measurements can be used as part of sampling, but a sampling procedure is different than a measurement procedure. Rather, sampling is usually used as part of conformity assessment.
0106 **UO**	2.7	Note 1	ge	The word "usually" introduces some doubt and seems contradictory to the definition.	"A measurement procedure should be sufficiently documented to enable an operator to perform a measurement."	Accepted.
0107 **IUPAC**	2.7	Note 2	ed	'may' in inappropriate context	change 'may to 'can'	Accepted.
0108 **ISO 246** **0109**	2.7	Note 4	te	The terms "(measurement) method" and "measurement procedure" are often used interchangeably, without making a distinction on possible intrinsic differences regarding metrological principles. Also, making a clear	Please consider replacing Note 4 by: "The terms "measurement method" and "measurement procedure" are often used interchangeably. However, from a metrological perspective both terms differ in scope. In general, a measurement method	Partially accepted. Wording is revised.

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				distinction between both terms requires making a distinction in “method validation” and “procedure validation”. To the best of my knowledge, the latter is not commonly used (if used at all).	specifies a broader category of operations than does a measurement procedure, which requires a detailed set of instructions.”	
0110 IUPAC	2.7	Notes	ed	It may be useful to add a Note about the ISO terminology here	Add NOTE 3 ISO/IEC Guide 2:1996 (Standardization and related activities — General vocabulary) defined “test method” as “specified technical procedure for performing a test”. When the procedure includes instructions for measurement, the term ‘test method’ in ISO standards often corresponds closely to ‘measurement procedure’ defined here.	Disagree. This is only indirectly about testing. Also, there is already a Note 3.
0111 ISO 247 0112	2.7		te	The current definition seems not to cover sample preparation as an intrinsic part of a measurement procedure. In many cases, sample preparation significantly contributes to the overall measurement uncertainty.	Please confirm that sample preparation is considered an intrinsic part of a measurement procedure. This acknowledgement may be achieved by either revising the definition or by inserting an additional Note.	Not sure exactly what is being proposed here; no explicit text is provided. Sample preparation seems to pertain more to ‘measurand’?
0113 ILAC	2.8	definition	te	definition should include reference to calibration	Consider add “or for calibration” at the end of the definition and delete the NOTE.	Disagree, but the Note is expanded.
0114 ISO 248 0115	2.8	definition	te	The definition is completely relative: compared to a very inaccurate measurement procedure, an accurate method is a reference measurement procedure. In addition, it can be used in a circular way. Imagine one uses an ICP-OES-based procedure to characterize a reference material. Then, as it has been used to characterize a reference material, the measurement procedure automatically becomes a reference procedure. In fact, the only aspect that distinguishes a reference measurement procedure from other measurement procedures is that somebody has declared it as reference.	Change to Measurement procedure that, in relation to other measurement procedures for the same measurands, has been officially designated as reference by a person or organization. (Note that this acknowledges the fact that reference measurement procedures are not necessarily more accurate than other methods (e.g. Kjeldahl-N vs. Dumas-N)	Partially agree, new text has been added to the definition.
0116 ISO 249 0117	2.9	definition	te	This definition is incomplete, as it lacks any quality requirements. This means that even very poor measurements get the de-facto quality label “primary method of measurement”. In addition, it disregards the fact that the only aspect that distinguishes a reference measurement procedure from other measurement	Combine the suggestions from 2.6 and 2.8	Not accepted. Even methods providing relatively large uncertainties can qualify as primary methods, although this is not usually the case.

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				procedures is that somebody has declared it as reference.		
0118 **ISO 250** **0119**	2.9	Example	te	The procedure described for measuring the volume of a 50 mL pipette is considered a primary reference measurement procedure. However, measurement procedures based on weighing require certified mass pieces for balance calibration. Thus, the described example contradicts the proposed definition (i.e., “without relation to a measurement standard)/	Please revise the example.	Not accepted. The definition says “... without relation to a measurement standard of the same kind.” The measurement standard used is for mass and not volume, which is not of the same kind.
0120 **UO**	2.9	Note 3	ge	I think the note is relevant with Entry 2.6 as used, but not here?	Delete NOTE 3.	Not accepted. The JCTLM proposed this Note. It is felt safest to keep the Note in both places, for cross-reference.
0121 **BelGIM**	2.10	definition	ge	The definition is unnecessarily abstract, vague and ambiguous and can therefore be interpreted by users in many ways. Meanwhile, a shared understanding of that definition is extremely critical to practical metrological tasks such as testing, calibration and verification. Although its wording has not significantly changed since VIM3, it generally remains unclear what sense one should make of the term "set of values" referred to there, and in what form it should be represented when a measurement result has to be reported in various types of documents, such as calibration certificates, test reports, etc. We would recommend including a more explicit description of that "set of values", say it could stand either for a coverage interval, or for a measured value together with a measurement uncertainty, or for something else.	The definition should be extended to become unambiguous in regard to the "set of values", otherwise, a separate note should be added to clarify the meaning of that term.	Partially agree. However, Note 1 is already intended to clarify the meaning of “set of values”.
0122 **BelGIM**	2.10	Note 2	ge	The note is inconsistent with the definition because it says the measurement result can be sometimes a single measured value, whereas, according to the definition, it shall be a set of values.	The note or/and the definition should be amended in accordance with this comment.	Partially accepted. Note has been revised. However, a set can contain only one element.
0123 **ISO 251** **0129** **EC-079**	2.10	Note 2	te	The addition “in comparison with a target uncertainty” is wrong. Example: The result is 100 ± 30, my target uncertainty is 90. So, the measurement uncertainty is negligible compared to the target uncertainty, but that still does not make the measurement uncertainty go away.	Delete “in comparison with a target uncertainty” or replace “target uncertainty” by “uncertainty limit”.	Disagree. What would be meant by “uncertainty limit”? If not “target uncertainty”, what would the measurement uncertainty need to be negligible with respect to?

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0125 **ISO 253**	2.10	Note 2	te	In the note, the measurement result is said to correspond to "single measured value and a measurement uncertainty". Use of the wording "single measurement value" could lead to the assumption that measurement result cannot consist of a mean of more than one (single) value. We propose to clarify by using the phrase "resulting measured value" which is already used in Note 1 to 2.11	A measurement result is sometimes reported as a resulting measured value and a measurement uncertainty.	Disagree. This takes away from the main intent of the Note.
0124 **ISO 252** **0126** **ISO 254**	2.10	Note 2	ge	The revised Note 2 is devaluing the relevance of measurement uncertainty and even in contradiction with the new Note 4. While it is understood that the possibility to present a measurement result as single value should be noted and explained, it should also be clear that the default expectation should be aligned with the definition itself i.e. a set of values. Furthermore, past practices should not be an excuse for not to progress in line with a modern metrological approach. Thus, some elements included in the note should include an element of expected positive developments in the future.	Change Note 2 to: NOTE 2 A measurement result is sometimes reported generally expressed as a single measured value and a measurement uncertainty. If the measurement uncertainty is negligible in comparison with target uncertainty, the measurement result is sometimes expressed as a single measured value. In this case only significant digits should be reported. In many some fields, this is still the common way of expressing a measurement result, however caution should be used.	Disagree. This proposed rewording has grammatical problems, and it is not clear just what is intended.
0127 **RNMF_FR**	2.10	Note 2	te	A measurement result is sometimes reported as a single measured value and a measurement uncertainty	To modify as follows “A measurement result is generally reported as a single measured value and a measurement uncertainty”	Accepted.
0128 **RNMF_FR**	2.10	Note 2	te	“The measurement result is sometimes expressed as a single measured value. In this case only significant digits should be reported. ”The last sentence is true even if the uncertainty is evaluated, not only when we have a single measured value.	To modify as follows: “The measurement result is sometimes expressed as a single measured value, then only significant digits should be reported”	Disagree. Content is the same, sentence becomes confusing.
0130 **ISO 255** **0131**	2.10	Note 3	te	I see very little added value of Note 3, partly due to the fact that the term “traditional literature” is not clarified/defined.	Please consider deleting Note 3.	Partially accepted. Note has been clarified.
0132 **BelGIM**	2.10	Note 4	ge	It is not clear what the purpose would be for Note 4 that refers the reader to a definition previously contained in the 1993 VIM2 publication. Each and every metrologist has been using VIM3 since 2007. Moreover, the content of that note just makes the current definition less understandable and efficient. We suppose that any controversies of the uncertainty concept might be	The note should be deleted.	Partially accepted. Text has been edited to include that the GUM, which is current, also covers this.

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				specifically addressed in appropriate documents, such as the JCGM 100 series, but not in VIM.		
0133 **ILAC**	2.10	Note 4	ed	Unnecessary disclaimer referring to long passed VIM2	Eliminate Note 4 under entry 2.10	Partially accepted. Text has been edited to include that the GUM, which is current, also covers this.
0134 **ISO 256** **0135**	2.10	Note 4	te	An explicit reference to an outdated VIM version (i.e., VIM2) is not relevant.	Please delete the reference to VIM2.	See response above to 0132.
0136 **ISO 257** **0138**	2.11		te	measured value of a quantity value of a quantity representing a measurement result	Does “quantity” here include “ordinal quantities” 1.30? probably yes, see above. Does it exclude nominal property and measurement result of a nominal property? Why only a “result”? In 2.10 a measurement result is only partially represented by the measured value of a quantity	Yes. Yes. Agreed (see additional new Note). However, no concrete proposal is provided.
0137 **ISO 258** **0141**	2.11	Note 2	te	In Note 2 Replace the word ‘Indications’ by ‘measurements ’To bring in more clarity. ‘Indications’ will not be appropriate, ‘measurements’ give correct meaning, (aligned with Note 5).	NOTE 2 When the range of the true values believed to represent the measurand is small compared with the measurement uncertainty, and therefore the definitional uncertainty is considered to be negligible, a measured value can be considered to be an estimate of an essentially unique true value and is often an average or median of individual measured values obtained through replicate indications measurements.	Accepted. Note has been revised.
0139 **IEC-DE 29** **0140**	2.11	definition	te	It should be indicated that the quantity needs to be an individual quantity.	Write “value of an individual quantity ...”	Not accepted. Only individual quantities can have values, so this is not necessary.
0142 **ISO 260** **0143**	2.11	Note 1 & Note 5	te	In the current version of CD VIM4, the term “measured value (of a quantity)” is exclusively used for the output quantity of a measurement model. The term “indication (4.13) is, for instance, used for input quantities. As explained in 4.13, the measurand of input and output quantities are different. In the strict sense of its intended meaning (4.13), I am not convinced about the practical significance of the term “indication” for the simple reason that even “indications” are the result of a measurement representing an output quantity of a different measurement model. Hence, an indication is also a “measured value”.	Please reconsider the concept of the term “indication” in VIM4.	Not accepted. No specific proposal is provided. However, an example has been added in Note 2 to the entry 4.13 for ‘indication’ for clarification.

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0144 **ISO 261** **0145**	2.11	Note 2	te	It should be mentioned explicitly that the given statement (i.e., range of unique true values) is mainly and particularly applicable to fundamental constants; see previous definition in (1.22; Note 2).		Not accepted. This concept has already been addressed in other entries.
0146 **ILAC**	2.11	Note 5	te	This Note is actually referring to one kind of slang that shall be avoided. You could imagine many other slang versions and they should not be listed. In general explaining in a standard what you shall not do, is bad standard writing as that list can be endlessly.	Delete Note 5	Partially accepted. This Note has been shortened.
0147 **UO**	2.11	term	ge	For some concepts in the CD, the preferred (main) term is the short form, and the alternative (synonym) term is a longer form. In this and some other cases, it's the opposite. As a non-native English speaker, I don't immediately see why, here, the short form could not be the main term.	Let 'measured quantity value' be the preferred (main) term and 'measured value of a quantity' an alternative (synonym) term.	Not accepted. Need to maintain consistency with 1.20 'value of a quantity'.
0148 **ISO 262** **0149**	2.11 and subsequent definitions	definition	te	The definitions no longer indicate that the quantities under consideration are individual quantities.	Replace "quantity/quantities" by "individual quantity/individual quantities" wherever it applies.	Not accepted. Use of "general" and "individual" is limited to only if there is ambiguity, which is not the case here.
0150 **ISO 263** **0151**	2.12		te	measurement model model of measurement model mathematical relation among all quantities known to be involved in a measurement	There are also non-mathematical models that can be used (e.g., the Ishikawa graphs)—see last draft of VIM and the reference here at the end, i.e.: Reference: F. Pavese: "On the classification in random and systematic effects", AMCTM XI, 2018, in A.B. Forbes, N.F. Zhang, A.G. Chunovkina, S. Eichstädt, F. Pavese, (Eds.): "Advanced Mathematical and Computational Tools in Metrology and Testing XI", vol.11, Series on Advances in Mathematics for Applied Sciences vol 89, World Scientific, Singapore, October 2018, pp. 58–69Only quantities can be included in a model, not ordinal or nominal properties? Even in non-mathematical models?	Partially accepted. Mathematical models can be broader than algebraic models, including graphs. A new Note has been added referring to JCGM-6:2020, where different types of models used in metrology are discussed.
0152 **ISO 264** **0153**	2.12	Note 2	te	I have difficulties to identify a measurement model that yields two or more output quantities. As correctly explained in Note 1, the model provides, through an equation, a mathematical relation between the input quantities and the output quantity or measurand. A measurement may indeed yield different output quantities through different equations, but, in my	Please confirm that a single model can yield more than one output quantity, when considering that a single measurement equation represents a specific and well-defined measurement model. Note 2 should be further clarified by adding practical examples.	Accepted. A measurement model can be a system of equations. Reference to JCGM 102:2011 is provided in a new Example to Note 2 highlighting this.

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				understanding, each output quantity is still the result of a specific model through a specific equation.		
0154 **ISO 265**	2.13	definition	ed	This is far too long. Definitions must be concise.	shorten to (e.g.) “function relating input values to output values”	Partially accepted that the definition is too long; see revised text. But the function is typically of quantities and not values.
0155 **ISO 266** **0156**	2.14		te	input quantity in a measurement model input quantity quantity, the value of which is required for calculating a measured value of a measurand	Alternatively “quantity whose value is influencing the measurement result, also called “influence quantity” (2.16).)See the Reference in comment ISO 008:Reference: F. Pavese: “On the classification in random and systematic effects”, AMCTM XI, 2018, in A.B. Forbes, N.F. Zhang, A.G. Chunovkina, S. Eichstädt, F. Pavese, (Eds.): "Advanced Mathematical and Computational Tools in Metrology and Testing XI”, vol.11, Series on Advances in Mathematics for Applied Sciences vol 89, World Scientific, Singapore, October 2018, pp. 58–69	Not accepted. An influence quantity is an entirely different concept than an input quantity (see 2.16).
0157 **ISO 267**	2.14	definition	te	""the value of which”, considered as the true value, does not match with “a measured value of a measurand”.	Change “the value” to “the known value” used in term 2.13 (measurement function).	Accepted.
0158 **ISO 268**	2.15	definition	te	Change “the value” to “the known value” used in term 2.13 (measurement function).	Change “the values” to “the known value” used in term 2.13 (measurement function).	Accepted,
0159 **ISO 269** **0160**	2.16		te	influence quantity quantity that does not affect the quantity being measured but that affects the measurement result	The distinction is deceiving and useless. The best and correct is “quantity that affects the measurement result “See the Reference in comment ISO 008:Reference: F. Pavese: “On the classification in random and systematic effects”, AMCTM XI, 2018, in A.B. Forbes, N.F. Zhang, A.G. Chunovkina, S. Eichstädt, F. Pavese, (Eds.): "Advanced Mathematical and Computational Tools in Metrology and Testing XI”, vol.11, Series on Advances in Mathematics for Applied Sciences vol 89, World Scientific, Singapore, October 2018, pp. 58–69	Not accepted. An influence quantity is an entirely different concept than an input quantity.
0161 **ISO 270** **0164** **IEC-DE 31**	2.16	Example 2	ed	In the example, the space between the word “example” and the number 2 is different compared with the one for the other examples. Differences hold also for the spaces between the numbers and the texts as mentioned earlier.	Unify the spaces throughout the whole document.	Noted. Thank you.

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0162 **ISO 271** **0163**	2.16	Example 3	ed	While a micrometer (device) is well-known in certain fields, the term may sometimes be interpreted as a length scale.	Consider replacing “micrometer” by “micrometer screw gauge”	Accepted.
0165 **ILAC**	2.16	Note	te	Not all readers will immediately understand that ‘measurement result’ includes both a measured value and associated uncertainty; some readers, for example, read the definition as restricting input quantities to those that changed the measured value	Consider an additional Note to remind readers that ‘measurement result’ is more than a measured value and an input quantity can change the measurement uncertainty without necessarily changing the measured value	Not accepted. Measurement result is defined to include measurement uncertainty.
0166 **ISO 272** **0167**	2.16	Note 2	ed	This Note first appeared as NOTE 1 to the definition 2.52 Influence quantity in VIM3 was justified there since that definition referred to direct measurement. The new definition in VIM4 is given with no regard to direct measurement, which makes NOTE 2 unnecessary.	NOTE 2 should be deleted.	Accepted.
0168 **ILAC**	2.16	Note 3	te/ed	~~In NOTE 4~~ reference is to VIM 2 and as that is way back only reference to GUM should be maintained.	Delete “and in the second edition of the VIM”.	Accepted.
0169 **ILAC**	2.16	Note1	ed	In the definition of “influence quantity”, it is recommended to use “individual quantity” instead of “quantity” and consequently delete Note 1 (if distinction with individual quantity is maintained). ---	individual quantity that does not affect the quantity being measured but that affects the measurement result	Not accepted. Use of a Note for this purpose has been used throughout the VIM4 1CD to reduce complication in definitions.
0170 **ISO 273** **0173** **IEC-DE 32** **0175** **ISO 276**	2.17		te	In the definition, the quantity under consideration may be a general quantity. This should be indicated. We are not sure if the word “for” is correct.	Write “general quantity ...” and delete the word “for” if appropriate.	Disagree that “quantity” means “general quantity”. “for” is correct.
0171 **ISO 274** **0172**	2.17		te	correction quantity, in a measurement model, compensating for an estimated systematic error	See the Reference in comment ISO 008: Reference: F. Pavese: “On the classification in random and systematic effects”, AMCTM XI, 2018, in A.B. Forbes, N.F. Zhang, A.G. Chunovkina, S. Eichstädt, F. Pavese, (Eds.): "Advanced Mathematical and Computational Tools in Metrology and Testing XI”, vol.11, Series on Advances in Mathematics for Applied Sciences vol 89, World Scientific, Singapore, October 2018, pp. 58–69	No explicit proposal is provided. We have taken these considerations into account. In entry 3.20 ‘measurement bias’ the Notes have been edited accordingly.
0174 **ISO 275**	2.17	definition	ge	This definition does not take into account two important factors:1) a correction is often introduced in the	Definition should be amended to take the comments into account	Disagree with first point; there is a model used for correcting a measured value. Second point is correct, but not of relevance

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0176				measured value only, not in a model; 2) the term "correction" can refer to both the quantity to be corrected for and the process of correction.		here since clearly from the definition only the quantity is considered, not the process.
0175.5 **ISO** **New**	2.17	definition		Add note clarifying relationship to adjustment, and providing linkage to its definition. By way of comparison, see Merriam-Webster's insightful definition: "a quantity applied by way of correcting (as for adjustment of an instrument)."	NOTE X Whereas the use of corrections may (if applied by **measuring system**) or may not (if applied by user to **measured values**) affect **indications**, **adjustment** (of a measuring system) entails use of one or more corrections to systematically affect indications (e.g., causing "as found" values to differ from "as left" values in a calibration report).	Not accepted. The use of 'correction' proposed in this comment is different than what is intended in the definition.
0177 **ISO 277** **0178**	2.17	definition & Note 2	te	The word "estimated" does not fit with the definitions and explanations provided for the terms "systematic measurement error" (3.19) and "measurement bias" (3.20). Note 2 of entry 3.19 correctly states that a systematic error can be either known or unknown, and that a correction can compensate for a known systematic error. Entry 3.20 correctly states that the unknown part of a systematic error can be estimated by means of the (measurement) bias. The uncertainty of the bias is estimated by assessing the trueness and directly adds to the measurement uncertainty. Considering the above, a "correction" can only be made for known systematic errors, rather than for estimated systematic errors.	Please revise both the definition and Note 2, i.e. by replacing "estimated" by "known". Also, in Note 2, please replace "target uncertainty" by "uncertainty limit" (see EC comment related to entry 3.10).	Partially accepted. Not sure what is meant by "uncertainty limit"?
0179 **VNIIM** **0180**	2.18	definition	ge	Some important terms and definitions related to modern measuring systems have not been included into the Draft, in particular, "measurement trustworthiness".	To amend 2.18 to Chapter 2: "Measurement trustworthiness The state of measuring instrument, measuring system, measurement process and procedure, as well as measurement results whose metrological characteristics are within permissible limits. Note 1 Quantitative measurement trustworthiness is expressed in terms of the probability that the metrological are outside the permissible limits, i.e., in terms of untrustworthiness. Note 2 Measurement trustworthiness, to a great extent, depends on the intervals between the procedures of metrological maintenance of measuring instruments and measuring systems."	Not accepted. This term is not familiar to WG2 in this context.

1 **Country code (enter the ISO 3166 two-letter country code, e.g. CN for China)**
2 Type of comment: ge **= general** te **= technical** ed **= editorial**

Template for comments and convener's observations

Date:2023-07-03	Document:	Project:

Country Code[1]	Clause	Paragraph/ Figure/Table	Type of comment[2]	Comments	Proposed change	Convener's responses
0181 **INRiM**	2.41		ge	The definition associates traceability to a measurement result (property of a measurement result), but then somehow turns traceability into a chain of calibrations, which is an action related to the instrument, not the measurement. The condition that an instrument is calibrated against primary or secondary standard through a documented unbroken chain of calibrations is not sufficient to guarantee that a field measurement is fully related to a reference (SI standard in most cases). The specification in the definition of calibration, about the fact that measurements must be performed under specified conditions, is also not sufficient to solve the raised issue: it is practically impossible during calibration to generate and control all the measurement conditions and their variability as met by the instruments in field. Quantities of influence and measurement conditions in the field can be, and in many cases are, so different from the conditions in which the instrument was calibrated, that traceability is in most cases more a question than a support for data comparability. Field uncertainties are in many cases difficult to fully evaluate and users are somehow induced to adopt the calibration uncertainty as the total measurement uncertainty, as at least an effort to declare the intention of documenting their data quality. Despite the use of calibrated sensor is a non-sufficient condition to guarantee metrological traceability to measurement result, non-specialist users can be induced to consider this a fact. “I calibrated my sensor, so any its response is a traceable measurement, thus it is comparable”. Which is not. In industry or environmental measurement, where influencing factors are dominant part of the uncertainty budget, this becomes even more evident.Adopting the proposed change, which includes the field conditions contributions to the uncertainty, traceability becomes both a condition expressed in the first part of its original definition, and a prescription in the second part. When all parameters contributing to the uncertainty budget are then evaluated, the measurement is finally traceable. The unbroken chain of calibration, contained in the original definition, remains the main metrological principle to be required for a measurement. Draft paper available (ask Walter) with more considerations and examples.	Consider: property of a measurement result whereby the result is related to a reference through a documented unbroken chain of calibrations, and the measurement uncertainty is composed of each of the calibration uncertainties and contributions due to the measurement conditions.	Disagree. The definition is maintained from the VIM3. A Note has been added that it needs to be checked that the measuring instrument providing a traceable value and uncertainty is operating within the operating conditions specified in the calibration report. Measurement results include measurement uncertainties, and so these are naturally taken into account along the traceability chain. This comment does not belong here, but rather in Chapter 5 (5.22)

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