OIML R60-1 Comments Received Based on 3CD and Secretariat's Responses

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Member state	Page number	Document clause	Comment	Secretariat's Response
Australia			Australia has voted no because we are providing a number of comments and believe these issues should be resolved before considering voting.	
Australia	3	2.3	We are happy for the illustration to remain, though we suggest also including a slightly modified version of the associated table in Figure 1 of OIML R 76. Perhaps along the lines of: Analog load cell: 2 Digital load cell: 2 + 3 + (4)* Load cells within scope of OIML R 60: 2 + (3) * Numbers in brackets indicate options	Amended as proposed
Australia	11	3.8	This clause refers to Annex A for the definition of "reference conditions" but there is no definition in Annex A. Suggest to add the definition.	Reference to Annex A deleted. Definition added for reference operating condition - see 3.8.5 in 4CD
Australia	25	7.2.1	The maximum capacity is important to identify the load cell. Suggest to smaller sized load cells to require maximum capacity as mandatory.	Maximum capacity (E_{max}) is already required/mandatory marking under 6.2.2

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Australia	25	7.2.1	The OIML Certificate Number is outside the scope of the CPR discussion. Suggest replacing 'OIML Certificate No' with 'Type Approval Mark'. This is then more consistent with other recommendations such as R 76 and R 49.	Replaced OIML Certificate number with "Type approval mark" to harmonize with other OIML Recommendations
Australia	30	8.2	As previously suggested, we do not believe that this was discussed at the TC meeting but would still like the issue addressed. Suggest deleting this requirement. Requirements documents shouldn't seek to override National Legislation. 'Responsibility for compliance' and definition of 'in use' are for each member state to determine and are outside the remit of a recommendation. Recommendations should also avoid gender-specific language such as "his premises".	Clause deleted. This level of prescriptive language is not used in other Recommendations. Content of 7.1.1 is believed to provide sufficient guidance.
Australia	30	8.1.2	This clause numbering is out of sequence.	Numbering of clause corrected to 8.2.1
Australia	37	9.7.3	Clause 9.7.4 refers to 9.7.3 for reference conditions. However, 9.7.3 generally does not specify value for reference conditions. It is noted that OIML R 76 defines reference conditions as specified values…	Term "reference" deleted in 9.7.4

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Australia	42	9.10.1.13, 9.10.2.9, and 9.10.3.11	Suggest to clarify the following: 'Repeat the operations described in xxx to xxx, first at the higher temperature, then at the lower temperature, including the approximate temperature range limits for the accuracy class intended.' Change to: 'Repeat the operations described in xxx to xxx, first at the higher temperature, then at the lower temperature, in accordance with 6.6.1'	Amended as proposed
Australia	49	9.10.6.11	We don't think it's appropriate to alter the damp heat tests to align with other manufacturer defined upper temperature limits by just changing the temperature. If the level is going to be adjusted then consideration needs to be given to appropriate humidity levels considering absorption, diffusion effect on the loadcell and water content of the air. We propose the damp heat test should be conducted at 40°C 85%.	The extent and impact of this suggested change in the test procedure would need to be understood and the implementation must be supported by TC9p1. To initiate this at this stage would be outside protocol.
Australia	53-59	9.10.7.5 9.10.7.6 9.10.7.7 9.10.7.8 9.10.7.10	Suggest removing reference to auto zero setting, this is not applicable to a loadcell.	Statements regarding automatic zero-setting/tracking amended to indicate that this is relevant only when the load cell is connected to an instrument during testing.
Australia	58	9.10.7.9	We do not agree that this test can be carried out in a weighing instrument, significant shielding and earthing effects can be attributed to the weighing instrument which should be removed from the effects of this test.	Note deleted

Member state	Page number	Document clause	Comment	Secretariat's Response
Australia	58	9.10.7.9	The 26MHz – 80M portion of the radiated immunity test is not required of the conducted immunity test is performed. Suggest making this clear.	Note added in test procedure for explanation. Frequency range amended to 80 MH_z to 2 000 MH_z
Australia			There is a mix of referring to 'reference temperatures' in the document as a fixed '20 C' or '20 C unless the total temperature range does not include 20 C'. We should be clear for which tests the manufacturer can deviate from the 20 C reference and consistently refer to this. We would expect that the IEC tests such as Voltage variations, ESD etc would be performed at standard laboratory conditions specified in those standards? Our understanding is that only those tests in A4 (i.e. Increasing & Decreasing Load, Creep and Minimum deadload output return) may have a specified reference temperature other than 20C.	The one location located where flexibility is permitted for a reference temperature (other than 20° C) that is not associated with Increasing, Decreasing Load, Creep and MDLO is 8.10.6.11 (Conduct damp heat, steady state test). This is consistent with R60 2000 edition. TC9/P1 membership would need to agree that this flexibility is not to be permitted in this test before procedure is changed

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Austria	General	2.3	Digital load cells may be covered but are restricted to "digital raw counts". What is a digital raw count? This term should be also defined. Even with the help of the definition in 3.1.2. "load cell equipped with electronics" it is difficult to identify a "digital load cell" clearly. Which intrinsic functions are meant to be allowed in a digital load cell to create only "raw counts"? In our opinion we should specify the term "digital load cell" in more detail to have clarification in the scope. Further intrinsic functions could also have to fulfil other requirements (OMIL R76), which are not regulated in R60, but could be allowed to influence the outcome. Therefore the scope of R60 is not that clear and further possibly testing procedures and requirements for the intrinsic functions are missing.	Definition added for "digital load cell" (3.1.5.3) based on input from project group subcommittee.
Austria	General	6.6.2	We are not that happy with this change (like Japan comment to 9.10.4.6), because no pressure range of testing is described any more. Due to the unknown site of the load cell, different atmospheric pressure situations can occur. This influence is not fully covered in the mentioned test. We don't support this lack of requirements, which could lead to unharmonized testing procedures.	This amendment was agreed upon during the TC9p1 meeting in March 2014. Participants of that meeting agreed that was not necessary to specify absolute pressures but instead simply specify the change in output allowed per kPa of change

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Austria		9.7.3.3	In our opinion the Influence of mounting is one of the hugest sensitive issues and influence factors for testing load cells. Therefore we support the hint to the particular care. Furthermore we suggest implementing the fact, that the mounting should consider the intended use of the load cell with attention to the load transmission like it is covered in ISO 376 due to the fact of the high influence. Please amend after "particular care": "… and should consider the intended use of the load cell and the load transmission."	Wording amended per comment
Austria		9.9.3	In general we support this requirement, due to the fact, that the hysteresis error from 3.7.5 should be taken into account. It is helpful to have this criterion for the hysteresis error.	Hysteresis error clause was included in 3CD without the appropriate approval of TC9p1. No additonal support to retain this clause has been received, therefore it has been removed from 4CD.

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Austria	General	9.10.1.2	We think that the reference temperature of 20°C should be focused to have a harmonized proceeding in the several tests. If for some cases another reference temperature can be chosen, further influences should be considered. Firstly, some tests are supposed to be executed at 20°C. For other special temperature limits and other reference temperatures procedures are missing. Secondly the final calculation depends on the one hand on the reference temperature, where a comparison between the testing of the load cells becomes difficult. Due to the definition of the measuring principle there is a high influence of the temperature. This should be taken into account. We suggest providing the testing of the reference temperature 20 °C mandatory. We suggest also implementing a note, to reconsider these aspects. Maybe further calculations and changes are necessary. (e.g. the warm up time is supposed to be at 20°C).	In response to these comments and those from Germany, the second sentence (added in 2CD and modified in 3CD) of this clause is deleted.
Austria		9.10.7.11	Response to the comment UK: The initial span measurement can be understood as the measurement nr.1 from the span value. The wording in 6.3.6 is clear to us.	Austria's response to U.K. comment on 2CD
Austria	C-1	Annex C Table 1	Is there a reason for not mentioning the units of v_{min} and DR? We suggest amending the unit "kg" in the respective column also for those two parameters.	Amended

Member state	Page number	Document clause	Comment	Secretariat's Response
Austria	C-3	Annex C Chapter 6	Same comment as for Table 1.	Amended
CECIP		General	Throughout the document there are several inconsequence's in wording and listing. The applications of these headings are different. Part 1 headings differ from part 2 headings. Suggestion: Heading of part 2 as format, including the first letter in capital. Annex A is OK Annex D, equal to part 2 (no dot after the last number (reason for this is the fact that in referring to these paragraphs, the last dot is not used). Not all paragraphs do start equally with a capital letter.	Formatting of the most recently added annexes is as they were submitted. Final editing will be done before publication.
CECIP		General	Throughout the document the abbreviation n_{max} is used for "Maximum number of **load cell** verification intervals". This is incorrect. The correct abbreviation is n_{LC} The abbreviation n_{max} stands for "maximum number of verification **scale** intervals".	Amended
CECIP		General	Suggestion is to skip the A.1.11 Maximum permissible measurement error. Instead use (maximum) permissible error only. The part "measurement" in the definition is confusing and not used consistently.	Amended
CECIP	7	3.5.2	See the remark above. It's an example of the confusion. The description "maximum permissible error" is not in conformity with the definition in A.1.11 Maximum permissible **measurement** error	Maximum permissible measurement error will not be used in place of maximum permissible error.

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CECIP	12	3.9. Abbreviations	In the text the abbreviation "LC" and "EUT" are used several times. Suggestion is to add "LC Load cell" and "EUT Equipment under test"	Added as proposed
CECIP	16	6.3	Rename maximum permissible measurement errors in Maximum permissible errors.	Amended
CECIP	20	6.7.1.1	Note: replace v to v_{min}	In this context there is not significant reason to amend. The use of the wording: verification interval (v) is retained
CECIP	21	6.7.2.1	Warm-up time add the sentence "as specified by the manufacturer"	Wording amended
CECIP	22	6.7.2.4.	Add a) to "All functions shall operate as designed." Add b) to "All measurement results shall be within maximum permissible errors."	Amended as proposed

Member state	Page number	Document clause	Comment	Secretariat's Response
CECIP	24	7.1	Add a. to "In general, for load cells, the severity level I, examined with validation procedure A, is required. Add b. to "For legally relevant software of digital load cells the following statements according to OIML D31 shall be applied. Add 1) to "The exception described in D 31, 5.1.1 [8] for an imprint of the software identification is allowed. Add 2) to "The level of conformity of manufactured devices to the approved type is according to D 31, 5.2.5 (clause a) [8]. Add 3) to "Updating the legally relevant software of a load cell in the field is possible via verified or traced update according to D31, 5.2.6.2 and 5.2.6.3 [8] Add 4) to "The software documentation shall include descriptions according to the applicable requirements of D 31, 6.1.1	Amended as proposed
CECIP	25	7.2.1	e. Year of production add (if applicable)	Amended as proposed
CECIP	29 and 30		Add page number	Amended
CECIP	39	9.10.1.2.	Add) after (± 2 °C	Amended
CECIP	41	9.10.1.14	Add "see Table 4." After 6.3.1.1	Amended as proposed
CECIP	41	9.10.2.2.	Remove underlining from "(± 2 °C)"	Amended
CECIP	44	9.10.4.7	Use "pressure effect" instead of "pressure error"	Amended as proposed

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CECIP	46	9.10.5.12	Table Test method, Test procedure in brief. Change "The 24 h cycle comprises:" in "The 24 h**our** cycle comprises:"	Amended
CECIP	59	9.10.7.10.	Table Test method, Notes. Suggestion to add (10 v) in the last sentence "applying a small test load (10 v)."	(10 v) added to identify "small test load"
CECIP	59	9.10.7.11	Remove "°)" in reasonably constant (±2 °C °)	Amended
CECIP	A-2	A.2	Replace [2] to [3] in A.2 Definitions from the VIML [2]	Amended
CECIP	A-3	A.2.10	Remove "mark" in A.2.10 Sealing mark	Corrected
CECIP	A-3 – A-6		The numbering of the definitions from OIML D 11, are not in conformity with the actual version (2013)	Amended
CECIP	A-7	A.4	Change [5] to [6] in A.4 Definitions from OIML B 3 [5]	Amended
CECIP	A-7	A.4.1	Change [B3, 2.2] to [B3, 3.2] in A.4.1 Category of instruments [B 3, 2.2] Remove "and" in the last sentence and add in the end: "and the conditions of use."	Definitions from B3 deleted
CECIP	A-7	A.4.2	Change [B 3, 2.3] to [B 3, 3.2] in A.4.2 Family of measuring instruments [B 3, 2.3] Add "Note: The concept of a "family" primarily aims to reduce the testing required for OIML Type Evaluation. It does not preclude the possibility of listing more than one family in one Certificate.'	Definitions from B3 deleted

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CECIP	A-7	A.4.4.	Change [b 3, 2.5] to [B 3 3.5] in A.4.4 Family of modules [B 3, 2.5]	Definitions from B3 deleted
CECIP	B-4	B.2	Table E.1, Maximum number of load cell verification intervals Add n_{max} in column Designation	Amended
CECIP	C-1	2.	Replace –10°C to +40°C to –10°C / +40°C	–10°C to +40°C is the appropriate phrase to use in this context.
CECIP	C-1	2.	Change (2000) to (2014) in "according to OIML R60 (2000)". Change "R60" to "R 60".	Amended
CECIP	C-1	2.	Table 2, change R60(2000) to R 60 (2014)	Amended
CECIP	C-2	5.	Third line.: maximum permissible error according OIML R60 No 5.1 There is no reference "No 5.1".	Amended
CECIP	C-3	Table	Rated output *C*n Replace C_n to C	Amended
CECIP	C-3	Table	"Excitation voltage, recommended": Add U_{exe}	Amended
CECIP			"Excitation voltage, maximum": Add U_{exe}	Amended
CECIP	C-3	Table	Because of consistency I would recommend o add a abbreviation for "Insulation resistance" like R_{iso}	Amended
CECIP	C-3	Table	"Compensated temperature range": Add "T" as abbreviation	Amended

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CECIP	C-3	Table	"Cable length": add "L" as abbreviation	Amended
CECIP	C-4		Delete "Load cell dimensions in mm", is already mentioned in "Figure 3: Dimensions of the load cell type xxx in mm". Remove subtitle of "Figure 3: Dimensions of the load cell type xxx in mm".	Amended
CECIP	C-1,C6	General	Rated output "mV/V" and Resistance values are only for analog load cells relevant. For digital load cells not applicable. Add for digital load cells: Type of Interface	Amended
CECIP	D-1	D.2	Group 3: add interval between "10 000," and "Y="	Amended
CECIP	E-1	Annex E	First line: "This Annex is taken from the WELMEC (European cooperation in legal metrology)". Add 2.4 after WELMEC.	Amended
CECIP	13	6.1.2	There are 2 tables with "Table 1". Page 13 and page C-1. document shows 2 times . This must be corrected, including several references.	Table titles changed in Annex.
CECIP	13	6.1.6	There are 2 tables with "Table 2". Page 15 and page C-1. document shows 2 times . This must be corrected, including several references.	Table titles changed in Annex.

CECIP	i	Bibliography	Bibliography with the right references to be corrected. [1] "OIML D11 General requirements for electronic measuring instruments.," **2013**. [2] "OIML R76-**1** Non-automatic weighing instruments," 2006. [3] "ISO/IEC Guide 99 OIML V 2-200 International Vocabulary of Metrology - Basic and General Concepts and Associated Terms **(VIM)**," 2012. **Guide 99, edition 2007 and VIM, edition 2012 to be combined?** [4] "OIML V2 International Vocabulary of Terms in Legal Metrology **(VIML)**," 2013. [5] "OIML D9 Principles of metrological supervision," 2004. [6] "OIML B3 OIML Basic Certificate System for OIML Type Evaluation of Measuring Instruments," 2011. [7] "Guide to the Expression of Uncertainty in Measurement, BIPM, IEC, IFCC, ISO, IUPAC, IUPAP, OIML," **JCGM 100:**2008. [8] "OIML D31 General requirements for software controlled measuring instruments," 2008. [9] "ISO 8601 Data elements and interchange formats - Information interchange - Representation of dates and times," 2004. [10] "IEC Publication 60068-2-30 ~~**Ed. 3.0,**~~" **2005-08**. [11] "IEC Publication 60068-3-4 ~~**Ed. 1 Environmental testing**~~," **2001-08**. [12] "IEC Publication 60068-2-78," ~~**2008**~~. **2012** [13] "IEC Publication 61000-2-1," 1990-05. [14] "IEC Publication 61000-4-1," 2006-~~**20**~~10. [15] "IEC Publication 61000-4-29," ~~**2008**~~. **2000-08** [16] "IEC Publication 61000-4-11," 2004-**03**. [17] "IEC Publication 61000-6-1," 2005-**03**. [18] "IEC Publication 61000-6-2," 2005-01. [19] "IEC Publication 61000-4-4," ~~**2004**~~. **2012-04** [20] "IEC Publication 61000-4-5," ~~**2005**~~. **2014-05** [21] "IEC Publication 61000-4-2," ~~**2008**~~. **2008-12** [22] "IEC Publication 61000-4-3 ~~**Ed. 3.0," 2006**~~. **2010-04** [23] "IEC Publication 61000-4-6," (~~**2003-05**~~). **2013-10** [24] "OIML R 61-**1** Automatic gravimetric filling instruments," 2004. [25] "OIML R 51-**1** Automatic catchweighing instruments," 2006. [26] "OIML R 50-**1** Continuous totalizing automatic weighing	References verified and amended

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			instruments (belt weighers)," 1997. [27] "OIML R 107-**1** Discontinuous totalizing automatic weighing instruments (totalizing hopper weighers)," 2007. [28] "OIML R 106-**1** Automatic rail-weighbridges," 2011.	
CECIP	1	[29]	There is no reference in the document to "[29] "IEC Publication 60529 Ed. 2.1," 2001-02.". Delete	Reference deleted
France	Global Document		Many thanks to the WG for the job performed! We are very close to reach a final document that makes a consensus.	
France			General. Page numbers correspond to the clean version of 3rd CD	
France	4	2.3	Replace (this occurs 2 times in this clause) "weighing modules" with "modules of aNA WI"	In this specific use, "weighing module" is simply a direct quote from OIML R76. No extrapolation to include all types of weighing devices should be made.

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France	6	3.3.2	Generally for a family of load cell, it is necessary to create such discrepancies like those described in B example to reach the metrological requirements, especially when the ratio of the highest to the lowest capacity is important. The separation in two different files will result necessarily in the addition of an additional humidity test and a separate administrative job for editing two certificates instead of one. We wonder if the insertion of such figures in the shape approach must be considered as additional criteria and if rather than strictly exclude of the family on the shape analysis guided by those figure examples (that have certainly an effect, but not more than screw length and diameter or surface finish, gauge model, gluing, potting thickness, etc.), it could not be possible to know whether in each case parameters are critical, and for example if machining shown on the right side would be more critical or not than the one on the left side or vice versa.	These example diagrams have been moved to 9.4 Selection of Load Cells Within a Family. This clause states that "When classifying load cells on the basis of the shape design,…" implyin that this is not an absolute and mandatory criterion but rather a possible means to further categorize members of a family of load cells.
France	8	3.5.12	The note should be deleted	Note refers to metrological requirements, deleted as proposed.
France	7-9	3.5.2–3.5.14	D_R Term confusing with the existing DR. We agree with NL and UK comments to change the minimum dead load output return to MDLOR (or something shorter like DLR) instead of DR term. If proposal accepted the entire document has to be reviewed in order to correct DR everywhere it appears inside part 1 and 2.	DR and D_R both appear in this Recommendation. It is recognized that they may be used erroneously and that this would lead to confusion of the terms. The use of the abbreviated symbol D_R will be discontinued and the full phrase "load cell measuring range" will be used instead. Following this same policy, E_R will no longer be used and will be replaced by "maximum measuring range"

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France	20	6.6	The second paragraph example is in opposition with scope, paragraph 2.3. Therefore, the example in brackets should be suppressed and replaced by a reference to figure 1 module restriction.	Example deleted, reference to 2.3. inserted.
France	22	6.7.1	In 2nd paragraph, the word "complete" should be deleted : "it may be considered outside the scope of this Recommendation and need to undergo additional evaluation using requirements contained in other OIML Recommendations which are applicable to complete weighing instruments." The reason is that the term "complete" clearly seems to exclude other modules that are part for example ofR76.	Amended as proposed
France	22	6.7.1.1	At the end of the first paragraph of b), delete the word "complete"	Amended as proposed
France	23	6.7.1.4	Replace "and" by "to" for the requirements references	Amended
France	30	8	Page number is missing in the clean document	Amended

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France	38	9.8.3.2	There is no formal experience of EMT reduction values in relation with loading and unloading time. It is not a free choice given to the laboratory but an alternative solution if loading or unloading times cannot be achieved. Information should be given to the manufacturer : • Either as a reminder in the application documentation (internal documents to the issuing authority); • or in the quotation to point out that this is likely to be applied . However, the obligation to effectively apply these reduced tolerances is sometimes detected when EST is presented, that is to say, between the order confirmation and receipt ofthe EST for test	Language added to indicate that consultation with applicant is necessary when loading/unloading times can not be achieved.
France	49	9.10.6.11	it could be repeated test procedure 4 or 2 times depending of precision class is missing" (like 9.1 0.5.11) it could be added 9.1 0.6.11 his : "Repeat the operations described in 9.10 .6.11 four more times for accuracy classes A and B or two more times for accuracy classes C and D".	This procedural step was not included in R60 - 2000 edition nor any of the drafts circulated among TC9 during this revision. It would be expected that if this major procedural step was critical to the evaluation, TC9p1 would have insisted on this change prior to this late stage in the revision process. The support of a majority of TC9p1 member states would be necessary to prompt this addition.

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France	49	9.10.6.12	it could be repeated test procedure 4 or 2 times depending of precision class is missing" (like 9.10.5.11) it could be added 9.10.6.12 his: "Repeat the operations described in 9.10.6.12 four more times for accuracy classes A and B or two more times for accuracy classes C and D".	This procedural step was not included in R60 - 2000 edition nor any of the drafts circulated among TC9 during this revision. It would be expected that if this major procedural step was critical to the evaluation, TC9p1 would have insisted on this change prior to this late stage in the revision process. The support of a majority of TC9p1 member states would be necessary to prompt this addition.
France	57	9.10.7.1	In the paragraph, read 9.10.7.11 instead of9.l0.7.10	Amended
France	60	9.10.7.9	For frequency range, beginning to 26 Mhz value, the corresponding nota bene of the ID 11 that describes particular cases for this disturbance test must be added.	Note added in test procedure for explanation. Frequency range amended to 80 MH_z to 2 000 MH_z
Germany	8	3.5.10	DR is the minimum dead load output return, but not expressed in load cell verification intervals *v* (see e.g. OIML R60(2000), Table C.1 or OIML R60-3, 1WD, No. 2.4. C_{DR} is the minimum dead load output return expressed in load cell verification interval *v*). DR is the minimum dead load output return expressed in mass units (g, kg, t). Change 3.5.10. in: Minimum dead load output return (DR) is the observed difference of output, expressed in mass units (g, kg, t) at the minimum load of the measuring range (D_{min}), measured before and after application of a load of D_{max}.	Paragraph amended

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Germany	General	6.1.4 (6.7.1.1)	The choise of wheater 6.7.1.1 a.) significant faults do not occur or 6.7.1.1 b.) significant faults are detected and acted upon is applied is left to the manufacturer. Remark: I do not know any digital load cell which provide the opportunity to detected significant faults (e.g. EMC). This suggests that for all digital load cells significant faults do not occur if 6.7.1.1 is applied. For R76 this requirement was the starting point for controversial discussions about significant faults. Wouldn't it be better to keep this discussion out of OIML R60 and to restrict on metrological requirements which are fulfilled by the digital load cell (e.g. field strength 10 V/m for EMC)?	While none may exist at the moment, the possibility for the manufacture of a digital load cell that detects significant faults can not be dismissed.
Germany	18	6.5.2	In contrast to 3.5.10 in 6.5.2 the minimum dead load output return is expressed in verification intervals *v*. Add following remark: It should be noted that DR is the minimum dead load output return expressed in mass units (g, kg, t). DR has to be adjusted in a value expressed in load cell verification intervals *v* (see OIML R60(2000), Table C.2 or OIML R60-3, 1 WD, No. 2.1.5.4).	Note inserted

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Germany	24	6.7.2.1	Corresponds with OIML R76 (2006), No. 5.3.5. The warm up tests according to OIML R60, No. 6.7.2.1 are corresponding with the OIML recommendation R76 (2006), No. 5.3.5 for non-automatic weighing instruments. In particular for automatic weighing instruments the warm up time is of great importance for the zero variation error (see OIML R51, No. A.5.2). The criteria for non automatic weighing instruments and thus the criteria defined in OIML R60 are not sufficient. Add following remark: Criteria not applicable for digital load cells used in automatic weighing instruments according to OIML R51.	As specified in 2.1 the scope of R60 will be limited to static type weighing
Germany	24-59	6.7.2.2 6.7.2.3 6.7.2.4 9.10.7.4	Remark: The test procedures described in 9.10.7.4 are consequent, but highly time-consuming.	Any means to expedite the testing should be discussed by PG 1 members
Germany	24	6.7.2.5	The given reference to 9.10.7.1 is not correct. Replace 9.10.7.1 by 9.10.7.5 to 9.10.7.10. Remark: Or is it sufficient to refer to the performance and stability tests for load cells equipped with electronics in table 5?	Reference to section numbers amended
Germany	24	6.7.2.5	Add v_{min} Change 6.7.2.5. in: ...shall not exceed the minimum load cell verification interval v_{min} or the load cell shall detect and react to a significant fault.	Language amended

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Germany	43	9.10.1.2	In the case where the total temperature range does not include 20°C another reference temperature may be selected. Remark: This point leads to problems because there are many other tests which have to be carried out at 20°C e.g. warm up tests and most of the tests for load cells equipped with electronics. Consequently these tests should also be carried out at reference temperature unequal 20°C which is probably not in with applicable EMC standards. Recommendation: The reference temperature should be 20°C in all cases or the consequences of another reference temperature should be checked conscientiously and carefully.	In response to these comments and those from Austria, the second sentence (added in 2CD and modified in 3CD) of this clause is deleted.
Germany	60	9.10.7.5	Incorrect references 6.7.2.2, 6.7.2.3 and 6.7.2.4 Replace 6.7.2.2, 6.7.2.3 and 6.7.2.4 by 6.7.2.5	Amended
Germany	60	9.10.7.5	There is no defined performance test procedure (load cell loaded or unloaded, near D_{min} or D_{max}, tests according to 9.10.1.1 to 9.10.1.12, number of repetitions, temperature conditions, further requirements) to evaluate the criteria defined in 6.7.2.5. It is not possible to create a report format for Short-time power reductions tests.	If additional details for this test procedure are necessary, they could be included if provided by the PG members. Earlier drafts of this Recommendation do not contain the detail requested.
Germany	61	9.10.7.6	Incorrect references 6.7.2.1 Replace 6.7.2.1 by 6.7.2.5	Amended

Member state	Page number	Document clause	Comment	Secretariat's Response
Germany	61	9.10.7.6	There is no defined performance test procedure (load cell loaded or unloaded, near D_{min} or D_{max}, tests according to 9.10.1.1 to 9.10.1.12, number of repetitions, temperature conditions, further requirements) to evaluate the criteria defined in 6.7.2.5. It is not possible to create a report format for Burst tests.	If additional details for this test procedure are necessary, they could be included if provided by the PG members. Earlier drafts of this Recommendation do not contain the detail requested.
Germany	62	9.10.7.7	Incorrect references 6.7.2.1 Replace 6.7.2.1 by 6.7.2.5	Amended
Germany	62	9.10.7.7	There is no defined performance test procedure (load cell loaded or unloaded, near D_{min} or D_{max}, tests according to 9.10.1.1 to 9.10.1.12, number of repetitions, temperature conditions, further requirements) to evaluate the criteria defined in 6.7.2.5. It is not possible to create a report format for Surge tests.	If additional details for this test procedure are necessary, they could be included if provided by the PG members. Earlier drafts of this Recommendation do not contain the detail requested.
Germany	65	9.10.7.8	Incorrect references 6.7.2.1 Replace 6.7.2.1 by 6.7.2.5	Amended
Germany	65	9.10.7.8	There is no defined performance test procedure (load cell loaded or unloaded, near D_{min} or D_{max}, tests according to 9.10.1.1 to 9.10.1.12, number of repetitions, temperature conditions, further requirements) to evaluate the criteria defined in 6.7.2.5. It is not possible to create a report format for electrostatic discharge tests.	If additional details for this test procedure are necessary, they could be included if provided by the PG members. Earlier drafts of this Recommendation do not contain the detail requested.
Germany	67	9.10.7.9	Incorrect references 6.7.2.1 Replace 6.7.2.1 by 6.7.2.5	Amended

Member state	Page number	Document clause	Comment	Secretariat's Response
Germany	67	9.10.7.9	There is no defined performance test procedure (load cell loaded or unloaded, near D_{min} or D_{max}, tests according to 9.10.1.1 to 9.10.1.12, number of repetitions, temperature conditions, further requirements) to evaluate the criteria defined in 6.7.2.5. It is not possible to create a report format for electromagnetic susceptibility tests.	If additional details for this test procedure are necessary, they could be included if provided by the PG members. Earlier drafts of this Recommendation do not contain the detail requested.
Germany	68	9.10.7.10	There is no defined performance test procedure (load cell loaded or unloaded, near D_{min} or D_{max}, tests according to 9.10.1.1 to 9.10.1.12, number of repetitions, temperature conditions, further requirements) to evaluate the criteria defined in 6.7.2.5. It is not possible to create a report format for immunity to conducted electromagnetic field tests.	If additional details for this test procedure are necessary, they could be included if provided by the PG members. Earlier drafts of this Recommendation do not contain the detail requested.
Germany	43	9.10.1.2	In the case where the total temperature range does not include 20°C another reference temperature may be selected. Remark: This point leads to problems because there are many other tests which have to be carried out at 20°C e.g. warm up tests and most of the tests for load cells equipped with electronics. Consequently these tests should also be carried out at reference temperature unequal 20°C which is probably not in with applicable EMC standards. Recommendation: The reference temperature should be 20°C in all cases or the consequences of another reference temperature should be checked conscientiously and carefully.	In response to these comments and those from Austria, the second sentence (added in 2CD and modified in 3CD) of this clause is deleted.

Member state	Page number	Document clause	Comment	Secretariat's Response
Germany	69	9.10.7.10	Test load: Are there some requirements for the test load (e.g. made of non metallic material)? What is a small test load?	See addition of (10 v) per comments from NL & CECIP
Germany		9.10.7.10	Test level index: A frequency range from 0.15 MHz to 80 MHz do not conform to current requirements	Values derived from IEC 61000-4-6
Germany	C-1	Annex C Table 1	Table 1: Add the unit (g, kg, t) in the respective column for v_{min} and DR	Amended In response to these comments and those from Austria, the second sentence (added in 2CD and modified in 3CD) of this clause is deleted.
Germany	C-3	Annex C Chapter 6	Chapter 6: Add the unit (g, kg, t) in the respective column for v_{min} and DR	Amended
Japan	NA	General	We appreciate secretariat's great efforts for providing R 60 3CD. Even so, we have to submit a negative vote again on this draft because we consider the draft still needs further revisions before final publication. The draft contains many ambiguous and/or inconsistent expressions. If our important comments on 3.5 (range, capacity …) and 6.7.2.6 (span stability) could be taken into consideration positively, we would support future revisions of R 60.	
Japan	3	2.3 Scope	Correct the number from "#3" to "#4" as shown below since it contradicts the description in OIML R76 (2006). *In the illustration from OIML R76 below, the scope of R60 would not extend beyond module ~~#3~~ **#4**.*	Amended

Japan	7 and other pages	3.5 Range, capacity and output terms, and other clauses **(IMPORTANT)**	This is partly a repetition of our comment on 2CD. The terms and symbols used to specify range, capacity and output terms have been revised inconsistently during the revision procedures from 1WD to 2CD. As a result of these revisions, there exists a significant lack of consistency among such terms and symbols, and it makes very difficult to understand 3CD correctly. Our basic policies of proposal for the terms and symbols are summarised below. 1. There is confusion in the use of symbols ***E*** (E_{min}, E_{max}, E_R) and ***D*** (D_{min}, D_{max}, D_R) for range/capacity. We believe that ***E*** should primarily be specified by the manufacturer based on the performance of load cell and then, ***D*** is determined based on *E* for practical tests and uses. 2. The range of *D* shall be equal or narrower than that of *E* based on the rule [$E_{min} \leq D_{min} \leq 0.1\ E_{max}$ and $0.9\ E_{max} \leq D_{max} \leq E_{max}$] in 9.7.3.4. The reason is the range of *D* is limited by the capability of a testing laboratory as well as the condition in practical use. Test for type approval should ideally be performed for the entire range of *E*. Some testing laboratory however may not have a sufficient testing capability to cover the entire range. For such a case, R 60 (3CD) allows an alternative test in a narrower range based on the rule (9.7.2.4). 3. Metrological requirements for type approval/verification including the important parameters (MPE, *v* and *n*) shall be defined based on '***E***' which is specified by the manufacturer and not on '***D***' which is affected by testing capability. If this policy could not be maintained, the specifications of load cell including the important parameters, in particular *v* which is proportionally related to MPE, may be affected by the testing capability. We believe that the specifications defined by the manufacturer shall not be affected (even indirectly) by the capability of a testing laboratory. 4. In 3CD, the expression '**force** expressed in units of mass' used frequently. However, 'force' is not equivalent to 'mass'. We request using a revised expression '**quantity** expressed in units of 'mass' instead. The term 'quantity' is already used frequently in R 60 (2006).	Figure 3 - Illustration of certain definitions has been amended. The following terms and their respective symbols have been included in this illustration: Minimum dead load (E_{min}); Maximum capacity (E_{max}); Maximum measuring range (E_R); Safe load limit (E_{lim}); Load cell measuring range (D_R); Minimum load (D_{min}); and Maximum load (D_{max}). Additional wording included to clarify diagram. Wording also amended to avoid any implication that the range of D is determined by the limits of the testing facilities capability.

Member state	Page number	Document clause	Comment	Secretariat's Response
			Practical proposals for revision are mentioned for each of the respective clauses (3.5.2, 3.5.5, 3.5.6, 3.5.7, 3.5.8, 3.5.9, 3.5.10, 3.5.11, 3.5.12, 3.5.14, 3.5.15, 6.1.2, 6.2.1 and 6.2.2).	
Japan	6	3.3.2 Load cell shape	As France and SCAIME Co. commented, the figures in this clause do not provide the standard criteria for classification of load cells. On the contrary, they seem a part of examples. Therefore, this clause should not be placed under terminology and moved back to Clause 9.4 (selection of load cells within a family) where it was in 2CD.	Examples moved to 9.4
Japan	7 & 8	3.5.2 Load cell measuring range (D_R), 3.5.7. maximum measuring range (E_R), and other clauses	In this draft, load cell measuring range is expressed with '$\boldsymbol{D_R}$' and minimum dead load output return is expressed with '**DR**' in 2.3.9. These two symbols however look similar. To avoid confusion, they should be easily distinguishable by using different expressions. We recommend change 'D_R' to '$\boldsymbol{D_{range}}$' and 'E_R' to '$\boldsymbol{E_{range}}$' because 'DR' has been already used widely in many documents including R60 (2006). (Note: D_R and E_R are used tentatively in our other comments.)	DR and D_R both appear in this Recommendation. It is recognized that they may be used erroneously and that this would lead to confusion of the terms. The use of the abbreviated symbol D_R will be discontinued and the full phrase "load cell measuring range" will be used instead. Following this same policy, E_R will no longer be used and will be replaced by "maximum measuring range"

Member state	Page number	Document clause	Comment	Secretariat's Response
Japan	7	3.5.2 Load cell measuring range (D_R)	Request revising the expression as shown below with strikethrough (also see our comment to 3.5). Metrological requirements should **not** be specified for D_R. ~~*Range of values of the measured quantity for which the result of measurement should not be affected by an error exceeding the maximum permissible error (MPE) (see Annex A: A.1.11). D_R is the*~~ *Range between the maximum load of the measuring range D_{max} and minimum load of the measuring range D_{min} .* ***[$D_R = (D_{max} - D_{min})$]***	Amended per comments of NL. No metrological requirements are specified in this definition - the magnitude of this range is simply defined by that range of measurements where no excessive error is observed.
Japan	8	3.5.5 Maximum capacity (E_{max})	Request revising the expression as shown below with underline (also see our comment to 3.5). *Largest value of a ~~force~~* ***quantity*** *expressed in units of mass, which may be applied to a load cell without the result exceeding the MPE (see Annex A: A.1.11).*	Amended as proposed
Japan	8	3.5.6 Maximum load of the measuring range (D_{max})	Request revising the expression as shown below with underline (also see our comment to 3.5). *Largest value of ~~force introduced~~* ***a quantity expressed in units of mass, which may be applied*** *to a load cell during test or use.* *Note: For the limits on D_{max} during testing, see 9.7.3.4.*	amended to delete use of term "force"

Member state	Page number	Document clause	Comment	Secretariat's Response
Japan	8	3.5.7 Maximum measuring range (E_R)	Request adding the expression as shown below with underline (also see our comment to 3.5). Metrological requirements should be specified for E_R. ***Range of values of the quantity expressed in units of mass, which may be applied to a load cell without the result exceeding the MPE (see Annex A: A.1.11). E_R is the*** *range between maximum capacity E_{max} and minimum dead load E_{min}.* ***[****$E_R = (E_{max} - E_{min})$****]***	Amended
Japan	8	3.5.8 Maximum number of load cell verification intervals (n_{max})	Request revising the expression as shown below with underline (also see our comment to 3.5). n_{max} shall be decided based on the maximum measuring range (E_R) specified by the manufacturer. *Maximum number of load cell verification intervals into which the ~~load cell~~* ***maximum*** *measuring range may be divided for which the result of measurement will not be affected by an error exceeding the MPE (see Annex A: A.1.11).*	Clause amended
Japan	8	3.5.9 Minimum dead load (E_{min})	Request revising the expression as shown below with underline (also see our comment to 3.5). *Smallest value of ~~force introduced by a load (expressed in mass units)that~~* ***a quantity expressed in units of mass, which*** *may be applied to a load cell without the result exceeding the MPE (see Annex A: A.1.11).*	Amended as proposed

Member state	Page number	Document clause	Comment	Secretariat's Response
Japan	8	3.5.10 Minimum dead load output return (DR)	Request revising the expression as shown below with underline (also see our comment to 3.5). Metrological requirements should be specified with *E*. The unit of *E* is mass, not interval. *The observed difference ~~of output, expressed in load cell verification intervals at the minimum load of the measuring range (D_{min})~~* ***in load cell output at minimum dead load (E_{min}), which is*** *measured before and after application of a load of* ***E_{max}.***	When evaluation of a load cell is performed during testing, practical use of maximum/minimum test loads (D_{min} and D_{max}) is appropriate. This is consistent with test procedure: 9.10.3 (A.4.3 in R60 2000 edition), where minimum and maximum test loads (D_{min} and D_{max}) are used to evaluate minimum dead load output return. Clause amended per comments from Germany
Japan	8	3.5.11 Minimum load cell verification interval (v_{min})	Request revising the expression as shown below with underline (also see our comment to 3.5). v_{min} shall be decided based on the maximum measuring range (E_R) specified by the manufacturer. *Smallest load cell verification interval into which the ~~load cell~~* ***maximum*** *measuring range ~~DR (Dmax – Dmin)~~* ***E_R ($E_{max} - E_{min}$)*** *can be divided.*	Symbol and formula removed, language from R60 2000 reinstated. See also response related to 3.5.10
Japan	8	3.5.12 Minimum load of the measuring range (D_{min})	Request revising the expression as shown below with underline (also see our comment to 3.5). *Smallest value ~~for a load~~* ***of a quantity expressed in units of mass,*** *which is applied to a load cell during test or use.* *Note: For the limits on D_{min} during testing, see 9.7.3.4.*	Amended as proposed

Member state	Page number	Document clause	Comment	Secretariat's Response
Japan	9	3.5.14 Relative DR or Z	Request revising the expression as shown below with underline (also see our comment to 3.5). DR shall be decided based on the maximum measuring range (E_R) specified by the manufacturer. *Ratio of the ~~load cell measuring range DR~~ **maximum measuring range E_R**, to two times the minimum dead load output return, DR.* *Note: This ratio is used to describe multi-interval instruments.*	Amended as proposed
Japan	9	3.5.15 Relative v_{min} or Y	Request revising the expression as shown below with underline (also see our comment to 3.5). v_{min} shall be decided based on the maximum measuring range (E_R) specified by the manufacturer. *Ratio of the ~~load cell measuring range DR~~ **maximum measuring range E_R**, to the minimum load cell verification interval, v_{min}.* *Note: This ratio describes the resolution of the load cell independent from the load cell capacity.*	Amended as proposed
Japan	10 or 11	3.7.xx (new) Maximum permissible error (MPE)	Request adding a definition of MPE as shown below. *Extreme values of an error permitted by this Recommendation (refer to clause 6) for a load cell. [Adapted from VIM 4.26]*	Protocol is to use established definitions when available. This generic definition is valid for load cells and devices

Member state	Page number	Document clause	Comment	Secretariat's Response
Japan	13	6.1.2. Maximum number of load cell verification intervals (n_{max})	Request revising the expression as shown below with underline (also see our comment to 3.5). n_{max} shall be decided based on the maximum measuring range (E_R) specified by the manufacturer. *The maximum number of load cell verification intervals, n_{max}, into which the ~~load cell~~ **maximum** measuring range can be divided in a measuring system shall be within the limits fixed in Table 1.*	Amended as proposed
Japan	15	6.2.1. Minimum load of the measuring range (D_{min})	Recommend deleting this clause as it is already mentioned in 3.5.12.	Clause retained - 3.5.12 provides definition, this clause provides range of D_{min}. Language amended per NL and UK comments
Japan	15	6.2.2. Maximum load of the measuring range (D_{max})	Recommend deleting this clause as it is already mentioned in 3.5.6.	Clause retained - 3.5.6 provides definition, this clause provides range of D_{max}. Language amended per NL and UK comments
Japan	21	6.7.2.2 Mains power supply (AC)	We request deleting the item b) for frequency in order to be compliant with the requirement in clause 3.9.3 of R76 (2006).	Amended as proposed

Member state	Page number	Document clause	Comment	Secretariat's Response
Japan	22, 59	6.7.2.6 Span stability: maximum allowable variation requirements, and 9.10.7.11 Span stability **(IMPORTANT)**	Based on the descriptions in 9.10.7.11, we assume that a humidity test is expected during the span stability test for a CH marked load cell. However, we request not to include the humidity test during the span stability test. Mounting/dismounting of a load cell to/from the load tester is required for the humidity test when the test is conducted using a separate humidity chamber. In this case, the mounting procedure affects the result of span stability test significantly, and it makes difficult to satisfy the MPE (0.5 v) for span stability. The MPE for the humidity test is already set at a larger value (1 v) by considering such effect of mounting procedure.	It would be implied that an alternative would be to not conduct any humidity test or to only conduct a steady state humidity test however, evaluations should include all testing necessary to comply with what is requested by applicant. The design of mounting equipment is extremely critical and must be done correctly (by manufacturer/applicant). It is recommended that test sequences (8.11 - 4CD) be followed. See also 9.7.3.3.
Japan	31	9.3 Selection of specimens for evaluation	This clause mentions concrete testing procedures for type approval including treatments for malfunctions in testing facilities of member states. We believe, however, it is inappropriate to mention these procedures in an OIML recommendation as each member state is allowed to specify such procedures independently. Therefore, we consider that the entire clause is unnecessary and should be deleted.	Modifications made to this section providing more flexibility in examination and test procedures to be performed by the issuing authority.
Japan	58	9.10.7.9 Electromagnetic susceptibility	The description needs to conform to B.3.5 of R76 (2006) and 13.2 of D11 (2013). Therefore, we recommend correcting the frequency range as well as adding a note as shown below *Frequency range: ~~26~~ **80** MHz to 2,000 MHz* *Note: The lower limit of frequency of electromagnetic field is 26 MHz for the load cells without power lines or I/O ports, to which the test for conducted electromagnetic field (9.10.7.10) is inapplicable.*	Note added in test procedure for explanation. Frequency range amended to 80 MH_z to 2 000 MH_z

Member state	Page number	Document clause	Comment	Secretariat's Response
Japan	59	9.10.7.11 Span stability	Correct the numbering as shown below. Present: *Span stability (see 6.7.2.**2**)* Correct: *Span stability (see 6.7.2.**6**)*	Amended
Netherlands	NL-1	general	Although lot of improvement is observed the actual draft is considered not sufficiently mature to forward to CIML approval stage.	
Netherlands	NL-2	general	Page numbering in comment forms is considered not efficient especially where different versions of drafts are available (clean or marked) In very near future BIML will provide a uniform template.	
Netherlands	NL-3	general	In a part 1 of a Recommendation the word "test" should be omitted. A test concerns a the manner to actually verify whether a requirement is fulfilled and therefore cannot be part of the requirement itself.	The term "test" is used only when necessary and unecessary or arbitrary uses have been eliminated
Netherlands	NL-4	general	Quite a number of definitions in the terminology do not fulfil OIML B 6-2.	Amended
Netherlands	NL-5	general	Quite some inconsistencies and redundancies were found in the draft. This mainly origins from the original language applied in the clauses in the published R 60 which is rather poor. Although it is quite usual that editorials will be corrected in the final stage of drafting it is suggested for this draft because of the number of corrections to be made to focus a little bit earlier on this editorial aspect. In the underneath NL comments quite a few suggestions for editorial improvement are presented.	Amendments made where appropriate

Member state	Page number	Document clause	Comment	Secretariat's Response
Netherlands	NL-6	general	Throughout the document the abbreviation n_{max} is used for "Maximum number of **load cell** verification intervals". This is incorrect. The correct abbreviation is n_{LC} The abbreviation n_{max} stands for "maximum number of verification **scale** intervals".	Amended where appropriate
Netherlands	NL-7	general	Suggestion is not to apply "*maximum permissible measurement error"*. Instead only apply "*maximum permissible error*". The word "*measurement*" in the definition is confusing and not used consistently.	Amended
Netherlands	NL-8	2.1	*...to appropriately evaluate them. These additional test procedures may be annexed when necessary* Suggest to amend to read: *...for appropriate evaluation. These additional test procedures may be added when necessary*	Existing language retained
Netherlands	NL-9	2.2	*"Note: the error envelope may be defined as the curves that provide the boundary of the maximum permissible errors ..."* What has been defined in this note as "error envelope" concerns the maximum permissible error (singular). What is presented to be *maximum permissible errors* are concern the *errors*. So please amend to: *"Note: the maximum permissible error may be defined as the boundary of the combined individual errors (see Table 4) as a function of the force introduced by the applied load (expressed in mass units) over the measuring range. This combined error determined may be positive or negative and include the effects of nonlinearity, hysteresis and temperature.*	Amended as proposed

Member state	Page number	Document clause	Comment	Secretariat's Response
Netherlands	NL-10	2.3	*While digital load cells may be covered under this Recommendation, a load cell that produces an output consisting of more than digital "raw counts" will not be covered under R60* "Counts" is not correct while counts are time dependent. *Although the scope of this Recommendation covers digital load cells, only those load cells that just output a pure instantaneous non integrated binary representation of the applied load (digital raw data) are covered under the R 60*	This wording was added as a result from the discussion during the TC9P1 meeting in March 2014
Netherlands	NL-11	3	One should only refer to vocabularies for terminology. In past quite some terms however were not part of the VIML or VIM. Today in the new versions of VIML the most relevant terminology applied in D 9, D1, D31 and B3 is part of the VIML (V1). So delete reference to these documents. Furthermore all the contents of Annex A should be moved to this clause 3.	Amended
Netherlands	NL-12	3.1.1	*"..into measurement units such as mass".* Suggest to amend to read: *"..into a value in measurement units such as mass".*	Retained existing language in last sentence. Any conversion by another device would be to convert a load cell output value into measurement units

Member state	Page number	Document clause	Comment	Secretariat's Response
Netherlands	NL-13	3.1.2	This way of presentation (as requested in the USA comment) is not allowed for terminology. Please study B 6-2 or contact BIML for details on presenting definitions terminology. E.g. It should always be possible to replace the term by its definition, which requires the definition only to contain a description/statement, not being a complete sentence. Add the definition for a digital load cell as follows: *"digital load cell* *load cell that includes intrinsically (as a minimum) the function of analogue to digital output conversion, and additionally may feature intrinsic functions such as temperature compensation and signal filtering."*	Definition of digital load cell added based on input from PG subcommittee.
Netherlands	NL-14	3.2.1.1	*"compression loading* *compressive force applied to the load receptor of a load cell."* Is not fulfilling the requirement of a definition. Suggest to amend to : *"compression loading* *applying a compressive force to the load receptor of a load cell".*	amended per comments of NL and UK
Netherlands	NL-15	3.2.1.2	Similar comment as for 3.2.1.2	amended per comments of NL and UK

Member state	Page number	Document clause	Comment	Secretariat's Response
Netherlands	NL-16	3.3.1	*"strain gauge* *analogue resistive element that is bonded to a load cell structure and changes resistance depending on the compression or tension deformation of the load cell structure*" Suggest to amend to read: *"strain gauge* *resistive element that is attached to a load cell structure of which the impedance will change depending on and analog to the compression or tension introduced deformation of the load cell structure"*	Terminology amended according to NL and UK comments. No change made from resistance to impedence per discussion with NL on 17 April 2015
Netherlands	NL-17	3.3.2	Does not concern terminology. This concerns additional information, to be annexed	Examples moved to 9.4
Netherlands	NL-18	3.3.2	The dimensions of the two load cells in example B are not the same. Specific guidance on which geometries should be tested is missing. The differences between Examples B and C may not be relevant.	These example diagrams have been moved to 9.4 Selection of Load Cells Within a Family. This clause states that "When classifying load cells on the basis of the shape design,…" implyin that this is not an absolute and mandatory criterion but rather a possible means to further categorize members of a family of load cells.
Netherlands	NL-19	3.4.1	*"humidity symbol* *symbol assigned to a load cell that indicates the conditions of humidity under which the load cell has been tested"* Incorrect. Concerns the conditions for which the load cell is designed So replace *"tested"* by "*designed"*	This change to clause not made per discussion with NL on 17 April, 2015

Member state	Page number	Document clause	Comment	Secretariat's Response
Netherlands	NL-20	3.4.2	In the way formulated this does not concern terminology The definition may start : *" group of load cells, which for the purpose of type evaluation are considered one family and that are of: ....."*	amended
Netherlands	NL-21	3.4.2	Propose to add a bullet concerning the same (type of) strain gauges and glue Please add information and examples (e.g. in annex D) on what needs to be additionally tested if the material changes, if the strain gauge changes, etc	Bullet point added as proposed. Information and examples may be added to Annex D when provided by experts
Netherlands	NL-22	3.5.1	"load cell interval part of the load cell measuring range into which that range is divided" "load cell interval subdivision of the load cell measuring range"	amended as proposed
Netherlands	NL-23	3.5.2	The term D_R might be confused with DR and is considered unnecessary while D_R is only used in the terminology. If needed it is suggested to use the full wording "load cell measuring range". So delete the abbreviation	D_R and DR both appear in this Recommendation. It is recognized that they may be used erroneously and that this would lead to confusion of the terms. The use of the abbreviated symbol D_R will be discontinued and the full phrase "load cell measuring range" will be used instead. Following this same policy, ER will no longer be used and will be replaced by "maximum measuring range"

Member state	Page number	Document clause	Comment	Secretariat's Response
Netherlands	NL-24	3.5.2	*"load cell measuring range (DR)* *range of values of the measured quantity for which the result of measurement should not be affected by an error exceeding the maximum permissible error (MPE) (see Annex A: A.1.11).* *DR is the range between the maximum load of the measuring range Dmax and minimum load of the measuring range* D_{min} $D_R = (D_{max} - D_{min})$*"* Replace "*should not be affected*" by "*is not affected*" The subsequent sentence cannot be part of the definition and is only additional information to be put in a note. "*load of a measuring range*" is incorrect Probably is meant: "*load regarding the measuring range*" This all results in: *"load cell measuring range* *range of values of the measured quantity for which the result of measurement is not be affected by an error exceeding the maximum permissible error (MPE) (see Annex A: A.1.11).and concerns the range between the maximum load(* D_{max}*)and minimum load (*D_{min}*).*	D_R and DR both appear in this Recommendation. It is recognized that they may be used erroneously and that this would lead to confusion of the terms. The use of the abbreviated symbol D_R will be discontinued and the full phrase "load cell measuring range" will be used instead. Following this same policy, E_R will no longer be used and will be replaced by "maximum measuring range"
Netherlands	NL-25	3.5.4	*"load cell verification interval (v)* *load cell interval, expressed in units of mass, used in the test of the load cell for accuracy classification."* Replace by: *"load cell verification interval (v)* *load cell interval as applied for verification purposes"* (while the load cell interval already contains "expressed in units of mass" and note previous comments on the use of the word "test")	This change to clause was not made based on discussion with NL and OIML on 17 April, 2015
Netherlands	NL-26	3.5.5	*"maximum capacity (*E_{max}*)* *largest value of a force ....* Replace by: *"largest value of force ....*	Amended per Japan comment

Member state	Page number	Document clause	Comment	Secretariat's Response
Netherlands	NL-27	3.5.6	Not correct while the word "test" is applied in which way the test would provide the normative value. However a test is only a actual verification of a specification. So the spec´s (design) should provide the $D_{max.}$ *"maximum load of the measuring range (D_{max}) largest value of force for which the load cell can be applied [for legal purposes] (expressed in units of mass)"*	Testing is performed under conditions present during the evaluation therefore the use of D_{max} is appropriate. Clause amended per comment from Japan.
Netherlands	NL-28	3.5.7	Suggest to delete the term E_R while not applied in the draft	ER will no longer be used and will be replaced by "maximum measuring range"
Netherlands	NL-29	3.5.10	The title is not in line with the definition. According to the definition the title should read "minimum load output return"	When evaluation of a load cell is performed during testing (as denoted in the definition's first words - "***observed difference***"...), practical use of maximum/minimum test loads (D_{min} and D_{max}) is appropriate. This is consistent with test procedure: 9.10.3 (A.4.3 in R60 2000 edition), where minimum and maximum test loads (D_{min} and D_{max}) are used to evaluate minimum dead load output return. Clause amended per comments from Germany
Netherlands	NL-30	3.5.11	No reason for implementing symbols and formula	Symbol and formula removed, language from R60 2000 reinstated.

Member state	Page number	Document clause	Comment	Secretariat's Response
Netherlands	NL-31	3.5.12	Definition is not correct. (Note previous comments on the use of the word "test")	See responses for 3.5.6 and 3.5.10
Netherlands	NL-32	3.5.13	Definition is not correct. The complete term should not be repeated in the definition. The term is "overdefined" In order to define the symbol "n" suggest to produce a list of symbols stating for "n" n = number of load cell verification intervals	Definition amended
Netherlands	NL-33	3.5.14	It is incorrect to use the term "*relative DR"* and at the same time use "*Z*" as symbol in the same term. Use the term "*relative dead load output (Z)"*	Definition amended
Netherlands	NL-34	3.5.15	It is incorrect to use the term "*relative* v_{min}*"* and at the same time use "*Y*" as symbol in the same term. Use the term "*relative minimum load cell verification interval (Y)"*	Amended as proposed
Netherlands	NL-35	3.5.17	*"warm-up time* *time between the moment that electrical power is applied to a load cell and the moment at which the load cell is capable of complying with the requirements."* ("power" only may be interpreted as e.g. "mechanical power)	Definition amended
Netherlands	NL-36	3.7.2 and more	In OIML R 76-1 (2006) the term is apportioning factor, propose to use same wording.	In the interest of consistency, amended as proposed
Netherlands	NL-37	3.7.3	For OIML purposes suggest only to refer to OIML G 1-100 (2008)	Amended as proposed

Member state	Page number	Document clause	Comment	Secretariat's Response
Netherlands	NL-38	3.7.4	Propose *"electrical (alarm)signal issued by the load cell …"*	Representation is a broader term that also may encompass a reading from a diagnostic meter. Original language retained.
Netherlands	NL-39	3.7.7	*"non-linearity* *deviation from the average of the values of load cell signals from a straight line through zero force applied and maximum force applied."* Unclear language in the definition and the term may be considered a common dictionary term. B6-2 (A.1.1.2) If still considered needed suggest to modify to: *"non-linearity* *deviation between the coordinates of the averages of the load cell signal values measured and the corresponding positions on the straight line drawn between the zero force coordinate and the coordinate at maximum force applied*."	Definition is clearly written in context to load cell performance. Existing language retained.
Netherlands	NL-40	3.7.9	Suggest to amend to: *"span stability* *capability of the output of a load cell to maintain over the load cell's measuring range within specific limits during a specific period of use"*	Paragraph amended
Netherlands	NL-41	3.9	In the draft the abbreviations "LC" and "EUT" are used several times. Suggest therefore to add " LC: Load cell and EUT: Equipment under test	Added as proposed

Member state	Page number	Document clause	Comment	Secretariat's Response
Netherlands	NL-42	4.	Propose to delete the example "*pressure (e.g. hydraulic, pneumatic)"* because usually this kind of transducers do not apply any alternative techniques but will apply strain gauges or vibratory frequency as well.	These types of transducers are provided as examples and are included to signify the broad scope of the document.
Netherlands	NL-43	5	Is there anyone who understands this clause and the use of it ? Suggest to change to: *"Any presentation of a measurement performed within the scope of legal metrology, including those where load cell(s) are applied as part of a measuring instrument shall be in units according to the International System of Units (SI)"*	Section deleted per UK comment.
Netherlands	NL-44	6.1	Second sentence: (linguistic) *"In the application of this Recommendation, it should be recognized that the effective performance of a particular load cell may be improved by compensation measures within the measuring system as part of which it is applied."* Third sentence: *Therefore, it is not the intention of this Recommendation to require the same accuracy class for a load cell as for the measuring system in which it may be applied. Nor does it require that a measuring instrument, which for example indicates in units of mass, applies a load cell which has been approved during a separate type evaluation.* Fourth sentence: change *"found"* to *"listed"*	Clause amended

Member state	Page number	Document clause	Comment	Secretariat's Response
Netherlands	NL-45	6.1.1	Suggest to amend to: *"Load cells shall be ranked, according to their overall performance capabilities, into one of the four accuracy classes, as follows:*	Clause amended
Netherlands	NL-46	6.1.2	Change "*fixed*" to "*presented"*	Amended as proposed
Netherlands	NL-47	6.1.5	*"Complete load cell classification"* Suggest to amend to: *"Overall load cell classification"* *"The load cell shall be classified according to six parts:"* Amend to: *"The load cell shall be classified corresponding the following six parameters:"*	Wording amended
Netherlands	NL-48	6.1.7	*"Multiple classifications* *Load cells that have complete classifications for different types of load shall be designated using separate information for each classification. Examples are shown in Table 3. An illustration of the standard classification symbols using an example is shown in Figure 4".* Suggest to amend to: *"Multiple classifications* *Load cells having an overall classification comprising different designs shall be accompanied by, or show the separate information for each of these classifications. Examples are shown in Table 3. An illustration of the standard classification symbols using an example is shown in Figure 4."*	Language amended

Member state	Page number	Document clause	Comment	Secretariat's Response
Netherlands	NL-49	6.1.7 Table 3	This is actually only one example of one load cell having multiple classifications.	Corrected
Netherlands	NL-50	6.2.1	Minimum load regarding the measuring range (D_{min}) The load applied to a load cell during test or use and expressed in values of mass shall be at least E_{min}	Language amended
Netherlands	NL-51	6.2.2	Which are the applied units ? Mass or force ? please harmonize with 6.2.1 Delete the note which is confusing only	Note deleted. Clause amended per U.K. comment
Netherlands	NL-52	6.3 and subclauses	Maximum permissible measurement error should as much as possible be specified in singular while it concerns a limit value.	Amended
Netherlands	NL-53	6.3.1	Please MPE in singular	Amended
Netherlands	NL-54	6.6	This sub clause was not discussed or commented and moreover the inserted text is quite unclear. E.g. What is meant by a "*submitter of the load cell evaluation*". Al least use different wording e.g. : *"Applicant for type evaluation"*	Amended
Netherlands	NL-55	6.6.1.1.	Upgrade language e.g. Regardless of the temperature effects on minimum dead load output and unless 6.6.1.2 applies the load cell shall satisfactory perform within the applicable maximum permissible error as specified in 6.3.1.1 over the temperature range of – 10 °C to + 40 °C, Note: In anticipation to local climatic and environmental conditions national authorities may prescribe alternative limits for the temperature range of at least 50 °C.	Wording amended

Member state	Page number	Document clause	Comment	Secretariat's Response
Netherlands	NL-56	6.3	Change "*maximum permissible measurement errors"* to "*maximum permissible errors"*.	Language in first paragraph retained, wording in Note amended per U.K. comment
Netherlands	NL-57	6.6.3.2	The error at minimum load may be disputable. Consider p_{LC} * 4% (due to limitation of zero-setting range for R76 instruments to 4%)	The change suggested is a technical amendment that has not been recommended or endorsed in earlier drafts by other member states. Changes of this nature should be supported by a majority of p1 members.
Netherlands	NL-58	6.7.1	p_{LC} = 1.0 should only be applied for digital load cells. Where equipped with only analogue electronics (for example to compensate for temperature effect) p_{LC} should be 0.7.	The change suggested is a technical amendment that has not been recommended or endorsed in earlier drafts by other member states. Changes of this nature should be supported by a majority of p1 members.
Netherlands	NL-59	6.7.1.2	*"This fault detection output shall continue until the user acts on the fault or the fault disappears"* Change to: *"This output shall continue to indicate the detected fault until the operator acts on the fault or the fault is resolved* "	Wording amended
Netherlands	NL-60	6.7.1.3	*"The load cell shall be suitably durable so that the requirements of this Recommendation may be met in accordance with the intended use of the load cell."* Suggest to amend to: "*The load cell shall be sufficiently durable implying that taking into account the intended use of the load cell the requirements of this Recommendation are met"*	Existing wording is not misleading or unclear. No changes are necessary.

Member state	Page number	Document clause	Comment	Secretariat's Response
Netherlands	NL-61	6.7.2.2	We wonder whether load cells with AC mains power supply exist. If not, remove the clause. However do add DC mains power supply as this will be the most common way applied.	Sub-group did not definitively conclude whether this type of load cell should be excluded from consideration in R60. Clause will be retained.
Netherlands	NL-62	6.7.2.4	Add character bulleting a); b) to "All functions shall operate as designed." and to "All measurement results shall be within maximum permissible errors." respectively Delete the note: A three phase electrical power supply is not applicable.	Amended as proposed
Netherlands	NL-63	6.7.2.6	*"whichever is the greater on any of the measurements".* Change to "*whichever is the greatest."* (*on any of the measurements* is considered redundant)	Amended as proposed
Netherlands	NL-64	(6.7.2.7) Table 5	Table 5 should be above 6.7.2.6? Also see NL comments on test names (9.10.7.9 and 9.10.7.10)	Table relocated prior to 6.7.2.6 (5.7.2.6 in 4CD). Test names amended.
Netherlands	NL-65	7.1	Software identification by an imprint is not acceptable for NL. A digital load cell can send its SW identification through its interface. The connected instrument can then show the SW identification. Add sub clauses/bulleting according to OIML B 6-2 where relevant.	Exceptions to imprinting provided in OIML D 31. Sub clauses created as proposed.

Member state	Page number	Document clause	Comment	Secretariat's Response
Netherlands	NL-66	9.7.3.1	Clause 9 concerns Type evaluation, implying testing on a few specimens under laboratory conditions, So "*routine testing*" is not applicable. In case specific parameters are not under control or registered while the response of the EUT on other parameters is tested there could be a disturbing influence by a non controlled parameter could cause an incorrect rejection. Delete the inserted text	Deleted portion of inserted text. See also UK comments.
Netherlands	NL-67	9.10.1.2. 9.10.1.13 9.10.2.2 9.10.3.2 9.10.5.2	Should be presented as (20 ± 2) °C [OIML B 6-2 (6.8.1.2)]	OIML B 6-2, 6.8.1.2 refers to "tolerances on percentages" not temperature
Netherlands	NL-68	9.10.7.9	Change title to: *"Exposure to radiated RF electromagnetic fields* (see D11:2013)" and the frequency range should not start at 26 MHz but at 80 MHz while a load cell always will have external wiring or external wiring can be connected	Note added in test procedure for explanation. Frequency range amended to 80 MH_z to 2 000 MH_z
Netherlands	NL-69	9.10.7.10.	Change title to: "*Exposure to conducted (common mode) currents generated by RF EM fields"* Table Test method, Notes. Suggestion to add (10 v) in the last sentence "*applying a small test load (10 v)."*	Title amended
Netherlands	NL-70	9.10.7.11	Remove "°)" in reasonably constant (±2 °C °)	Amended
Netherlands	NL-71	A.1 and A.2	Should be part of terminology	Relocated definitions from A.1. & A.2. to Terminology

Member state	Page number	Document clause	Comment	Secretariat's Response
Netherlands	NL-72	A.2.10	Remove *"mark"* in A.2.10 Sealing mark (See VIML)	Corrected
Netherlands	NL-73	A.3	The numbering of the definitions from OIML D 11, are not in conformity with the actual version (2013)	Corrected
Netherlands	NL-74	A.3	Refer only to OIML D11 where terms are not defined in the actual VIM or VIML	Amended
Netherlands	NL-75	A 3	In case a term is no longer defined in VIM; VIML or D 11delete completely while those terms are considered self-explanatory or common dictionary terms	Amended
Netherlands	NL-76	A.4	For terminology no reference should anymore be made to B 3 only refer to VIML or VIM	Definitions from B3 deleted
Netherlands	NL-77	B.1. and further	Replace "*test certificate*" by "*OIML certificate of conformity*" or "*certificate*"	Amended
Netherlands	NL-78	B.2	Table E.1, Maximum number of load cell verification intervals Add n_{max} in column Designation	Amended
Netherlands	NL-79	B.3	This clause is superfluous because an OIML Certificate of Conformity is accompanied by the associated type evaluation reports	This section deleted
Netherlands	NL-80	C	There is an overlap in table numbering between the main parts and the annexes. (Table 1 and 2 versus annex C) Please apply OIML B 6-2 (6.2.2)	Amended
Netherlands	NL-81	C.2	This clause is superfluous because an OIML Certificate of Conformity is accompanied by the associated e type evaluation reports	Amended

Member state	Page number	Document clause	Comment	Secretariat's Response
Netherlands	NL-82	Annex C Sect.5	Second paragraph.: maximum permissible error according OIML R60 No 5.1 There is no reference "No 5.1".	Amended
Netherlands	NL-83	Annex C Sect.6 Table # ?	*"Rated output Cn"* "Rated output" is not defined	As an example for supplemental data that could be included on a certificate, a formal definition for this term is not warranted
Netherlands	NL-84	Connections Table # ?	Delete "Load cell dimensions in mm", is already mentioned in "Figure 3: Dimensions of the load cell type xxx in mm".	Amended
Netherlands	NL-85	D	Where possible extend examples with different geometries (see comment on 3.4.2)	More realistic examples could be considered by the PG if submitted for review.
Netherlands	NL-86	D.2	Group 3: add space between "*10 000," and "Y="*	Amended
SCAIME	Golbal document		Many thanks to the WG for the job performed! We are very close to reach a final document that makes a consensus.	

Member state	Page number	Document clause	Comment	Secretariat's Response
SCAIME	6	3.3.2	We think that the insertion of such figures in the shape approach will result in increasing the costs of a load cell family approval. Generally for a family of load cell, it is necessary to create such discrepancies like those described in B example to reach the metrological requirements, especially when the ratio of the highest to the lowest capacity is important.. The separation in two different files will result necessarily in the addition of an additional humidity test and a separate administrative job for editing two certificates instead of one. Approval fees will be increased. Rather than strictly exclude of the family on the shape analysis guided by those figure examples (that have certainly an effect, but not more than screw length and diameter or surface finish, gauge model, gluing, potting thickness, etc.), we will prefer to let the issuing authority to select additionally one specific load cell of the whole range that present such discrepancies. §9.3 and §9.4 concerning the selection of load cells and their number allows to add additional samples to test if required.	These example diagrams have been moved to 9.4 Selection of Load Cells Within a Family. This clause states that "When classifying load cells on the basis of the shape design,…" implyin that this is not an absolute and mandatory criterion but rather a possible means to further categorize members of a family of load cells.

Member state	Page number	Document clause	Comment	Secretariat's Response
SCAIME	7-9	3.5.2.-3.5.14	D_R Term confusing with the existing DR. We agree with NL and UK comments to change the minimum dead load output return to MDLOR (or something shorter like DLR) instead of DR term. If proposal accepted the entire document has to be reviewed in order to correct DR everywhere it appears inside part 1 and 2	D_R and DR both appear in this Recommendation. It is recognized that they may be used erroneously and that this would lead to confusion of the terms. The use of the abbreviated symbol D_R will be discontinued and the full phrase "load cell measuring range" will be used instead. Following this same policy, E_R will no longer be used and will be replaced by "maximum measuring range"
SCAIME	20	6.6	Second paragraph example in opposition with scope, paragraph 2.3. Suppress the example in brackets and refer to figure 1 module restriction.	Example deleted, reference to 2.3. inserted.
SCAIME	23	6.7.1.4	Replace "and" by "to" for the requirements references	Amended
SCAIME	29		White page to suppress in the clean document	Amended
SCAIME	30	8	Page number is missing in the clean document	Amended
SCAIME	41	9.8.3.2	We have no formal experience of EMT reduction values in relation with loading and unloading time. It is not a free choice given to the laboratory but an alternative solution if loading or unloading times cannot be achieved. An information shall be done to the manufacturer previously to submitting load cells for an approval if this method will be applied.	Language added to indicate that consultation with applicant is necessary when loading/unloading times can not be achieved.

Member state	Page number	Document clause	Comment	Secretariat's Response
SCAIME	44	9.10.1.5	Stability criteria: we are waiting for the propositions. We agree that it will quite hard to define it because it is purely subjective… Something that will combine the rising time (percentage of final value) and time after this point is reached. Depending of the test facility and conditioner filtering, a practical evaluation can be done when initiating the test.	No criteria for stability has been submitted for consideration.
SCAIME	48	New § after 9.10.6.11	We think repeat test procedure 4 or 2 times depending of precision class is missing (like 9.10.5.11)	This procedural step was not included in R60 - 2000 edition nor any of the drafts circulated among TC9 during this revision. It would be expected that if this major procedural step was critical to the evaluation, TC9p1 would have insisted on this change prior to this late stage in the revision process. The support of a majority of TC9p1 member states would be necessary to prompt this addition.
SCAIME	49	New § after 9.10.6.12	We think repeat test procedure 4 or 2 times depending of precision class is missing (like 9.10.5.11)	This procedural step was not included in R60 - 2000 edition nor any of the drafts circulated among TC9 during this revision. It would be expected that if this major procedural step was critical to the evaluation, TC9p1 would have insisted on this change prior to this late stage in the revision process. The support of a majority of TC9p1 member states would be necessary to prompt this addition.

Member state	Page number	Document clause	Comment	Secretariat's Response
SCAIME	57	9.10.7.1	In the paragraph, read 9.10.7.11 instead of 9.10.7.10	Amended
SCAIME	59	9.10.7.4	This requirement applies to DC mains and AC mains networks but both have been suppressed.	Applicable test procedures for both DC and AC mains are provided
SCAIME	67	9.10.7.9	We will prefer 80Mhz old 26Mhz requirement as in IR76. If 26 Mhz value is kept, add necessarily the corresponding nota bene of the ID11 that describes particular cases for this disturbance test.	Frequency range amended to 80 MH_Z to 2 000 MH_Z
U.K.	4	3.1.1.	load cell measuring transducer that, in response to an applied load will produce an output. This output may be converted by another device into measurement units such as mass. Suggest change to wording: measuring transducer that will produce an output in response to an applied load. This output may be converted by another device into measurement units such as mass.	amended as proposed

Member state	Page number	Document clause	Comment	Secretariat's Response
U.K.	5	3.1.12	load cell equipped with electronics load cell employing an assembly of electronic components having a recognizable function of its own. Load cells that include intrinsically (as a minimum) the function of analog to digital output conversion, are referred to as "digital load cells" and are examples of load cells equipped with electronics. Additional features such as temperature compensation and signal filtering may also be an intrinsic functions of the load cell equipped with electronics. Suggest change to wording: Additional features such as temperature compensation and signal filtering may also be ~~an~~ intrinsic functions of the load cell equipped with electronics.	Definitions for load cells revised, definition for digital load cell added based on input from PG subcommittee.
U.K.	5	*3.2.1.1.*	compression loading compressive force applied to the load receptor of a load cell. Suggest change to wording: compressive force applied to ~~the load receptor of~~ a load cell. Or alternative wording: compressive force applied to the loading point of a load cell.	amended per comments of NL and UK
U.K.	5	*3.2.1.2.*	tension loading tension force applied to the load receptor of a load cell. Suggest change to wording: tension force applied to ~~the load receptor of~~ a load cell. Or alternative wording: tension force applied to the loading point of a load cell.	amended per comments of NL and UK

Member state	Page number	Document clause	Comment	Secretariat's Response
U.K.	5	3.3.1	strain gauge analog resistive element that is bonded to a load cell structure and changes resistance depending on the compression or tension deformation of the load cell structure Suggest change to wording: analog resistive element that is bonded to a load cell structure and changes resistance depending on the ~~compression or tension deformation~~ deflection of the load cell structure [Comment: *as used in ISO 376, the ISO standard for load cell calibrations*]	Terminology amended
U.K.	6	3.3.2.	Load cell shape When classifying load cells on the basis of the shape design, additional consideration should be given to design criteria such as the geometrical characteristics of the areas of the load cell created during fabrication. Examples for load cells with identical outer dimensions but different geometries are shown below. Suggest change to wording: When classifying load cells on the basis of the shape design, additional consideration should be given to design criteria such as the geometrical characteristics of the areas of the load cell created during fabrication. Examples ~~for~~ of load cells with identical outer dimensions but different geometries are shown below.	Amended as proposed. Clause relocated to 9.4 Selection of Load Cells Within a Family.

Member state	Page number	Document clause	Comment	Secretariat's Response
U.K.	7	3.4.2	Replace the "bullet points" with "letters" i.e. a), b), c), d) for easier reference Suggest change to wording: to last "bullet point • one or more load cell groups, where all load cells within the group possess identical metrological characteristics (as listed in 6.1.5 – including: class; nmax; temperature rating; etc.).	Amended as proposed
U.K.	7	3.4.2.1	load cell group all load cells within a family possessing identical metrological characteristics (as listed in 6.1.5 – including: class; nmax; temperature rating; etc.). Delete this section as it is a "circular ref to the previous section "load cell family" - last "bullet point	Deleted
U.K.	9	3.5.14	relative DR or Z ratio of the load cell measuring range DR, to two times the minimum dead load output return, DR. *Note: This ratio is used to describe multi-interval instruments.* Suggest change to wording: *Note: This ratio is used ~~to describe~~ in the definition of multi-interval instruments*	Amended as proposed

Member state	Page number	Document clause	Comment	Secretariat's Response
U.K.	10	3.7.2	apportionment factor (pLC) the value of a dimensionless fraction expressed as a decimal (for example, 0.7) representing that portion of an error produced by the (weighing) instrument which is attributed to the load cell alone. *Note: This value is used in determining MPE (see Annex A: A.1.11)* Suggest change to wording: the value of a dimensionless fraction expressed as a decimal (for example, 0.7) representing that portion of an error ~~produced by~~ of the (weighing) instrument which is attributed to the load cell alone.	Definition amended
U.K.	11	3.7.9	span stability capability of a load cell to maintain the load cell output of the load cell's measuring range (DR) over a period of use within specified limits. Suggest change to wording: [to avoid repetition of "load cell"] capability of a load cell to maintain the ~~load cell output of the load cell's~~ measuring range (DR) output, the difference between the load cell output at maximum load [D_{max}] and the load cell output at minimum load [D_{min}] over a period of use within specified limits.	Paragraph amended

Member state	Page number	Document clause	Comment	Secretariat's Response
U.K.	12	4	Description of Load Cells A load cell provides an output proportional to a force resulting from applying a load. Load cells may be used as a single transducer or applied together with other load cells in a system where the design allows such application. The term "load cell" in this Recommendation is not limited to any particular type of technology or design principle. While many technologies are used in the design of load cells, those used in legal metrology applications are commonly designed to provide an output relative to an input stimulus based on electrical current. Both analog and digital outputs are recognized in load cells within that category. Although strain gauge technology was a primary focus in the development of R60, it is to be understood that load cells that operate using other principles may also be evaluated under this Recommendation. Variations of transducers that operate using alternative basis of input/output may include, but are not limited to: pressure (e.g., hydraulic, pneumatic); vibratory frequency; and magnetic forces. Suggest change to wording: by moving the highlighted text into "**1. INTRODUCTION**"	Sentence relocated to Introduction as proposed
U.K.	12	5	Units of measurement The units of measurement resulting from the output of a load cell that is incorporated as a component of an instrument are required to conform to the Recommendation(s) applicable to the instrument. Suggest deleting this section as it has no direct relevance :	Section deleted.

Member state	Page number	Document clause	Comment	Secretariat's Response
U.K.	13	6.1.1.	Accuracy classes and their symbols Load cells shall be ranked, according to their overall performance capabilities, into four accuracy classes whose designations are as follows: Class A; Class B; Class C; Class D. Suggest change to wording: According to their overall performance capabilities, load cells shall be ~~ranked~~,assigned ~~according to their overall performance capabilities~~, into one of the four accuracy classes whose designations are as follows:	Clause amended
U.K.	14	6.1.4	Supplementary classifications Load cells shall also be classified by the type of load applied to the load cell wherever there would be a risk of confusing the type of loading (i.e., compression loading, tension loading or, universal). A load cell may bear different classifications for different types of load applied to the load cell. The type of load for which the classification(s) applies(y) shall be specified. For multiple capacity load cells, each capacity shall be classified separately. Suggest change to wording: Load cells shall also be classified by the type of ~~load~~ force applied to the load cell wherever there would be a risk of confusing the type of loading (i.e., compression loading, tension loading or, universal). A load cell may bear different classifications for different types of ~~load~~ force applied to the load cell. The type of ~~load~~ force for which the classification(s) applies(y) shall be specified. For multiple capacity load cells, each capacity shall be classified separately.	Alternative language used to amend clause.

Member state	Page number	Document clause	Comment	Secretariat's Response
U.K.	14	6.1.5.	The load cell shall be classified according to six parts: a) accuracy class designation (see 6.1.1 and 7.2.4.1); b) maximum number of load cell verification intervals (see 6.1.2 and 7.2.4.5); c) type of load, if necessary (see 6.1.4 and 7.2.4.2); Suggest change to wording: The load cell shall be classified according to six parts: a) accuracy class designation (see 6.1.1 and 7.2.4.1); b) maximum number of load cell verification intervals (see 6.1.2 and 7.2.4.5); c) type of ~~load~~ force, if necessary (see 6.1.4 and 7.2.4.2);	Amended to be consistent with changes made in 6.1.4.
U.K.	14	Table 1	Symbol for the different types of loads Suggest change to wording: Symbol for the different types of ~~loads~~ applied force	Amended to be consistent with changes made in 6.1.4.
U.K.	15	6.1.7	Multiple classifications Load cells that have complete classifications for different types of load shall be designated using separate information for each classification. Examples are shown in Table 3. An illustration of the standard classification symbols using an example is shown in Figure 4. Suggest change to wording: Load cells that have complete classifications for different types of ~~load~~ applied force shall be designated using separate information for each classification. Examples are shown in Table 3. An illustration of the standard classification symbols using an example is shown in Figure 4.	Amended to be consistent with changes made in 6.1.4.

Member state	Page number	Document clause	Comment	Secretariat's Response
U.K.	15	6.2.1	Minimum load of the measuring range (Dmin) (see 3.5.12) The smallest value of mass applied to a load cell during test or use shall not be less than Emin (see 3.5.9). Suggest change to wording: The value of the smallest load ~~value of mass~~ applied to a load cell during test or use shall not be less than Emin (see 3.5.9). For the limits on Dmin during testing, see 9.7.3.4.	Language amended
U.K.	15	6.2.2	Maximum load of the measuring range (Dmin) (see 3.5.6) The largest value of force applied to a load cell during test or use shall not be less than Emin (see 3.5.9). Suggest change to wording: The value of the largest load ~~value of force~~ applied to a load cell during test or use shall not be less than Emin (see 3.5.9).	Clause amended

Member state	Page number	Document clause	Comment	Secretariat's Response
U.K.	16	6.3	**Maximum permissible measurement errors** For consistency in the Recommendation, references to Maximum Permissible Measurement Errors should be amended to Maximum Permissible Errors. Under the rated operating conditions in 6.6, the maximum permissible error (MPE) shall not exceed the values stated in 6.5 These MPEs are applicable after increasing as well as decreasing the force applied (i.e., they include hysteresis). Note: The term "measurement error" in this Recommendation refers to load cell measurement errors. Suggest deleting "These MPEs are applicable after increasing as well as decreasing the force applied (i.e., they include hysteresis)". As similar wording is in text under Table 4	Amended clause

Member state	Page number	Document clause	Comment	Secretariat's Response
U.K.	17	*.6.3.1.1.*	Type evaluation The MPE (see Annex A: A.1.11) on type evaluation shall be the values derived using the expressions contained in the left column of Table 4. The apportionment factor, pLC shall be chosen and declared (if other than 0.7) by the manufacturer and shall be in the range of 0.3 to 0.8 Suggest change to wording: The MPE (as defined in Annex A: A.1.11) on type evaluation shall be the values derived using the expressions contained in the left column of Table 4. The apportionment factor, *p*LC shall be chosen and declared (if other than 0.7) by the manufacturer and shall be in the range of 0.3 to 0.8 For consistency references to Maximum Permissible Measurement Errors should be amended to Maximum Permissible Errors as in the title to **Table 4. Maximum Permissible Errors (MPE) on Type Evaluation** The limits of error shown include errors due to nonlinearity, hysteresis and temperature effect on sensitivity over certain temperature ranges, specified in 6.6.1.1 and 6.6.1.2. The limits of error shown include errors due to nonlinearity, hysteresis and temperature effect on sensitivity over ~~certain~~ the temperature ranges, specified in 6.6.1.1 and 6.6.1.2.	Clause amended
U.K.	18	*6.5*	**Permissible variation of results under reference conditions** Suggest change to wording: **Permissible variation of results under reference and rated operating conditions**	Amended as proposed

Member state	Page number	Document clause	Comment	Secretariat's Response
U.K.	18	6.5.1.	Creep The difference between the reading taken upon the application of a maximum load (Dmax) and the reading observed within and after 30 minutes of exposure of 90% to 100% of Emax shall not exceed 0.7 times the value of MPE for the applied load.* Suggest amending the wording: The difference between the reading taken upon the application of a maximum load (Dmax) and the reading observed within and after 30 minutes of exposure of 90% to 100% of Emax shall not exceed 0.7 times the absolute value of MPE for the applied load.* The difference in readings taken after 20 minutes of exposure to 90% to 100% of Emax and at 30 minutes of exposure to 90% to 100% of Emax shall not exceed 0.15 times the absolute value of MPE *. *Regardless of any value declared by the manufacturer for the apportionment factor, *p*LC, the MPE for creep shall be determined from Table 4 using the apportionment factor, *p*LC = 0.7. " {delete} Include an example of the calculation (for a *p*LC = 0.75, as declared by the manufacturer): 1) 0.7 * [the absolute value of (the apportionment factor, *p*LC = 0.7 * MPE for the applied load)] = 0.7 * (0.7 * 1.5v) = 0.735. 2) 0.15 * [the absolute value of (the apportionment factor, *p*LC = 0.7 * MPE for the applied load)] = 0.15 * (0.7 * 1.5v) = 0.1575.	Wording and examples added as proposed

Member state	Page number	Document clause	Comment	Secretariat's Response
U.K.	18	6.5.2.	Minimum dead load output return The difference between the initial reading of the minimum load output (Dmin) and the reading of Dmin after being exposed to a load of 90% to 100% of Emax for 30 minutes shall not exceed half the value of the load cell verification interval (0.5 v). Does the highlighted text need to be included, as it is already in 6.5.1 (which is part of this test)? Suggest amending the wording: The difference between the initial reading of the minimum load output (Dmin) and the reading of Dmin ~~after being exposed to a load of 90% to 100% of Emax for 30 minutes~~ at the end of the Creep test (6.5.1), shall not exceed half the value of the load cell verification interval (0.5 v).	Amended as proposed
U.K.	18	6.6.1.1	Temperature limits Excluding temperature effects on minimum dead load output, the load cell shall perform within the limits of error in 6.3.1.1 over the temperature range of – 10 °C to + 40 °C, unless otherwise specified as in 6.6.1.2 below. *Note*: National legislation may prescribe alternate temperature limits with a range of 50 °C or more as appropriate for local climatic conditions and the environmental conditions that can be anticipated. Suggest amending the wording: *Note*: National legislation may prescribe alternate temperature limits ~~with a range of 50 °C or more~~ outside of the range specified above, as appropriate for local climatic conditions and the environmental conditions that can be anticipated.	Wording amended

Member state	Page number	Document clause	Comment	Secretariat's Response
U.K.	19	6.6.3	Humidity With respect to humidity conditions, this Recommendation defines 3 humidity classes: CH (as standard), NH, and SH. In case of class NH, or SH, the class designation shall be marked on the load cell. In the case of class CH, class designation marking of the load cell is not mandatory. Suggest amending the wording: With respect to humidity conditions, this Recommendation defines 3 humidity classes: CH (*cyclic humidity* -as standard), NH (*no humidity)*, and SH (*steady state humidity*). In case of class NH, or SH, the class designation shall be marked on the load cell. In the case of class CH, class designation marking of the load cell is not mandatory.	Amended as proposed
U.K.	20	*6.6.3.2*	. *Humidity error – SH marked load cells* This requirement is only applicable to load cells marked SH and not applicable to load cells marked NH or CH or with no humidity symbol marking. A load cell shall meet the applicable MPE when exposed to conditions of relative humidity variations as specified in 9.10.6 Suggest amending the wording: A load cell shall meet the ~~applicable~~ MPE applicable to the load applied, as considered in Table 4, when exposed to conditions of relative humidity variations as specified in 9.10.6	Amended as proposed

U.K.	20	*6.7.1.1*	Faults A load cell equipped with electronics shall be designed and manufactured such that when it is exposed to electrical disturbances either: a) significant faults do not occur; or b) significant faults are detected and acted upon. If significant faults do occur, and the load cell is equipped with the intelligence to detect and act upon significant faults through the instrument that the load cell is installed in, the reporting of and acting upon significant faults would then be evaluated under the appropriate Recommendation for the complete instrument. Messages of significant faults should not be confused with other messages presented. *Note:* A fault equal to or smaller than the load cell verification interval, v, is allowed. Suggest amending the wording: Significant Faults A significant fault is a fault greater than the load cell verification interval, v. A load cell equipped with electronics shall be designed and manufactured such that when it is exposed to electrical disturbances either: a) significant faults do not occur; or b) significant faults are detected and acted upon. If significant faults do occur, and the load cell is equipped with the intelligence to detect and act upon significant faults through the instrument that the load cell is installed in, the reporting of and acting upon significant faults would then be evaluated under the appropriate Recommendation for the complete instrument.	Wording amended

Member state	Page number	Document clause	Comment	Secretariat's Response
			Messages of significant faults should not be confused with other messages presented. *Note:* A value ~~fault~~ equal to or smaller than the load cell verification interval, v, is not considered a significant fault.	
U.K.	21	6.7.2.1.	Warm-up time During the design warm-up time of a load cell equipped with electronics there shall be no transmission of measurement results. Suggest amending the wording: During the ~~design~~ warm-up time, specified by the manufacturer, of a load cell equipped with electronics there shall be no transmission of measurement results.	Wording amended

Member state	Page number	Document clause	Comment	Secretariat's Response
U.K.	21	6.7.2.2.	Mains power supply (AC) A load cell equipped with electronics that operates from a mains power supply shall be designed to comply with the metrological requirements if the mains power supply varies: a) in voltage from – 15 % to + 10 % of the supply voltage specified by the manufacturer; and b) in frequency from – 2 % to + 2 % of the frequency specified by the manufacturer, if AC is used. Suggest amending the wording: A load cell equipped with electronics that operates from a mains power supply shall be designed to comply with the metrological requirements if the mains power supply, as specified by the manufacturer, varies: a) in voltage from – 15 % to + 10 % of the supply voltage ~~specified by the manufacturer~~; ~~and~~ ~~b) in frequency from – 2 % to + 2 % of the frequency specified by the manufacturer, if AC is used~~.	Amended as proposed
U.K.			What about the requirements for a load cell equipped with electronics that operates from a D.C. (non-battery) power supply? e.g. rectified transformed mains A.C. supply. Should this also be addressed in this Recommendation?	Since no examples of this type of load cell have been identified, and the sub-group that deliberated on this topic did not believe that there are any load cells supplied by a direct source of power, no additional requirement will be included at this time.

Member state	Page number	Document clause	Comment	Secretariat's Response
U.K.		*6.7.2.4*	*Maximum allowable variations during voltage variations:* All functions shall operate as designed. All measurement results shall be within maximum permissible errors. *Note:* Where a load cell is powered by a three-phase supply, the voltage variations shall apply to each phase successively and all phases simultaneously. Comment: delete "Note "as we do not consider this (three-phase supply) is applicable to load cells.	Note deleted

Member state	Page number	Document clause	Comment	Secretariat's Response
U.K.		6.7.2.5	*Disturbances* When a load cell equipped with electronics is subjected to the disturbances specified in 9.10.7.1 (also summarized in Table 5), the difference between the load cell output due to a disturbance and the load cell output without disturbance (fault) shall not exceed the minimum load cell verification interval, , or the load cell shall detect and react to a significant fault. Suggest amending the wording: *Disturbances* *A* di*sturbance is an* Influence quantity having a value within the limits specified in this Recommendation, but outside the specified rated operating conditions of the instrument. When a load cell equipped with electronics is subjected to the disturbances specified in ~~9.10.7.1~~ 9.10.7.5 to 9.10.7.10 (also summarized in Table 5), the difference between the load cell output due to a disturbance and the load cell output without disturbance (fault) shall ~~not exceed the minimum load cell verification interval, , or the load cell shall detect and react to a significant fault~~. satisfy 6.7.1.1	Definition of "disturbance" is found in Annex A3 - not to be located here in requirements section. Amendments made to referenced section numbers and wording in last sentence.
U.K.		6.7.2.7	Compliance with requirements A load cell equipped with electronics is presumed to comply with the requirements in 6.7.1.1 and 6.7.1.3, if it passes the examinations specified in 6.7.2 and 9.10.7 Delete this section as it is a duplication of 6.7.1.4	Deleted

Member state	Page number	Document clause	Comment	Secretariat's Response
U.K.		6.7.2.8	Application of the requirements in 6.7.1.1 The requirements in 6.7.1.1 may be applied separately to each individual cause or significant fault. The choice of whether 6.7.1.1 a) or 6.7.1.1 b) is applied is left to the manufacturer. Delete this section as it is a duplication of 6.7.1.5	Deleted

U.K.	24	7.1	**Software** This section should be moved into 6.7, as it relates to load cells equipped with electronics Provision shall be made for appropriate sealing by mechanical, electronic and/or cryptographic means, making any change that affects the metrological integrity of the device impossible or evident. Any embedded programming (i.e., firmware) that influences the raw count output of the load cell will be evaluated under the terms of this Recommendation. In addition, if the software modifies load cell performance, not exceeding the functions of analog to digital conversion and the linearization of the load cell output, then that software shall be evaluated under the terms in this Recommendation and in accordance with OIML D31 Edition 2008(E) [8] Any weighing instrument function shall be evaluated under other appropriate Recommendations for weighing instruments. Suggest amending the wording: Provision shall be made for appropriate sealing by mechanical, electronic and/or cryptographic means, making any change that affect~~s~~ the metrological integrity of the device either impossible or evident. Any embedded ~~pr~~ogramming~~g~~ software (i.e., firmware) that influences the raw count output of the load cell will be evaluated under the ~~terms~~ requirements of this Recommendation. In addition, if the software modifies load cell performance, not exceeding the functions of analog to digital conversion and the linearization of the load cell output, then that software shall be evaluated under the ~~terms~~ requirements in this Recommendation and in accordance with OIML D31 Edition 2008(E) [8] Delete ~~Any weighing instrument function shall be evaluated under other appropriate Recommendations for weighing instruments~~. {*this is incorporated in following*	While this is relevant to load cells equipped with electronics, the focus is related to security/sealing that is appropriately categorized as a technical requirement. Deleted redundant sentence

Member state	Page number	Document clause	Comment	Secretariat's Response
			paragraph}	
U.K.	25	7.2.	**Inscriptions and presentation of load cell information** Technical information markings including load cell classifications as indicated in 6.1.5 Complete Load Cell Classification must be specified for the load cell(s). Suggest amending the wording: Technical information markings including load cell classifications as indicated in 6.1.5, ~~Complete Load Cell Classification~~ must be specified for the load cell(s).	Amended as proposed

Member state	Page number	Document clause	Comment	Secretariat's Response
U.K.	26	7.2.1	Mandatory markings on the load cell The following mandatory markings shall be clearly an indelibly marked on the load cell: a. Manufacturer's name or trade mark b. Manufacturer's type designation or load cell model c. Serial number d. Maximum capacity as: Emax = (in units g, kg, t,) e. Year of production f. OIML certificate number (if applicable) If due to the limitation of the size of the load cell, it is impossible to apply all mandatory markings, the minimum of the load cell type designation and the serial number shall be provided as a minimum on the load cell itself. All other mandatory information shall be provided in an accompanying document supplied by the manufacturer and submitted to the user. Where such a document is provided, the information required in 7.2.2 shall also be given therein. Suggest amending the wording: The following mandatory markings shall be clearly and indelibly marked on the load cell: If due to the limitation of the size of the load cell, it is impossible to apply all mandatory markings, ~~the minimum of~~ the load cell type designation and the serial number shall be provided as a minimum on the load cell itself.	Amended as proposed

Member state	Page number	Document clause	Comment	Secretariat's Response
U.K.	27	7.2.2	Mandatory additional information The following mandatory information shall be provided in a document accompanying the load cell supplied by the manufacturer and submitted to the user (or, if space permits, they may be marked on the load cell). Where the information provided is associated with a specific unit of measure, the unit (i.e., g, kg, t,) shall also be specified. a. Manufacturer's name or trade mark b. Type designation c. Accuracy class(es); see 7.2. 4.1 Suggest amending the wording: The following mandatory information shall be provided in a document accompanying the load cell supplied by the manufacturer and submitted to the user (or, if space permits, they may be marked on the load cell). Where the information provided is associated with a specific unit of ~~measure~~ measurement, the unit (i.e., g, kg, t,) shall also be specified. a. Manufacturer's name or trade mark b. Type designation c. Accuracy class(es); see 7.2.-4.1	Amended as proposed

Member state	Page number	Document clause	Comment	Secretariat's Response
U.K.	28	7.2.4.1 / 7.2.4.2 Table 6	Delete these sections as the information is already included in Table 4	Noted that Accuracy class designation and Designation of the type of load applied to the load cell are included in Figure 4 however, so are working temperature designation, humidity symbols, and maximum number of load cell verification intervals. These sections have some value as they provide more detail on the markings required.
U.K.	28	7.2.4.3.	Working temperature designation The special limits of working temperature, as referred to in 6.6.1.2, shall be specified when the load cell cannot perform within the limits of error in 6.3.to 6.6 over the temperature range specified in 6.6.1.1. In such cases, the limits of temperature shall be designated in degrees Celsius (°C). Suggest amending the wording: The special limits of working temperature, as referred to in 6.6.1.2, shall be specified when the load cell cannot perform within the limits of error in ~~6.3.to 6.6~~ 6.3 to 6.5 over the temperature range specified in 6.6.1.1. In such cases, the limits of temperature shall be designated in degrees Celsius (°C).	References amended
U.K.	30	**Part 2**	**Metrological controls and performance tests** Suggest amending the wording: Metrological controls and ~~performance tests~~ Test procedures	The change of wording as suggested is not seen as providing additional clarity

Member state	Page number	Document clause	Comment	Secretariat's Response
U.K.	30	8.2	Responsibility for compliance with the requirements Notwithstanding the kind of legal metrological control in a country, the manufacturer (or their formal representative) has the full responsibility that the load cells comply with the requirements in Part 1 (Metrological and technical requirements) and are in accordance with the certificate issued for the load cell's type approval at the moment they are delivered to the user. After assignment, the responsibility of compliance with the requirements in Part 1 (Metrological and technical requirements) is that of the owner of the load cell as long as the load cell is in use. The operational presence of the load cell in his premises is considered as "in use". Suggest amending the wording: Notwithstanding the kind of legal metrological control in a country, the manufacturer (or their ~~formal~~ authorised representative) has the full responsibility that the load cells comply with the requirements in Part 1 (Metrological and technical requirements) and are in accordance with the ~~certificate issued for the load cell's~~ type approval certificate issued for the load cell(s) at the moment they are delivered to the user. After assignment, the responsibility of compliance with the requirements in Part 1 (Metrological and technical requirements) is that of the owner of the load cell as long as the load cell is in use. The operational presence of the load cell in his premises is considered as "in use".	Clause deleted. This level of prescriptive language is not used in other Recommendations. Content of 7.1.1 is believed to provide sufficient guidance.

Member state	Page number	Document clause	Comment	Secretariat's Response
U.K.	30	8.1.2	Should this be 8.2.1 or moved under 8.1.1 ? Measurement standards The expanded uncertainty, U (for coverage factor k = 2), for the combination of the force-generating system and the indicating instrument used during the tests to observe the load cell output shall be less than 1/3 times the MPE of the load cell under test. [Guide to the Expression of Uncertainty in Measurement, 2008] [7]. However, consider moving this section into 9.7.2 (e.g. 9.7.2.1) as it is relative to the equipment used in the testing.	Numbering of clause corrected to 8.2.1
U.K.	31	9.3	**Selection of specimens for evaluation** If a specimen does not pass a specific test as a result of the design of the type and therefore has to be modified, the applicant shall carry out this modification to all the specimens supplied for test. If the modification has been applied to all sub-types of the family which have the common design defect that required modification, it is then required that the other specimens that have been submitted shall be completely tested. Could we have some clarification of the requirement, e.g. If the modification has been applied to all sub-types of the family which have the common design defect that required modification, it is then required that the other specimens that have been submitted, and tested, shall be ~~completely~~ re-tested. Depending upon the modification this may be a repeat of the specific test or a complete re-test.	Amended as proposed

Member state	Page number	Document clause	Comment	Secretariat's Response
U.K.	31	9.3.1	**Number of load cells to be tested** The selection of load cells to be tested shall be such that the number of load cells to be tested is minimized as well as optimized. (see practical example in Annex D). Suggest amending the wording: The selection of load cells to be tested shall be such that the number of load cells to be tested is minimized as ~~well as optimized~~. (see practical example in Annex D).	Amended as proposed
U.K.	32	9.4	**Selection of load cells within a family** In order to accelerate the test procedure, the testing laboratory may carry out different tests simultaneously on different units. In this case, the issuing authority decides which version or measuring range will be subjected to a specific test. All accuracy and influence tests including span stability test for digital load cells, shall be performed on the same unit. Disturbance tests on digital load cells may be (simultaneously) carried out on not more than 2 an additional load cell instruments. Suggest amending the wording: All accuracy and influence tests including span stability test for digital load cells, shall be performed on the same unit. Disturbance tests on digital load cells may be (simultaneously) carried out on ~~not more than 2 an~~ additional load cells ~~instruments~~.	Wording amended per U.S. comment

Member state	Page number	Document clause	Comment	Secretariat's Response
U.K.	32	9.4.1	**Load cells of the same capacity belonging to different groups** Where load cells of the same family and same capacity belong to different groups, the selection of a load cell for testing requires a choice between characteristics of the load cells. In this case, the load cell requiring the most onerous tests shall be selected. This selection will result in the load cell with the most stringent metrological characteristics being tested. Suggest amending the wording: Where load cells of the same family and same capacity belong to different groups, the selection of a load cell for testing requires a choice between characteristics of the load cells. In this case, the load cell ~~requiring the most~~ with the more onerous specification ~~tests~~ shall be selected. This selection will result in the load cell with the most stringent metrological characteristics being tested.	Existing language is perceived as unambiguous.

Member state	Page number	Document clause	Comment	Secretariat's Response
U.K.	32	9.4.2	**Load cells with a capacity in between the capacities tested** Load cells of the same family with a capacity in between the capacities tested, as well as those above the largest capacity tested, but not over 5 times above the largest capacity tested, are deemed to fulfill the requirements of this Recommendation. This is under the provision that along with the change of capacity there is no change of measurement principle or material used in construction of the load cell (e.g., from bending beam to shear beam or stainless steel replacing aluminum). Suggest amending the wording: Load cells of the same family with a capacity in between the upper and lower capacities tested, as well as those above the largest capacity tested, but not over 5 times ~~above~~ the largest capacity tested, may be included in the certificate and are deemed to fulfill the requirements of this Recommendation. This is under the provision that along with the change of capacity there is no change of measurement principle or material used in the construction of the load cell (e.g., from bending beam to shear beam or stainless steel replacing aluminum).	Amended

Member state	Page number	Document clause	Comment	Secretariat's Response
U.K.	32	9.4.3	**Smallest capacity load cell from the group** For any family, the smallest capacity load cell from the group with the best characteristics shall be selected for testing. For any group, the smallest capacity load cell in the group shall always be selected for test unless that capacity falls within the range of allowed capacities of selected load cells having better metrological characteristics according to the requirements of 9.4.2 and 9.4.3. Suggest amending the wording: For any family, the smallest capacity load cell from the group with the best characteristics shall be selected for testing. For any group, the smallest capacity load cell in the group shall always be selected for test unless that capacity falls within the range of allowed capacities of selected load cells having better metrological characteristics according to the requirements of ~~9.4.2 and 9.4.3~~ 9.4.1 and 9.4.2.	Amended

Member state	Page number	Document clause	Comment	Secretariat's Response
U.K.		9.4.6	**Selection of load cells equipped with electronics** For load cells and load cell families equipped with electronics and with an analog to digital converter (that do not differ between load cells in the family) all applicable tests shall be performed on the load cell with the minimum, µV/vmin as input for the analog to digital converter. (Same principle as OIML R76 [2], Annex C, Table 12) Notwithstanding this requirement, the criteria for assignment of a load cell to a family and the selection of test specimens found in 9.4.1 to 9.4.5 shall be observed. Suggest amending the wording: For load cells and load cell families equipped with electronics and with an analog to digital converter (that do not differ between load cells in the family) all applicable tests shall be performed on the load cell with the minimum~~,~~ µV/vmin as input for the analog to digital converter. (Same principle as OIML R76 [2], Annex C, Table 12) Notwithstanding this requirement, the criteria for assignment of a load cell to a family and the selection of test specimens found in 9.4.1 to ~~9.4.5~~ 9.4.4 shall be observed	Amended

Member state	Page number	Document clause	Comment	Secretariat's Response
U.K.	33	9.5	**Documentation** The documentation submitted with the application for type approval shall include: a) description of its general principle of measurement; b) mechanical drawings (including documents on the load transmission(s) as per Annex E); c) electric/electronic diagrams; If the testing laboratory deems this necessary, it can require more detailed documentation; either to be able to study the quality of the instrument, or to be able to fully define the approved type, or both. If the manufacturer does not prescribe a specific load transmission it will be the responsibility of the test laboratory to decide what kind of load transmission is to be used for testing. (see also Annex E). Suggest amending the wording: The documentation submitted with the application for type ~~approval~~ evaluation shall include: a) description of its general principle of measurement; b) mechanical drawings (including documents on the load transmission(s) as per Annex E); c) electrical/electronic diagrams; ~~If the testing laboratory deems this necessary, it can require more detailed documentation~~ Additional and more detailed documentation may be required by the testing laboratory where it deems this is necessary; either to be able to study the quality of the instrument, or to be able to fully define the approved type, or both. If the manufacturer does not prescribe a specific load transmission it will be the responsibility of the test laboratory to decide what kind of load transmission is to be used for testing~~.~~ (see also Annex E).	Wording amended where deemed appropriate

Member state	Page number	Document clause	Comment	Secretariat's Response
U.K.	34	9.6	**Examinations** Examinations and testing of load cells are intended to verify compliance with the requirements of Part 1 of this Recommendation. The load cell and the documentation shall be given a visual inspection to obtain a general appraisal of its design and construction and the documentation shall be studied. Suggest amending the wording: Examinations and testing of load cells are intended to verify compliance with the requirements of Part 1 of this Recommendation. The load cell ~~and the documentation~~ shall be given a visual inspection to obtain a general appraisal of its design and construction, and the documentation shall be studied.	Amended

U.K.	35	9.7.3.1	**Environmental conditions** Tests shall be performed under stable environmental conditions. The ambient temperature is deemed to be stable when the difference between extreme temperatures noted during the test does not exceed one fifth of the temperature range of the load cell under test, without being greater than 2 °C. During routine testing, some ambient conditions may not be actively measured or closely controlled unless they are specific parameters for which the load cell is being evaluated. In general, temperature, humidity, and barometric pressure are rigidly controlled under laboratory protocol. Conditions involving: electrical power supplies; electromagnetic fields; and radio frequency fields are to be measured/controlled when the load cell is being evaluated against the effects of these influences, and must also be considered when there is a potential for these types of conditions to impart effects on other tests. Suggest amending the wording: During routine testing, some ambient conditions may not be actively measured or closely controlled unless they are specific parameters for which the load cell is being evaluated. ~~In general, temperature, humidity, and barometric pressure are rigidly controlled under laboratory protocol.~~ Conditions involving: electrical power supplies; electromagnetic fields; and radio frequency fields are to be measured/controlled when the load cell is being evaluated against the effects of these influences, and must also be considered when there is a potential for these types of conditions to impart effects on other tests.	Deleted portion of added text. See also NL comment
U.K.	35	9.7.3.2	**Acceleration of gravity**	Any clarification for this point must come

Member state	Page number	Document clause	Comment	Secretariat's Response
			The mass standards used to generate the force applied during testing shall be corrected, if necessary, for the site of testing and the value of the gravity constant, g, at the test site shall be recorded with the test results. The value of the mass standards used to generate the force shall be traceable to the appropriate national or international standard of mass. "..national or international standard of mass." Are these not one and the same (for OIML)?	from the CPR

U.K.	35	9.7.3.3	**Loading conditions** Particular attention shall be paid to loading conditions to prevent the introduction of errors not inherent to the load cell. Factors such as surface roughness, flatness, corrosion, scratches, eccentricity, etc., should be taken into consideration. Loading conditions shall be in accordance with the requirements of the load cell manufacturer. The loads shall be applied and removed along the sensitive axis of the load cell without introducing shock to the load cell. Since the aim of this test is not to measure the influence on the metrological performances of mounting/dismounting the load cell on/from the force-generating system, the installation of the load cell in the force-generating system shall be done with particular care. The effect on the metrological performance caused by mounting/dismounting the load cell on/from the force-generating system should be negligible in order to establish the magnitude of the test parameter. If possible, the load cell should not be dismounted from the force-generation system during the entire period of the test. Suggest amending the wording: Particular attention shall be paid to loading conditions to prevent the introduction of errors not inherent to the load cell. Factors such as surface roughness, flatness, corrosion, scratches, eccentricity, etc., should be taken into consideration. Loading conditions shall be in accordance with the ~~requirements~~ specification of the load cell manufacturer. The loads shall be applied and removed along the sensitive axis of the load cell without introducing shock to the load cell. Since the aim of ~~this test~~ the testing is not to measure the influence on the metrological performances of mounting/dismounting the load cell on/from the force-generating system, the installation of the load cell in the force-generating system shall be done with particular care. The effect on the metrological performance caused by mounting/dismounting the load cell on/from the force-generating system should be negligible in order to establish the magnitude of the test parameter. If possible, the load cell should	Amended as proposed

Member state	Page number	Document clause	Comment	Secretariat's Response
			not be dismounted from the force-generation system during the entire period of the test.	
U.K.	36	9.7.3.9	**Humidity effects** Delete these sections as the information is already included in sections 6.6.3.1 & 6.6.3.2.	This clause simply provides a reference to the specific test procedures applicable to each type of humidity markings where sections 6.6.3.1 & 6.6.3.2 provide specific metrological requirements. The presence of this clause does not detract from the Recommendation.
U.K.	36	9.7.3.10.	**Indicating instrument checking** Some indicating instruments are provided with a convenient means for checking the indicating instrument itself. When such features are provided, they shall be utilized frequently to ensure that the indicating instrument is within the accuracy required by the test being performed. Periodic check on calibration status of the indicating instrument shall be performed. Suggest amending the wording: Some indicating instruments are provided with a convenient means for checking the indicating instrument itself. When such features are provided, they shall be utilized frequently to ensure that the indicating instrument is within the accuracy required by the test being performed. Periodic checks on the calibration status of the indicating instrument shall be performed.	Amended as proposed.

Member state	Page number	Document clause	Comment	Secretariat's Response
U.K.	37	9.7.3.11	O**ther conditions** Other conditions specified by the manufacturer such as input/output voltage, electrical sensitivity, input impedance of the indicator, etc. shall be taken into consideration during the test. Suggest amending the wording: Other conditions specified by the manufacturer such as input/output voltage, electrical sensitivity, input impedance of the indicator, etc. shall be taken into consideration during the test(s).	Amended as proposed.
U.K.	38	9.8.3.1.	**Loading/unloading times** The loading or unloading times shall be approximately half the time specified in Table 8. The remaining time shall be utilized for stabilization. The tests shall be conducted under constant conditions. The loading or unloading time and the stabilizing time shall be recorded in the test report in absolute, not relative values. Suggest amending the wording: The loading or unloading times shall be approximately half the time specified in Table 8. The remaining time shall be utilized for stabilization. The tests shall be conducted under constant conditions. The loading ~~or~~ / unloading time and the stabilizing time shall be recorded in the test report in absolute, not relative values.	Language amended
U.K.	38	9.8.3.2	**Loading/unloading times impracticable** Suggest amending the wording: **When the specified Loading/unloading times are impracticable**	Title of clause changed to "Adherence to loading/unloading times"

Member state	Page number	Document clause	Comment	Secretariat's Response
U.K.	39	9.10	**Test procedures** Each of the tests below is presented as a "stand alone" individual test. However, for the efficient conduct of the load cell tests, it is acceptable that the increasing and decreasing load, creep, and minimum dead load output return tests be conducted at the given test temperature before changing to the next test temperature (see 9.11, Figures 5 and 6). The barometric pressure and the humidity tests are conducted individually following completion of the above tests. Suggest amending the wording: Each of the tests below is presented as a "stand alone" individual test. However, for the efficient conduct of the load cell tests, it is acceptable that the increasing and decreasing load, creep, repeatability and minimum dead load output return tests can be conducted together ~~at~~ during the given test temperature before changing to the next test temperature (see 9.11, Figures 5 and 6). The barometric pressure and the humidity tests are conducted individually following completion of the above tests.	Wording amended
U.K.	44	9.10.4.6	**Change barometric pressure** Change the barometric pressure by a minimum of 1 kPa greater than atmospheric pressure and record the indicating instrument indication. Suggest amending the wording: Change the barometric pressure by a minimum of 1 kPa ~~greater~~ higher, or lower, than atmospheric pressure and record the indicating instrument indication.	Conclusions of TC9/P1 meeting in March 2014 were to establish the test procedure as stated in 3CD. This included raising the barometric pressure by a minimum of 1 kPa from ambient conditions. Existing wording will be retained.
U.K.	46	*9.10.5.12*	*Conduct damp heat, cyclic test* Suggest amending the wording: *Conduct damp heat, cyclic test [CH]*	Amended as proposed

Member state	Page number	Document clause	Comment	Secretariat's Response
U.K.	49	9.10.6.11	Conduct damp heat, steady state test Suggest amending the wording: Conduct damp heat, steady state test [SH] ALSO IEC 60068-2-78 [12]: Environmental testing ¬Part 2: Tests. Test Ca: Damp heat, steady state, Environmental testing - Part 2: Tests. Test Cb: Damp heat, steady state, primarily for equipment. ~~[12]~~ IEC 60068-3-4: Environmental testing - Part 2 [11]: Tests. Guidance for damp heat tests. ~~[11]~~ {consistency with the other test headings}	Amended
U.K.	49	9.10.6.13	**Determine the magnitude of humidity-induced variations** With the resulting data, the magnitude of humidity-induced variations can be determined and compared with the limits specified in 6.6.3.2. Suggest amending the wording: ~~With the resulting data, the~~ The magnitude of humidity-induced variations ~~can be determined and compared with~~ shall not exceed the limits specified in 6.6.3.2. {6.6.3.2. *Humidity error – SH marked load cells - only relates to the MPEs.}*	The purpose of this clause is simply to provide test procedure, not to provide metrological requirements as supplied in 6.6.3.2 (5.6.3.2.in 4CD)
U.K.	50	9.10.7.1.	Performance and stability tests A load cell equipped with electronics shall pass the performance and stability tests according to 9.10.7.2 to 9.10.7.10 for the tests given in Table 5. Suggest amending the wording: A load cell equipped with electronics shall pass the performance and stability tests according to ~~9.10.7.2~~ 9.10.7.3 to 9.10.7.10 for the tests given in Table 5.	Amended

Member state	Page number	Document clause	Comment	Secretariat's Response
U.K.	52	9.10.7.4.	Power voltage variations Relates to load cells powered by AC mains: but what about load cells powered by DC power supplies ?	The sub-group that deliberated on this topic did not express a need to perform voltage variation tests on DC mains since there is no example of load cells that are directly powered by that source. No additional requirements are considered necessary at this time.
U.K.	58	9.10.7.9.	Electromagnetic susceptibility (see 6.7.2.5 Disturbances) Suggest dividing this into 2 sections: **9.10.7.9.1 Radiated** & **9.10.7.9.2 Conducted** *{renumber subsequent sections}*	These tests are separated under 9.10.7.9 and 9.10.7.10

Member state	Page number	Document clause	Comment	Secretariat's Response
U.K.	59 / 60	9.10.7.11.	Span stability (see 6.7.2.2) (not applicable to class A load cells) *Test duration:* 28 days or the period necessary for the performance tests to be carried out, whichever is shorter, for temperature and humidity tests. This may be extended up to 40 days for CH marked load cells only. *Time between measurements:* Between 1/2 day (12 hours) and 10 days (240 hours) for SH marked load cells, and 14 days for CH marked load cells, with an even distribution of the measurements over the total duration of the test. Suggest amending the wording: Span stability (see ~~6.7.2.2~~ 6.7.2.6) (not applicable to class A load cells) *Test duration:* 28 days or the period necessary for the performance tests to be carried out, whichever is shorter, for temperature and humidity tests. ~~This may be extended up~~ The duration may be increased to 40 days for CH marked load cells only. *Time between measurements:* Between 1/2 day (12 hours) and 10 days (240 hours) for SH marked load cells, and ~~14 days~~ between 1/2 day (12 hours) and 14 days (336 hours) for CH marked load cells, with an even distribution of the measurements over the total duration of the test.	Amended as proposed

Member state	Page number	Document clause	Comment	Secretariat's Response
U.K.	B-6	**Annex B**	**B.3. Tests** Is this section necessary, as if the tests have not been conducted then the load cell cannot be deemed in conformity to the Recommendation(?) *Test* | *R 60 Ref.* | *Approved* | *Institute* If not approved then the certificate cannot be issued (?)	This section deleted
U.K.	C-1	**Annex C**	**1. Technical Data** Is this section necessary, as the information is already in B2 **6. Data sheet and dimensions** Is this section necessary, as the information is already in B2	The supplemental information in this annex is simply providing an example for data that could be included.
U.K.	D-1	**Annex D**	**(Informative) Selection of load cell(s) for testing - a practical example** This [section] does not reflect the discussions at the meeting (NIST March 2014) to provide more realistic examples.	More realistic examples could be considered by the PG if submitted for review.
USA	21	6.7.2.1	I believe the third word "design" should be "designated" as I believe the warm-up time to be a value declared by the manufacturer.	Wording amended
USA	23	6.7.2.6	I believe the word "class" in the section title should be capitalized – "Class"	While this is appropriate format in U.S. documents, this is not a prescribed practice in OIML documents

Member state	Page number	Document clause	Comment	Secretariat's Response
USA	25	7.2.1	The paragraph at the bottom of this section permits the manufacture to provide some of the mandatory markings on a accompanying document if marking the information on the load cell is not possible due to the load cells size. However, I could not find a minimum size requirement for marked information. Without a recommended or even suggested size limit the decision to mark the load cell or supply an accompanying document is at the manufacturers discretion. (If this was discussed in previous committee meetings forget I mentioned it.)	Markings that must appear on the load cell are found in 6.2.1 (4CD). Additional mandatory markings may be included on an accompanying document (see 6.2.2).
USA	32	9.4	The last sentence of the second paragraph, remove the word "an" after the number "2" in the sentence.	Amended
USA	32	9.4	The last word in the second paragraph. Is a load cell an "instrument"? Through the document the word "instrument" is used to describe an "indicating instrument" here it seams to be describing a load cell. Is the term "units" more appropriate or should the word "cell" be plural (cells)?	Amended as proposed
USA	Numerous	Numerous	Many Sections refer to "Table 7 in 9.8.3" however; there is no Table 7 in the document. I believe that Table 8 should be Table 7. (Reference to Table 7 is found in Sections 9.10.1.7, 9.10.1.9, 9.10.1.11, 9.10.2.8, 9.10.3.8 (there is also a space missing between the number 7 and the word "in"), 9.10.3.10, 9.10.5.8, 9.10.5.10, 9.10.6.7, 9.10.6.9, 9.10.6.12, and 9.10.7.3.	Table was identified incorrectly. Number of table corrected to "Table 7." Spacing between characters added where needed in other clauses identified.