OIML R60-1 Metrological Regulation of Load Cells

R60 Parts 1&2 4CD Comments and Secretariat's Responses

Member State	Page #	Document Clause	Comment	Secretariat's Response
Australia	25	6.2.1	We understand that maximum capacity (Emax) is currently a required/mandatory marking under 6.2.2 but for small load cells it may be provided in accompanying documentation, rather than marked on the load cell. We believe that the maximum capacity is important to identify the load cell and that it should be included as a minimum on the load cell itself, along with 'load cell type designation' and 'serial number', in the case where markings are limited by the size of the load cell.	Paragraph has been amended to reflect what is specified in the 2000 edition of R60. Manufacturer's name or trade mark and maximum capacity added to mandatory markings on the load cell.
Australia	37	8.7.3	This clause still does not specify actual values for the conditions referred to in clause 9.7.4. We are not satisfied that the removal of the term 'reference' necessarily addresses this issue.	This paragraph was inserted as part of the effort to conform to the OIML template for Recommendations. Its value was questionable, thus it has been deleted.

Australia	48	8.10.6.11	We do not think that our previous comment regarding altering the damp heat tests was adequately addressed. The test proposed in this draft of R 60 varies from the test used in the current 2000 version of OIML R 60 and we do not believe this to be appropriate without further consideration. We are still of the opinion that it is not 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 load cell and water content of the air. We propose that the damp heat test should be conducted at 40°C 85%.	Test procedure in the latest draft aligns with that procedure found in the 2000 version of R60. High temperature limit is found in 5.6.1 (– 10 °C to + 40 °C, unless otherwise specified as in 5.6.1.2)
Australia	55	8.10.7.8	We believe that the issue identified in our previous comment has not been adequately resolved. There is nothing in the note to say that this test cannot be conducted on a load cell in a weighing instrument. The note that is there appears to indicate that the test could be performed while the load cell is installed as a component in a weighing instrument.	Note deleted in all tables under test procedures. See also Netherlands comment.

Austria	3	2.3	The last sentence may be a contraction to the described scope of R60 in the previous sentence. On the one hand the scope is limited to digital "raw count" while on the other hand, the picture may allow further processing (scaling). Within this data processing we understand only "scaling" as possible data processing covered by OIML R60. Further data processing is not under the scope of R60. Therefore we suggest changing the sentence "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." to "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 only be covered under R60 when the further data processing only consists of scaling."	Wording has been amended. See also comments from France, CECIP, Netherlands, and Germany.
Austria	10	3.6	For clarification we suggest changing "related to E" to "related to Annex E. The same should be done for (related to D).	Language amended
Austria	27	6.2 f	We can not find a definition for the type approval mark within the document; whereas we assume that it is meant as identification and reference to the appropriate certificate.	Definition for type approval mark added to terminology - see 3.7.21.
Austria	41	8.10.1.14	In the definitions of errors (3.7) the "hysteresis error" is only mentioned once in the whole document. We suggest referencing to the hysteresis error as well, because the meaning itself seems to be the same.	Hysteresis error was included under "Variation of results under reference conditions" in the 2CD (9.12.1) however, the project group did not support its inclusion. The clause was deleted from the 3CD.
Austria	56	8.10.7.9	In the notes there is a wrong reference. (9.10.7.10 should be 8.10.7.10)	Amended

Austria	60	8.12.1	Please include the possibility for Annex C. Please amend "Annex C provides as an example of supplemental information that may be included in the OIML Certificate format and is intended to compliment Annex B..	Amended as proposed
CECIP	3	2.3	Editorial Correction: The scope of R60 would not extend beyond module 3. Module 4 is not correct	Wording has been amended. See also comments from France, Austria, Netherlands, and Germany.
CECIP	4	3.1.2	Unknown abbreviation: Replace "EUT" by "Equipment under Test (EUT)".	Definition has been deleted, also see abbreviations 3.9
CECIP	5	3.1.5.2	An electronic load cell is a special kind of digital load cell which utilizes active electronics and consequently has metrologically relevant software for additional functionalities but not beyond module 3 of figure 1. Recommendation: Replace to first sentence of 3.1.5.2 by "Digital load cell which is capable of performing the functions as described under "non-electronic load cell (3.1.5.1) and which utilizes active electronics and consequently has metrologically relevant software.	Clause has been amended
CECIP	5	3.1.5.2	Add following note for clarification: Note: The further data processing of an electronic load cell do not cover functionalities of module 4 of figure 1 (e.g. scaling on weighing value in mass units).	See edits and responses to comments regarding 2.3
CECIP	5	3.1.5.2	Add following second note for clarification: Note: Subsequent this recommendation refers to digital load cells (see. 3.1.5.3) Justification: 3.1.5.2 and 3.1.5.3 Only difference is the missing Firm/Software but there are usually electronic components in both load cells used. So it's clearer to use general in this recommendation the digital load cell as description.	Definition has been amended to indicate that these are digital load cells. Additional note could add unnecessary information and was not considered to contribute to clarity

			Replace 3.4.2 c.) by when used, the same type attachment of the strain gauge (e.g. the same adhesive) to the load cell. Or delete 3.4.2 c it's similar under 3.4.2.b	3.4.2.c) amended to specify the use of "similar" adhesive
CECIP	7	3.4.2 c.)	Replace 3.4.2 c.) by when used, the same type attachment of the strain gauge (e.g. the same adhesive) to the load cell. Or delete 3.4.2 c it's similar under 3.4.2.b	3.4.2.c) amended to specify the use of "similar" adhesive
CECIP	9	3.5.2	Delete the second part of paragraph: Replace 3.5.2 by "Range of values of the measured quantity" Justification: The load cell measuring range Dmax – Dmin is specified by testing possibilities of the issuing authority and should be as close as possible cover the maximum measuring range, defined by the manufacturer. The load cell measuring range is independent of test results and the MPE.	Paragraph amended (see also Japan's comments)
CECIP	8	3.5.5	Delete the second part of paragraph: Replace 3.5.5 by "largest value of a quantity expressed in units of mass, which may be applied to a load cell". Justification: The maximum capacity Emax is defined by the manufacturer. The Emax is independent of test results and the MPE.	Amended as proposed
CECIP	9	3.5.6	Replace "during test or use" by "under test" Justification: Dmax is a test specification given by testing possibilities of the issuing authority and should be as close as possible by Emax. It is not a specification for a load cell used in a weighing instrument.	Amended as proposed
CECIP	9	3.5.7	Delete the second part of paragraph: Replace 3.5.7 by "range of values of the quantity expressed in units of mass that may be applied to a load cell". Justification: The maximum measuring range is defined by the manufacturer and independent of test results and the MPE.	Amended as proposed

CECIP	9	3.5.8	Delete the second part of paragraph: Replace 3.5.8 by "maximum number of load cell verification intervals into which the load cell measuring range may be divided. Justification: The maximum number of load cell verification intervals is defined by the manufacturer and independent of test results and the MPE.	Paragraph amended (see also Japan's comments)
CECIP	9	3.5.9	Delete the second part of paragraph: Replace 3.5.9 by "smallest value of a quantity (expressed in mass units) that may be applied to a load cell. Justification: The minimum dead load is defined by the manufacturer and independent of test results and the MPE.	Amended as proposed
CECIP	9	3.5.11	Change "smallest load cell verification interval" to "smallest load cell verification interval" Editorial clarification	Paragraph amended (see also Japan's comments)
CECIP	9	3.5.11	Change "load cell measuring range DR (Dmax – Dmin) to "maximum load cell measuring range Emax – Emin)" Justification: Vmin is defined by the manufacturer and independent of test results and the MPE.	Paragraph amended (see also Japan's comments)
CECIP	9	3.5.12	Replace "during test or use" by "under test" Justification: Dmin is a test specification given by testing possibilities of the issuing authority and should be as close as possible by Emin. It is not a specification for a load cell used in a weighing instrument.	Amended as proposed
CECIP	9	3.5.13	Replace "load cell measuring range" by "maximum measuring range Emax – Emin" Justification: The number of load cell verification intervals is defined by the manufacturer and independent of test results.	Amended as proposed

CECIP	9	3.5.14	Replace "load cell measuring range" by "maximum measuring range $E_{max} - E_{min}$" Justification: The number of load cell verification intervals is defined by the manufacturer and independent of test results.	Amended
CECIP	10	3.5.14	Delete "or" Editorial change	Amended as proposed
CECIP	10	3.5.15	Delete "or" Editorial change	Amended as proposed
CECIP	10	3.6	Replace to last part of the first paragraph by "..., dependent on the conditions of the test of a load cell". Justification: The variable parameters D depend only on the test conditions and not the conditions of use.	Amended as proposed
CECIP	10	3.6	Replace "related to E" by "related to parameters Emin and Emax" Justification: Unclear and undefined meaning of "E"	Amended as proposed
CECIP	10	3.6	Replace "related to D" by "related to parameters Dmin and Dmax" Justification: Unclear and undefined meaning of "D"	Amended as proposed
CECIP	10	3.6	Figure 3: delete D_R	Amended as proposed
CECIP	10	3.6	Description of Figure 3: Delete "Range of D" and "Range of E" Justification: Unclear and undefined meaning of "D" and "E"	Amended as proposed
CECIP	11	3.7.9	Delete (see 3.7.9) Editorial change	Amended as proposed
CECIP	13	3.7.20	Replace "load cell´s measuring range (DR)" by ""load cell measuring range (see 3.5.2)" Editorial change. Delete "DR"	"DR" deleted in definition as proposed
CECIP	13	3.7.21	Replace "Change in minimum dead load output ..." by "change of the signal output under minimum dead load Dmin ..." Justification: Editorial change, minimum dead load output is not defined"	Amended as proposed

CECIP	14	3.9	Further abbreviations: DR: minimum dead load output return (see 3.5.10) CH: cyclic humidity NH: no humidity SH: steady-state humidity	Abbreviations added as proposed
CECIP	14	4	Replace 1st sentence in the 2nd paragraph "...to provide an output to an input stimulus based on electrical current" by "...to provide an electrical output relative to a mechanical input". Justification: Replace "load cell maximum measuring range" by "maximum measuring range E_{max} – E_{min} (see 3Wording not general enough	Amended as proposed
CECIP	15	5.1.2	.5.8)" Editorial change	Paragraph amended (see also Japan's comments)
CECIP	16	5.1.5 c.)	Delete "7", see 5.1.4 Editorial change	Amended as proposed
CECIP	16	5.1.5	Figure 4: Delete (shear and bending) Unnecessary information, editorial change	Amended as proposed
CECIP	17	5.2.1	Delete "or use" Justification: D_{min} is only a test specification	Amended as proposed
CECIP	17	5.2.2	Delete "or use" Justification: D_{max} is only a test specification	Amended as proposed
CECIP	18	5.3.2	"1" as footnote Editorial change	Amended
CECIP	19	5.5.1	Delete "*" Editorial change	Asterisk has been retained, refers to note that follows the clause.
CECIP	19	5.5.1	Put the first formula from the first example directly under paragraph 5.5.1 Editorial change	Clause amended

CECIP	19	5.5.1	Chance the first formula in a general way to "0.7 × pLC × MPE of the applied load" Editorial change	Clause amended
CECIP	19	5.5.1	Change the first example in the following way: Example: Load cell class: C3: (declared by the manufacturer) Apportionment factor: pLC = 0.7 (declared by the manufacturer) applied load: Dmax = Emax (test specification) Maximum difference between the reading = 0.7 × 0.7 × 1.5 = 0.735 Justification: The example is incorrect	Replaced example as proposed
CECIP	19	5.5.1	Put the second formula from the second example directly under paragraph 5.5.1 Editorial change	Clause amended
CECIP	19	5.5.1	Chance the second formula in a general way to "0.15 × pLC × MPE of the applied load" Editorial change	Clause amended
CECIP	19	5.5.1	Change the second example in the following way: Example: Load cell class: C3: (declared by the manufacturer) Apportionment factor: pLC = 0.7 (declared by the manufacturer) applied load: Dmax = Emax (test specification) Maximum difference between the initial reading = 0.15 × 0.7 × 1.5 = 0.1575 Justification: The example is incorrect with pLC = 0,75	Replaced example as proposed
CECIP	19	5.5.2	Change head line from "Minimum dead load output return" to "Minimum dead load output return (DR)" Editorial change for	Amended as proposed
CECIP	19	5.5.2	Add a reference to the definition of DR: "(see definition of DR in 3.5.10) Editorial change shown for clarification	Amended

CECIP	19	5.5.2	Note: Add a reference to the definition of DR: "(see definition of DR in 3.5.10) Editorial change shown for clarification	Since reference is now included in title of clause, this change would seem superfluous
CECIP	21	5.7.1	Replace „pLC, equal to 1.0 (pLC = 1.0) by the wording „pLC, $0{,}7 \leq pLC \leq 0.9$ (typically: pLC = 0.8)" Justification: An apportionment factor of PLC = 1.0 is not possible for a digital load cell (incorrect example, 1.0 it's possible only for a module according OIML R76)	Amended as proposed
CECIP	21	5.7.1.1	Change "load cell equipped with electronics" by "digital load cell"	Amended
CECIP	22	5.7.1.1	A fault is a value that is equal or smaller than the minimum load cell verification interval vmin and not the load cell verification interval v. Change in the note: "load cell verification interval v" in "minimum load cell verification interval vmin. " Justification: This is a significant error in this issue and also covers the issue of OIML R60-3	See also comments from Germany. The significant change being proposed would cause substantial changes in tests and interpretation of results. This type of change is more appropriate for consideration during early stages of a revision and should not be implemented without the support of a majority of PG members.
CECIP	22	5.7.1.4	Change "load cell equipped with electronics" by "digital load cell"	Amended
CECIP	22	5.7.1.1	Change note: „load cell verification interval v" in „minimum load cell verification intercal vmin" Justification: Situation of a complete weighing instrument not a subject to transfer to digital load cells. "v" as a generally criteria for a significant fault is much too high.	See response above

CECIP	22	5.7.2	Justification: This is a describtion for a weighing Module according OIML R76 Add note: Alternatively a manufacturer has the possibility to specify a warm-up time in the data sheet, if there is no possibility to prevent the transmission of measuring results in the warm-up period of the digital load cell.	This clause does not currently require that transmission of measuring results be prevented, it simply states that during the warm-up time there shall be no transmission of measurement results. If the manufacturer specifies a period of time, then that warm-up time has been established through the manufacturer's declaration.
CECIP	23	5.7.2.5	Editorial change in Table 5 Section 8.10	Amended
CECIP	24	5.7.2.6	Change "load cell equipped with electronics" by "digital load cell"	Amended - replaced load cell equipped with electronics with "digital load cell"
CECIP	24	5.7.2.6	Change "test load applied" in "applied test load Dmax" Editorial change shown for clarification	Amended as proposed
CECIP	24	5.7.2.6	Delete the last half sentence "whichever is the greatest" Justification: The explanation is misleading	Sentence has been amended

CECIP	24	6.1	Change wording "Any weighing instrument function …" by "Any weighing instrument function is covered by this recommendation and …" Editorial change shown for clarification	There is no need for clarification. The sentence states that "Any weighing instrument function shall be evaluated under other appropriate Recommendations…" This clearly states that the function of weighing instruments are outside the scope of this Recommendation.
CECIP	26	6.2.2 j.	Add "or relative minimum dead load verification interval Y = " Editorial change shown a common practice	Amended as proposed
CECIP	27	6.2.4.2	Table 6: Delete (shear and bending) Unnecessary information, editorial change	Amended
CECIP	37	8.8.2	Incorrect reference: Change "5.3.1.1" to "5.3.2"	Amended
CECIP	40	8.10.1.8	Incorrect reference: Change "5.3.1.1" to "5.3.2"	Amended
CECIP	47	8.10.6.8	Incorrect reference: Change "5.3.1.1" to "5.3.2"	Amended
CECIP	52	8.10.7.6	Under "test procedure in brief" the old IEC standard 61000-4-4 of 1995 has been quoted although the "Bibliography" lists the document of 2012.	Reference in "test procedure in brief" under 8.10.7.6 amended to reflect current standard
CECIP	59	8.11	Incorrect reference: Change "Figure 35" to "Figure 5"	Amended
CECIP	A-4	A.1.2	Delete (For note, please refer to OIML D 11)	Does not exist in A.1.2. however, this has been deleted also in A.1.1
CECIP	A-4	A.1.3	Delete (For note, please refer to OIML D 11)	Amended
CECIP	A-4	A.1.4	Delete (For note, please refer to OIML D 11)	Amended

CECIP	A-8	A.2	Add under the head line "For note, please refer to OIML R 76) Editorial change	Not necessary, no note to refer to for the single definition referenced in R76
CECIP	A-8	A.2.1	Change "[T.2.2.7]" to "(OIML R76, T.2.2.7)" Editorial change	Since section A.2 is titled "Definitions from OIML R76," this is not seen as necessary
CECIP	B-3	Annex B	A list of the EUT and test pattern, identified by type, metrological characteristic and serial number is missing.	Annex B provides the format for OIML Certificate and has not been modified from the 2000 edition of R60-1. There appears to be ample locations for including this type of additional information on the EUT in the current Certificate format

France	2 bottom 3 top FR-1	2.3	The sentence: "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. In the illustration from OIML R76 below, the scope of R60 would not extend beyond module #4" seems not consistent in itself and also with the Note in paragraph 3.1.5.3. It is not clear if #4 is included as the limit of "raw counts" is in theory before #4 Proposal : If the intention is to cover at least part of #4 : the reference to "more than raw counts" should be deleted. A possible sentence could then be : "Digital load cells may be covered under this Recommendation if their output is in raw counts or with only limited further data processing (e.g., scaling). In the illustration from OIML R76 below, the scope of R60 applies to part 2 or part 2+3 or part 2+3+4" (If the intention was to limit it to "raw counts" then "beyond #4" should be replaced by "before #4" and the Note in 3.1.5.3 should be deleted.)	Wording has been amended. See also comments from Austria, CECIP, Netherlands, and Germany.
France	3 FR-2	Figure 1	The title of the figure 1, "weighing modules" shall be changed to "typical parts of a weighing instrument" because a "weighing module" is a special typical module within a weighing instrument defined in R76-T.2.2.7; Figure 1 is more general.	Language amended
France	3 FR-3	3.1.3	"Sampling" is only used 2 times in this draft: in 3.1.3 and in 3.1.17 and nowhere else. Are 3.1.3 and 3.1.17 necessary?	These definitions have been deleted
France	4 FR-4	3.1.5 3.1.5.1	Agree in principle with this approach; however, in 3.1.5.1, in the wording "· passive electronics (i.e., strain gauges)", "i.e." should be replaced by "e.g." because other solutions may use passive electronics	Amended as proposed

France	6 FR-5	3.3 3.3.1	Again, we face with the almost unique experienced type of load cells based on strain gauge technology. As 3.3 title is "construction of load cells", this lonely 3.3.1 seems very restrictive compared to the title of 3.3. In fact, introducing other definitions for other technologies would take a lot of time with rare examples of evaluation (e.g. pressure sensors or optic fibber sensors, …) – Suggestion to add a note to refer to 3rd paragraph of chapter I-Introduction and stating that other technologies, although possibly in the scope of R60 have not yet been experienced. Therefore, as knowledge has not been gained to make sure that specifications given in existing R60 would match other technologies, it has been decided to restrict paragraph 3.3 to strain gauges technology.	Note added to refer to sections 1 and 2.1
France	10	Figure 3	Delete "DR" to keep only "load cell measuring range"	Amended as proposed
France	10	Figure 3	in the text added in Fig 3 b) $E_{min} \le D_{min} \le (0.1\ E_{max})$, and $(0.9\ E_{max}) \le D_{max} \le E_{max}$ Requirements applies for test purpose only at certification stage, not for the use of the load cell $\{ E_{min} \le D_{min}, \text{ and } D_{max} \le E_{max} \}$. This type of requirements should not be repeated in the chapter Definitions (especially if the repetition is misleading)	Text has been amended
France	13 FR-7	3.7.20	Delete " (DR) "	"DR" deleted in definition as proposed
France	NL-8 P 17	5.3.2	Editorial : Delete "1." and read $(0.3 \le p\ LC \le 0.8)$	Amended
France	20 FR-8	5.5.1	In the examples, PLC seems to be 0,7	Amended
France	32 FR-9	8.4	In the sentence "Examples of load cells with identical outer dimensions but different geometries are shown below", add "strain gauges" to read "Examples of strain gauges load cells…"	Amended
France		8.10.7.1	Read "to 8.10.7.11" instead of "8.1.7.10"	Amended
France	50	table	Editorial : delete the "*" that references to nothing now	* Deleted

France	FR-10	general for EMC	We wonder why there is no homogeneity to electromagnetic environmental classes defined in OIML D11. For example, - in 8.10.7.6 (page 52), test levels for bursts are 1 kV for power supply lines and 0.5 kV for I/O signal, data, and control lines. This is class E1 according to OIML D11 - in 8.10.7.10 (page 57), test levels for conducted currents generated by RF EM fields is a field strength of 10 V (emf). This is class E2 according to OIML D11	Paragraph 8.10.7.6 has been amended per comment. RF field strength changed from 10V to 3V to reflect level 2 severity index
France	57 FR-11	8.10.7.10	It is stated that test level is "Level 2 (in accordance with the referred standard)", but this is not in line with OIML D11 that states that field strength shall be 3 V for level 2, not 10V	10V changed to 3V to comply with test procedures for level 2
France	FR-12	Bibliography item [5]	Reference to OIML D11 should be edition of 2013, not 2004.	Amended
Germany	3	2.3	Editorial Correction: The scope of R60 would not extend beyond module 3. Module 4 is not correct.	Wording has been amended. See also comments from Netherlands, France, CECIP, and Austria.
Germany	3	3.1.2	Unknown abbreviation: Replace "EUT" by "Equipment under Test (EUT)".	Definition has been deleted, also see abbreviations 3.9
Germany	4	3.1.5.2	An electronic load cell is a special kind of digital load cell which utilizes active electronics and consequently has metrologically relevant software for additional functionalities but not beyond module 3 of figure 1. Recommendation: Replace to first sentence of 3.1.5.2 by "Digital load cell which is capable of performing the functions as described under "non-electronic load cell (3.1.5.1) and which utilizes active electronics and consequently has metrologically relevant software.	Clause amended

Germany	4	3.1.5.2	Add following note for clarification: Note: The further data processing of an electronic load cell do not cover functionalities of module 4 of figure 1 (e.g. scaling on weighing value in mass units).	See edits and responses to comments regarding 2.3
Germany	4	3.1.5.2	Add following second note for clarification: Note: Subsequent this recommendation refers to digital load cells (see. 3.1.5.3)	Additional note could add unnecessary information and was not considered to add clarity. See also CECIP's comment.
Germany	8	3.4.2 c.)	Replace 3.4.2 c.) by when used, the same type attachment of the strain gauge (e.g. the same glue) to the load cell	3.4.2.c) amended to specify the use of "similar" adhesive
Germany	8	3.5.2	Delete the second part of paragraph: Replace 3.5.2 by "Range of values of the measured quantity" Justification: The load cell measuring range $D_{max} - D_{min}$ is specified by testing possibilities of the issuing authority and should be as close as possible cover the maximum measuring range, defined by the manufacturer. The load cell measuring range is independent of test results and the MPE.	Amended paragraph (See also Japan's comments)
Germany	8	3.5.5	Delete the second part of paragraph: Replace 3.5.5 by "largest value of a quantity expressed in units of mass, which may be applied to a load cell". Justification: The maximum capacity E_{max} is defined by the manufacturer. The E_{max} is independent of test results and the MPE.	Amended as proposed
Germany	9	3.5.6	Replace "during test or use" by "under test" Justification: D_{max} is a test specification given by testing possibilities of the issuing authority and should be as close as possible by E_{max}. It is not a specification for a load cell used in a weighing instrument.	Amended as proposed

Germany	9	3.5.7	Delete the second part of paragraph: Replace 3.5.7 by "range of values of the quantity expressed in units of mass that may be applied to a load cell". Justification: The maximum measuring range is defined by the manufacturer and independent of test results and the MPE.	Amended as proposed
Germany	9	3.5.8	Delete the second part of paragraph: Replace 3.5.8 by "maximum number of load cell verification intervals into which the load cell measuring range may be divided. Justification: The maximum number of load cell verification intervals is defined by the manufacturer and independent of test results and the MPE.	Paragraph amended (see also Japan's comments)
Germany	9	3.5.9	Delete the second part of paragraph: Replace 3.5.9 by "smallest value of a quantity (expressed in mass units) that may be applied to a load cell. Justification: The minimum dead load is defined by the manufacturer and independent of test results and the MPE.	Amended as proposed
Germany	9	3.5.11	Change "smallest load cell verification interval" to "smallest load cell verification interval in units of mass" Editorial clarification	Paragraph amended (see also Japan's comments)
Germany	9	3.5.11	Change "load cell measuring range DR ($D_{max} - D_{min}$) to "maximum load cell measuring range $E_{max} - E_{min}$)" Justification: V_{min} is defined by the manufacturer and independent of test results and the MPE.	Paragraph amended (see also Japan's comments)

Germany	9	3.5.12	Replace "during test or use" by "under test" Justification: D_{min} is a test specification given by testing possibilities of the issuing authority and should be as close as possible by E_{min}. It is not a specification for a load cell used in a weighing instrument.	Amended as proposed
Germany	9	3.5.13	Replace "load cell measuring range" by "maximum measuring range $E_{max} - E_{min}$" Justification: The number of load cell verification intervals is defined by the manufacturer and independent of test results.	Amended as proposed
Germany	10	3.5.14	Replace "load cell measuring range" by "maximum measuring range $E_{max} - E_{min}$" Justification: The number of load cell verification intervals is defined by the manufacturer and independent of test results.	Amended as proposed
Germany	10	3.5.14	Delete "or" Editorial change	Amended as proposed
Germany	10	3.5.15	Delete "or" Editorial change	Amended as proposed
Germany	10	3.6	Replace to last part of the first paragraph by "..., dependent on the conditions of the test of a load cell". Justification: The variable parameters D depend only on the test conditions and not the conditions of use.	Amended as proposed
Germany	10	3.6	Replace "related to E" by "related to parameters E_{min} and E_{max}" Justification: Unclear and undefined meaning of "E"	Amended as proposed

			Replace "related to D" by "related to parameters D_{min} and D_{max}"	
Germany	10	3.6	Justification: Unclear and undefined meaning of "D"	Amended as proposed
Germany	11	3.6	Figure 3: delete D_R	Amended as proposed
Germany	11	3.6	Description of Figure 3: Delete "Range of D" and "Range of E" Justification: Unclear and undefined meaning of "D" and "E"	Amended as proposed
Germany	12	3.7.9	Delete (see 3.7.9) Editorial change	Amended as proposed
Germany	13	3.7.20	Replace "load cell's measuring range (DR)" by ""load cell measuring range (see 3.5.2)" Editorial change	"DR" deleted in definition as proposed
Germany	13	3.7.21	Replace "Change in minimum dead load output ..." by "change of the signal output under minimum dead load D_{min} ..." Justification: Editorial change, minimum dead load output is not defined"	Amended as proposed
Germany	14	3.9	Further abbreviations: DR: minimum dead load output return (see 3.5.10) CH: cyclic humidity NH: no humidity SH: steady-state humidity	Abbreviations added as proposed
Germany	14 / 15	4	Replace 1st sentence in the 2nd paragraph "...to provide an output to an input stimulus based on electrical current" by "...to provide an electrical output relative to a mechanical input". Justification: Wording not general enough	Amended as proposed
Germany	15	5.1.2	Replace "load cell maximum measuring range" by "maximum measuring range $E_{max} - E_{min}$ (see 3.5.8)" Editorial change	Paragraph amended (see also Japan's comments)
Germany	16	5.1.5 c.)	Delete "7", see 5.1.4 Editorial change	Amended as proposed

Germany	17	5.1.5	Figure 4: Delete (shear and bending) Unnecessary information, editorial change	Amended as proposed
Germany	18	5.2.1	Delete "or use" Justification: D_{min} is only a test specification	Amended as proposed
Germany	18	5.2.2	Delete "or use" Justification: D_{max} is only a test specification	Amended as proposed
Germany	19	5.3.2	"1" as footnote Editorial change	Amended
Germany	19	5.5.1	Delete "*" Editorial change	Asterisk refers to note that follows the clause.
Germany	20	5.5.1	Put the first formula from the first example directly under paragraph 5.5.1 Editorial change	Clause amended
Germany	20	5.5.1	Chance the first formula in a general way to "$0.7 \times p_{LC} \times$ MPE of the applied load" Editorial change	Clause amended
Germany	20	5.5.1	Change the first example in the following way: Example: Load cell class: C3: (declared by the manufacturer) Apportionment factor: $p_{LC} = 0.7$ (declared by the manufacturer) applied load: $D_{max} = E_{max}$ (test specification) Maximum difference between the reading = $0.7 \times 0.7 \times 1.5 = 0.735$ Justification: The example is incorrect	Replaced example as proposed

Germany	20	5.5.1	Put the second formula from the second example directly under paragraph 5.5.1 Editorial change	Clause amended
Germany	20	5.5.1	Chance the second formula in a general way to "0.15 × p_{LC} × MPE of the applied load" Editorial change	Clause amended
Germany	20	5.5.1	Change the second example in the following way: Example:　　Load cell class:　　　C3: 　　　　　(declared by the manufacturer) 　　　　　Apportionment factor:　$p_{LC} = 0.7$ 　　　　　(declared by the manufacturer) 　　　　　applied load:　　　$D_{max} = E_{max}$　　(test specification) 　　　　　Maximum difference between the initial reading $= 0.15 \times 0.7 \times 1.5 = 0.1575$ Justification: The example is incorrect	Replaced example as proposed
Germany	20	5.5.2	Change head line from "Minimum dead load output return" to "Minimum dead load output return (DR)" Editorial change for	Amended as proposed
Germany	20	5.5.2	Add a reference to the definition of DR: "(see definition of DR in 3.5.10) Editorial change shown for clarification	Amended
Germany	20	5.5.2	Note: Add a reference to the definition of DR: "(see definition of DR in 3.5.10) Editorial change shown for clarification	Since reference is now included in title of clause, this appears superfluous
Germany	22	5.7.1	Replace „p_{LC}, equal to 1.0 ($p_{LC} = 1.0$) by the wording „p_{LC}, $0.7 \le p_{LC} \le 0.9$ (typically: $p_{LC} = 0.8$)" Justification: An apportionment factor of $P_{LC} = 1.0$ is not possible for a digital load cell (incorrect example)	Clause amended

			Change "load cell equipped with electronics" by "digital load cell"	Amended
Germany	22	5.7.1.1	Change "load cell equipped with electronics" by "digital load cell"	Amended
Germany	22	5.7.1.1	A fault is a value that is equal or smaller than the minimum load cell verification interval v_{min} and not the load cell verification interval v. Change in the note: "load cell verification interval v" in "minimum load cell verification interval v_{min}. " Justification: This is a significant error in this issue and also covers the issue of OIML R60-3	See also comments from CECIP. The significant change being proposed would cause substantial changes in tests and interpretation of results. This type of change is more appropriate for consideration during early stages of a revision and should not be implemented without the support of a majority of PG members.
Germany	23	5.7.1.4	Change "load cell equipped with electronics" by "digital load cell"	Amended
Germany	23	5.7.1	Change „load cell verification interval v" in „minimum load cell verification intercal v_{min}" Justification: Situation of a complete weighing instrument not a subject to transfer to digital load cells. "v" as a generally criteria for a significant fault is much too high.	Erroneous reference – this language not found in 5.7.1.

Germany	23	5.7.2	Add note: Alternatively a manufacturer has the possibility to specify a warm-up time in the data sheet, if there is no possibility to prevent the transmission of measuring results in the warm-up period of the digital load cell.	This clause does not currently require that transmission of measuring results be prevented, it simply states that *during the warm-up time* there shall be no tranmission of measurement results. If the manufacturer specifies a period of time, then that warm-up time has been established through the manufacturer's declaration.
Germany	25	5.7.2.6	Change "load cell equipped with electronics" by "digital load cell"	Amended - replaced load cell equipped with electronics with "digital load cell"
Germany	25	5.7.2.6	Change "test load applied" in "applied test load D_{max}" Editorial change shown for clarification	Amended as proposed
Germany	25	5.7.2.6	Delete the last half sentence "whichever is the greatest" Justification: The explanation is misleading	Sentence has been amended

Germany	26	6.1	Change wording "Any weighing instrument function …" by "Any weighing instrument function is covered by this recommendation and …" Editorial change shown for clarification	There is no need for clarification. The sentence states that "Any weighing instrument function shall be evaluated under other appropriate Recommendations…" This clearly states that the function of weighing instruments is outside the scope of this Recommendation.
Germany	27	6.2.2 j.	Add "or relative minimum dead load verification interval Y = " Editorial change shown a common practice	Amended as proposed
Germany	28	6.2.4.2	Table 6: Delete (shear and bending) Unnecessary information, editorial change	Amended
Germany	37	8.8.2	Incorrect reference: Change "5.3.1.1" to "5.3.2"	Amended
Germany	40	8.10.1.8	Incorrect reference: Change "5.3.1.1" to "5.3.2"	Amended
Germany	47	8.10.6.8	Incorrect reference: Change "5.3.1.1" to "5.3.2"	Amended
Germany	52	8.10.7.6	Under "test procedure in brief" the old IEC standard 61000-4-4 of 1995 has been quoted although the "Bibliography" lists the document of 2012.	Reference in "test procedure in brief" under 8.10.7.6 amended to reflect current standard
Germany	59	8.11	Incorrect reference: Change "Figure 35" to "Figure 5"	Amended
Germany	A-4	A.1.2	Delete (For note, please refer to OIML D 11)	Does not exist in A.1.2. however, this has been deleted also in A.1.1
Germany	A-4	A.1.3	Delete (For note, please refer to OIML D 11)	Amended
Germany	A-4	A.1.4	Delete (For note, please refer to OIML D 11)	Amended

Germany	A-8	A.2	Add under the head line "For note, please refer to OIML R 76) Editorial change	Not necessary, no note to refer to for the single definition referenced in R76
Germany	A-8	A.2.1	Change "[T.2.2.7]" to "(OIML R76, T.2.2.7)" Editorial change	Since section A.2 is titled "Definitions from OIML R76," this is not seen as necessary
Germany	B-3	Annex B	A list of the EUT and test pattern, identified by type, metrological characteristic and serial number is missing.	Annex B provides the format for OIML Certificate and has not been modified from the 2000 edition of R60-1. There appears to be ample locations for including this type of additional information on the EUT in the current Certificate format
Japan		General	We had to submit a negative vote on 4CD due to the following reasons. Practical suggestions are mentioned in respective calluses. 1. It seems that our earlier important comments on 3.5 and 8.10.7.11were not fully accepted. 2. We consider that contents of the present draft are still premature to be published as it was described in our editorial/technical comments.	Additional edits have been made.

Japan	4	2.3 Figure 1	1. Copy the table under Figure 1 of R76-1 (2006) and add it under Figure 1 of this draft. As Australia suggested, we also propose to add this table to facilitate understanding. 2. Definitions of load cells were added in 3.1.5.1-3.1.5.3. Therefore, it is better to explain three types of load cell with a relationship to their components in the table requested in 1. The similar explanation is already provided in the table under Figure 1 of R 76-1. 3. Output data from the data processing unit (#4) is not always expressed in the unit of mass. Therefore, the label "(in mass units)" in Figure 1 is not necessary.	Table from R76 added as proposed
Japan	4	3. Terminology	To facilitate users' understanding of this recommendation, we propose to arrange the terms in the order of either one of the two shown below. 1. R76-1 (2006) 　　 T1. General definitions 　　 T2. Construction of instrument 　　 T3. Metrological characteristics of an instrument 　　 … 2. VIML 　　 0. Basic terms 　　 1. Metrology and its legal aspects 　　 2. Legal metrology activities 　　 …	While the proposed change to format/sequence may have some benefit, the format prescribed under the OIML Recommendation templates has been adhered to as much as possible

Japan	4	3. Terminology	Several terms are added to the terminology. Among them, unused terms in this draft should be deleted as shown below. 3.1.2. durability test [VIML 5.22] 3.1.3. inspection by sampling [VIML 2.18] 3.1.10. preliminary examination [VIML 2.10] 3.1.13. sensitivity of a measuring system [VIM 4.12] 3.1.14. test program [VIML 5.20] 3.1.17. verification by sampling [VIML 2.11] 3.1.18. verification of a measuring instrument [VIML 2.09] 3.7.13. measurement repeatability [VIM 2.21] 3.7.17. resolution of a displaying device [VIM 4.15]	These definitions of terms were determined not to assist the user of this document and have been deleted
Japan	5	3.1.5 Load cell	1. Analog load cells are commonly used complementary to digital load cells. Therefore, the present two categories for analog type (3.1.5.1 and 3.1.5.2) should be merged into one category and should be renamed as "analog load cell". We consider that a categorization scheme with "analog/digital" fits current situation of load cells more practically than another scheme with "electronic/non-electronic". Proposed revision is shown below for understanding. Present: 3.1.5.1. non-electronic load cell 3.1.5.2. electronic load cell 3.1.5.3. digital load cell Proposed: 3.1.5.1. analog load cell 3.1.5.1.1. non-electronic load cell, 3.1.5.1.2. electronic load cell 3.1.5.2. digital load cell 2. The term "load cell equipped with electronics" was defined in terminology in 3CD but it was deleted in 4CD. However, this term is still used in the current draft. Instead, a new term "electric load cell" is defined in 3.1.5.2. Use either one of these terms in the same document.	The use of the terminology "analog load cell" as a means to categorize is a determination that should have been made by TC9/p1 in an early draft (1st or 2nd CD). At this late stage in the revision, it is not considered appropriate to change the structure of categorization of load cells in this fashion. Use of term "load cell equipped with electronics has been discontinued and has been replaced with "digital load cell." Also see revised definition for electronic load cell

Japan	8	3.5 Range, capacity and output terms	This is partly a repetition of our comment on 3CD because these comments were not completely reflected in 4CD. The terms and symbols used to specify range, capacity and output terms have been revised inconsistently during the revision procedures from 2CD to 3CD, and these expressions were maintained in 4CD. As a result of these revisions, there exists a **significant lack of consistency** among such terms and symbols, and it makes difficult to understand the present draft correctly.	A review of the complete document has been performed. Amendments made where inconsistencies were found. Use of symbols E and D, E_{max}/E_{min} and D_{max}/D_{min} has been amended where needed
			The use of symbols E (E_{min}, E_{max}, E_R) and D (D_{min}, D_{max}, D_R) for range/capacity seems to be confusing. 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**. The range of D shall be equal or narrower than that of E based on the principle [$E_{min} \leq D_{min} \leq 0.1 E_{max}$ and $0.9 E_{max} \leq D_{max} \leq E_{max}$] in 8.7.3.4 (Measuring range limits). It is because 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. The above principle was prepared for such a case to provide an alternative test method in a narrower range.	
			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.	

Japan	8	3.5.2 load cell measuring range	Change the expression by deleting the first half as shown below. *3.5.2 load cell measuring range* ~~*range of values of the measured quantity for which the result of measurement is not affected by an error exceeding the maximum permissible error (MPE) (see 3.7.10).*~~ ~~*Note:*~~ ~~*Load cell measuring range is the*~~ *range between the maximum load of the measuring range Dmax and minimum load of the measuring range Dmin* *Load cell measuring range = (Dmax – Dmin)* Reason: "load cell measuring range" is the range used for practical test or use. It should not be related to MPE. Therefore, the first half of the definition is unnecessary. See also our comment on 3.5.	Amended (See also Germany's comments)
Japan	9	3.5.8 maximum number of load cell verification intervals (nLC)	The definition of n_{LC} should be consistent with that of "maximum measuring range" (3.5.7). Change the expression as shown below. *3.5.8. maximum number of load cell verification intervals (nLC)* *maximum number of load cell verification intervals into which the* ~~*load cell*~~ <u>*maximum*</u> *measuring range may be divided for which the result of measurement will not be affected by an error exceeding the MPE (see 3.7.10).*	Amended (See also Germany's comments)

Japan	9	3.5.10 minimum dead load output return(DR)	Change the expression as shown below. *3.5.10. minimum dead load output return (DR)* *observed difference of load cell output, expressed in units of mass at the minimum dead load (Emin)of the measuring range (Dmin), measured before and after application of a load of Dmax Emax.* Reason: DR should be defined based on Emin/Emax. See also our comment on 3.5.	Amended as proposed (also see Germany's and CECIP's comments)
Japan	9	3.5.11 minimum load cell verification interval (vmin)	Change the expression as shown below. *Smallest load cell verification interval into which the load cell measuring maximum measuring range DR (Dmax - Dmin) (Emax-Emin） can be divided.* Reason: v_{min} should be defined based on Emin/Emax. See also our comment on 3.5.	Paragraph amended (See also Germany's and CECIP's comments)
Japan	10	3.5.14 relative minimum dead load output return or Z	Change the expression of the definition as shown below. *3.5.14. relative minimum dead load output return or Z* *Ratio of the load cell maximum measuring range, to two times of the minimum dead load output return, DR.* Reason: Definition should be consistent with those of 3.5.7 and 3.5.10.	Amended
Japan	10	Figure 3 Illustration of certain definitions	Since "Figure 2" is deleted in 4CD, "Figure 3" should be corrected to "Figure 2" in the figure title (p. 12) as well as in the main text of 3.6.	Amended
Japan	10, 18	3.6 Illustration of certain definitions Figure 3	"D_R" is not used in this draft. Therefore, delete "D_R" under the label "Load Cell Measuring Range"	"DR" symbol deleted as proposed

Japan	11	3.7.2 apportioning factor	The name of P_{LC} in terminology was changed from "apportionment factor" to "apportioning factor". However, only the former is used in the rest of this draft. Use either "apportionment factor" or "apportioning factor".	Consistency was maintained throughout document by use of only "apportioning factor" in document
Japan	12	3.7.11 Measurement error	The note in 5.3 cited below should be moved to 3.7.11. *Note: The term "measurement error" in this Recommendation refers to load cell measurement errors.*	Amended as proposed. Note in 5.3 relocated to 3.7.11
Japan	12	3.7.12. measured quantity value (and other places)	The term "measured quantity value" is not used in this draft, whereas "measured quantity" is used twice (3.5.2 and 3.7.11). Use the same expression in the terminology.	Entry of "measured quantity value" modified following the directive found in OIML B6-2: A.2.5.1 Parentheses ( ) enclosing a part of a term indicate that that part of the term may be omitted, provided that no confusion can arise in the context in which the term is used.
Japan	13	3.8.5. reference operating condition	"Reference operating condition" is not used in this draft, whereas "reference condition" is used frequently. Use the same expression.	Entry of "reference operating condition" modified following the directive found in OIML B6-2: A.2.5.1 Parentheses ( ) enclosing a part of a term indicate that that part of the term may be omitted, provided that no confusion can arise in the context in which the term is employed.
Japan	14	3.9 Abbreviations	Like Clause T.9 in R76-1 (2006), this clause could include more abbreviations.	CH, SH, NH, and DR abbreviations added

Japan	14	3.10	Like Clause "T.8 Index of terms defined" in R76-1 (2006), index of all terms used in this recommendation should be added for convenience.	Revision of this Recommendation was based on OIML template which did not include index of all terms
Japan	15	5.1.2 Maximum number of …	Change the expression as shown below by deleting "load cell". *The maximum number of load cell verification intervals, n_{LC}, into which the ~~load cell~~ maximum measuring range can be divided in a measuring system shall be within the limits presented in Table 1.* Reason: The definition of n_{LC} should be consistent with that of maximum measuring range (3.5.7).	Paragraph amended (see also Germany's and CECIP's comments)
Japan	16	5.1.5. Complete load cell classification f), Figure 4, 5.1.7 Multiple classifications	Correct "Figure 4" to "Figure 3" both in the main text and the figure title because "Figure 3" should be corrected to "Figure 2".	Amended as proposed
Japan	19	5.5.1 Creep	In order to match the formula below, make a correction as shown below. There are two places to be corrected in this clause. *Example: (p_{LC} declared by manufacturer = ~~0.75~~ __0.7__)*	Amended
Japan	32	8.4 Selection of load cells within a family	Figure number and title are missing. Add "Figure 4 Examples of Load Cell Design Shapes" under the figures.	Amended as proposed

| Japan | 57 | 8.10.7.11 Span stability | We consider both span stability test and humidity test are important. Even so, conducting humidity test during span stability test is not appropriate due to the following reasons. Humidity test should be conducted after completing span stability test.

Tests for the high-capacity load cell are usually conducted using a large-capacity tester for general use. Result of span stability test can be affected even by a small difference in the force application point. Therefore, uninstalling/installing of the load cell from the tester can lead an ambiguity in the force application point and results in a significant error.

Please be noted that the present R60 (2000) reminds that instauration of load cells should be done carefully as cited below.

A.3.2.13 Span stability: the installation of the load cell in the force-generating system shall be done with particular care, 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.

With the reasons above, we would like to propose following changes in the first paragraph.

Test procedure in brief:
The test consists in observing the variations of the output of the load cell under reasonably constant (±2 °C °) conditions (e.g., in a normal laboratory environment) at various intervals before, during and after the load cell has been subjected to performance tests. ~~The performance tests shall include (as a minimum) the temperature test and, if applicable, the damp heat test.~~ <u>A performance test shall include temperature test (at minimum). Damp heat test may be conducted after a series of span stability tests, if applicable.</u> | Amended paragraph by changing language in **bold-font** as follows:

Test procedure in brief:

The test consists in observing the variations of the output of the load cell under reasonably constant (±2 °C) conditions (e.g., in a normal laboratory environment) at various intervals before, during and after the load cell has been subjected to performance tests. ~~and, if applicable, the damp heat test~~ **<u>The performance tests shall include (as a minimum) the temperature test. The damp heat test may be performed (when applicable) after a series of span stability tests if the conduct of that test during a span stability test imposes a greater risk that the principles expressed under 8.7.3.3. would be compromised. This may be a greater vulnerability when conducting tests on</u>** |

				higher capacity load cells.
Japan	59	8.11 Test sequence	Correct "Figure 35" to "Figure 5" in the text.	Amended
Netherlands	NL-1	General	We observed that the actual draft is improved a lot and is considered almost ready for the next stage. The main point is that the implications of the subdivision of load cells as presented in the terminology has not yet been fully implemented in the draft.	The amendments made in the 5CD are expected to resolve these concerns
Netherlands	NL-2	PG convener response on NL-61 on 3 CD	The following was reported as part of the email sent on 30 September 2015 by the subgroup to the PG convener: "It is expected that directly powered load cells are rare or even do not exist. If there would exist (become available on the market) a directly powered load cell it is considered outside the scope of this edition of R 60" This was expected to be the definitive conclusion of the subgroup that direct mains powered load cells are not in the scope of R 60.	References to load cells supplied directly from mains have been deleted
Netherlands	NL-3	several	The term "load cells equipped with electronics" should no longer be applied instead the terms of 3.1.5.2 and 3.1.5.3 should be applied.	See comments from Germany & CECIP and amendments made to definitions based on work of sub-group. "Load cells equipped with electronics" has been deleted and replaced with the term "digital load cells"

Netherlands	NL-4 Several pages	PG convener response on NL-58 on 3 CD	As a consequence of the previous comment (NL-3) and as stated in NL-58 on the 3 CD pLC = 1.0 should only be applied for digital load cells (3.1.5.3). For electronic load cells (3.1.5.3) only quipped with analogue electronics (for example to compensate for temperature effect) pLC should be 0.7. For NL this is a mayor issue which is considered not in contradiction with the yet applied practise based on the R 60	Refer to revised definitions of load cells (non-electronic, electronic, and digital) in 3.1.3.1, 3.1.3.2, and 3.1.3.3. Clause amended – see Germany's/CECIP's comments
Netherlands	NL-5 P 3	2.3 NL-10 on 3 CD	At least adapt the clause to the applicable figure 1 text: digital "raw values" (counts)	Wording has been amended. See also comments from Austria, France, CECIP, and Germany.
Netherlands	NL-6 P 7	3.2.1.1; 3.2.1.2 NL-14 and NL-15 on 3 CD	Although the secretariat response so indicates we have not detected any changes made	Amended as proposed
Netherlands	NL-7 P 14	3.9	Suggest to add NH, SH, CH and DR	Abbreviations added as proposed
Netherlands		5.1.7	Suggest to remove "shear" and "bending" from the descriptions in the table.	Amended as proposed
Netherlands	NL-9 P 20	5.6 NL-54 on 3 CD	It is the companies or manufacturers (so called economic operators) that will apply for type evaluation. 'The person responsible for submitting the load cell for evaluation' is rather undefined and may even be interpreted the person from the transport company. Therefore please use the word "applicant"	Wording amended

Netherlands	NL-10 several	8.10.7.9 Australian comment on page 58 of 3CD 8.10.7.5 -8.10.7.10	This Australian comment is supported by NL However, although the secretariat response on the Australian indicates that the note is deleted, we have not detected this change, moreover the note shows been added to several other tables. Please reverse the insertions: "If test is conducted while load cell is installed as a component in a weighing instrument, then…" while a load cell to be tested for R60 should never be installed in a weighing instrument during the testing. Normally it will be connected to an indicator which will not be exposed to the test and maybe some support will be needed to introduce a force on the load cell.	Note deleted in all tables under test procedures
Netherlands	NL-11	several	Many references to OIML D 11 (2013) definitions are not correct.	Amended
SCAIME		General	Few comments for this draft close to the final one. Good job!	
SCAIME	8	3.4.2. c)	We are not in favour of this adding that will create unnecessary constraints when manufacturing the load cell. Like the type/model/manufacturer of the strain gage, and also the type/model/manufacturer of the glue, some adjustments are needed and we are dependent of suppliers' sources and products that are subject to change due to environmental requirements like ROHS and Reach Directives in Europe. All that can modify the manufacturing process. We propose to suppress this adding.	3.4.2.c) amended to specify the use of "similar" adhesive
SCAIME	11	Fig 3	in the text added in Fig 3 b) Emin ≤ Dmin ≤ (0.1 Emax), and (0.9 Emax) ≤ Dmax ≤ Emax Requirements applies for test purpose only at certification stage, not for the use of the load cell { Emin ≤ Dmin, and Dmax ≤ Emax}.	Text has been amended
SCAIME	19	5.3.2	Supress "1." and read $(0.3 \leq pLC \leq 0.8)$	Amended
SCAIME	48	8.10.7.1	Read "to 8.10.7.11" instead of "8.1.7.10"	Amended
SCAIME	50	table	Supress the "*" that references to nothing.	* Deleted

Member State	Page number	Document clause	Comment	Secretariat's Response
Austria			*Despite the missing parts in 2.2.5 and 2.2.8 and the format issue, we may send our comments to 1 WD R60-2 at the moment as follows:*	
Austria	36	4.10.5	*Chapter 4.10.5 should be deleted, because it is twice (see 4.10.3)*	Amended as proposed
Austria	41	5.1	*The term "OIML certificate number should be renamed to "type evaluations mark according to R60-1.*	Amended as proposed
CECIP	2	1.1	Replace "R60 (20XX)" by "OIML R60" Editorial change Remark: I recommend referring to OIML R60 without year specification.	Amended
CECIP	7	2.2	Head line: Change "load cells equipped with electronics" by "digital load cell" in general Editorial change	Replaced "load cells equipped with electronics" with "digital load cells"
CECIP	2	1.2 2	Replace "R60-1 (20XX)" by "OIML R60-1" Editorial change	Amended

Member State	Page number	Document clause	Comment	Secretariat's Response
CECIP	7	2.2.1.2	Supplement: Calculate the span in count: $span\ (counts) = counts\ at\ D_{max} - counts\ at\ D_{min}$ Calculate the span in units of vmin: $span\ (vmin) =\ span(counts)\ x\ (Dmax - Dmin)\ /\ f\ x\ n\ x\ vmin$ Calculate the change of the span in units of vmin with regard to the initial span. The change of span must not exceed vmin.	See also comments from Germany. Refer to comments and response for R60 Part 1, paragraph 5.7.1.1. The significant change being proposed would cause substantial changes in tests and interpretation of results. This type of change is more appropriate for consideration during early stages of a revision and should not be implemented without the support of a majority of PG members.
CECIP	7/8	2.2.3.2	Miscalculation, must refer to v_{min}, according 2.2.1.2	Existing language retained. See response to comment on clause 2.2.1.2.
CECIP	8	2.2.4.2	Miscalculation, must refer to v_{min}, according 2.2.1.2	Existing language retained. See response to comment on clause 2.2.1.2.
CECIP	8	2.2.5.2	Miscalculation, must refer to v_{min}, according 2.2.1.2	Existing language retained. See response to comment on clause 2.2.1.2.
CECIP	8	2.2.6.2	Miscalculation, must refer to v_{min}, according 2.2.1.2	Existing language retained. See response to comment on clause 2.2.1.2.
CECIP	8	2.2.7.2	Miscalculation, must refer to v_{min}, according 2.2.1.2	Existing language retained. See response to comment on clause 2.2.1.2.
CECIP	9	2.2.8.2	Miscalculation, must refer to v_{min}, according 2.2.1.2	Existing language retained. See response to comment on clause 2.2.1.2.
CECIP	9	2.2.9.2	Miscalculation, must refer to v_{min}, according 2.2.1.2	Existing language retained. See response to comment on clause 2.2.1.2.
CECIP	13	4.3.2	2nd table: Change "load cells equipped with electronics" by "digital load cell" Editorial change	"load cells equipped with electronics" has been replaced with "digital load cells" for consistency with R60-1

Member State	Page number	Document clause	Comment	Secretariat's Response
CECIP	22	4.9.1	Row 5: Change "load cells equipped with electronics" by "digital load cell" Editorial change	"load cells equipped with electronics" has been replaced with "digital load cells" for consistency with R60-1
CECIP	23	4.9.3	Head line: Change "load cells equipped with electronics" by "digital load cell" Editorial change	"load cells equipped with electronics" has been replaced with "digital load cells" for consistency with R60-1
CECIP	31	4.10	Table, row 7: Change "load cells equipped with electronics" by "digital load cell" Editorial change	"load cells equipped with electronics" has been replaced with "digital load cells" for consistency with R60-1
CECIP	38	4.10.8	Chapter 4.10.7 is missing. Leads to changes in the numbering of the following chapters Editorial change	Amended
CECIP	38	4.10.8	Head line: Change "load cells equipped with electronics" by "digital load cell" Editorial change	"load cells equipped with electronics" has been replaced with "digital load cells" for consistency with R60-1
CECIP	40	4.10.12	Head line: Change "load cells equipped with electronics" by "digital load cell" Editorial change	"load cells equipped with electronics" has been replaced with "digital load cells" for consistency with R60-1
CECIP	45	6.1.1	Head line: Change "load cells equipped with electronics" by "digital load cell" Editorial change	"load cells equipped with electronics" has been replaced with "digital load cells" for consistency with R60-1
CECIP	48	6.2.1	Table, row 7: Change "load cells equipped with electronics" by "digital load cell" Editorial change	"load cells equipped with electronics" has been replaced with "digital load cells" for consistency with R60-1
CECIP	71	Form 6.11	Table 6.11: Change the "span" in the second line in "span in units of vmin" Substantial correction	Existing language retained. See response to comment on clause 2.2.1.2.

Member State	Page number	Document clause	Comment	Secretariat's Response
CECIP	71	Form 6.11	Table 6.11: Change the "change" in the third line in "change of span in units of vmin" Substantial correction	Existing language retained. See response to comment on clause 2.2.1.2.
CECIP	71	Form 6.11	Table 6.11: Delete "mpc v" in the last column Substantial correction	Existing language retained. See response to comment on clause 2.2.1.2.
CECIP	71	Form 6.11	Add the following remark: The change of span must not exceed vmin. Substantial correction	Existing language retained. See response to comment on clause 2.2.1.2..
CECIP	72	Form 6.12	Table 6.12: Change the "span" in the second line in "span in units of vmin" Substantial correction	Existing language retained. See response to comment on clause 2.2.1.2.
CECIP	72	Form 6.12	Table 6.12: Change the "change" in the third line in "change of span in units of vmin" Substantial correction	Existing language retained. See response to comment on clause 2.2.1.2.
CECIP	72	Form 6.12	Table 6.12: Delete "mpe v" in the last column Substantial correction	Existing language retained. See response to comment on clause 2.2.1.2.
CECIP	72	Form 6.12	Add the following remark: The change of span must not exceed vmin. Substantial correction	Existing language retained. See response to comment on clause 2.2.1.2.
CECIP	73	Form 6.12	The Table on page 73 is not named and has no head line (table 6.13 or table 6.12 b ?). Editorial change	Table has been titled 6.12 (b)

Member State	Page number	Document clause	Comment	Secretariat's Response
CECIP	73	Form 6.12	Table ???: Change the "span" in the second line in "span in units of vmin" Substantial correction	Existing language retained. See response to comment on clause 2.2.1.2.
CECIP	73	Form 6.12	Table ???: Change the "change" in the third line in "change of span in units of vmin" Substantial correction	Existing language retained. See response to comment on clause 2.2.1.2.
CECIP	73	Form 6.12	Table ???: Delete "mpe v" in the last column Substantial correction	Existing language retained. See response to comment on clause 2.2.1.2.
CECIP	73	Form 6.12	Add the following remark: The change of span must not exceed vmin. Substantial correction	Existing language retained. See response to comment on clause 2.2.1.2.
CECIP	73	Form 6.13	Miscalculation, must refer to v_{min} according 6.11 new.	Existing language retained. See response to comment on clause 2.2.1.2.
CECIP	74 / 75	Form 6.14	Miscalculation, must refer to v_{min} according 6.11 new.	Existing language retained. See response to comment on clause 2.2.1.2.
CECIP	74 / 75	Form 6.14	Miscalculation, must refer to v_{min} according 6.11 new.	Existing language retained. See response to comment on clause 2.2.1.2.
CECIP	76 / 77	Form 6.15	Miscalculation, must refer to v_{min} according 6.11 new.	Existing language retained. See response to comment on clause 2.2.1.2.
CECIP	78 - 80	Form 6.16	Miscalculation, must refer to v_{min} according 6.11 new.	Existing language retained. See response to comment on clause 2.2.1.2.
CECIP	80 - 81	Form 6.17	Miscalculation, must refer to v_{min} according 6.11 new.	Existing language retained. See response to comment on clause 2.2.1.2.
CECIP	82 - 83	Form 6.18	Miscalculation, must refer to v_{min} according 6.11 new.	Existing language retained. See response to comment on clause 2.2.1.2.
CECIP	84 - 92	Form 6.18	Miscalculation, must refer to v_{min} according 6.11 new.	Existing language retained. See response to comment on clause 2.2.1.2.

Member State	Page number	Document clause	Comment	Secretariat's Response
Germany	2	1.1	Replace "R60 (20XX)" by "OIML R60" Editorial change Remark: I recommend referring to OIML R60 without year specification.	Amended as proposed
Germany	2	1.2	Replace "R60-1 (20XX)" by "OIML R60-1" Editorial change	Amended as proposed
Germany	2	2	1st paragraph: Replace "R60-1 20XX" by "OIML R60-1" Editorial change	Amended as proposed
Germany	2	2	2nd paragraph: Replace "R60 parts 1 20XX" by "OIML R60-1" Editorial change	Amended as proposed
Germany	7	2.2	Head line: Change "load cells equipped with electronics" by "digital load cell" Editorial change	Replaced "load cells equipped with electronics" with "digital load cells"
Germany	7	2.2.1.2	Supplement: Calculate the span in count: $span\ (counts) = counts\ at\ D_{max} - counts\ at\ D_{min}$ Calculate the span in units of vmin: $span\ (vmin) =\ span(counts)\ x\ (Dmax - Dmin)\ /\ f\ x\ n\ x\ vmin$ Calculate the change of the span in units of vmin with regard to the initial span. The change of span must not exceed vmin.	See also comments from CECIP. Refer to comments and response for R60 Part 1, paragraph 5.7.1.1. The significant change being proposed would cause substantial changes in tests and interpretation of results. This type of change is more appropriate for consideration during early stages of a revision and should not be implemented without the support of a majority of PG members.
Germany	7/8	2.2.3.2	Erroneous calculation; refers to v instead to v_{min}; calculation should be done in analogy to 2.2.1.2	Existing language retained. See response to comment on clause 2.2.1.2.

Member State	Page number	Document clause	Comment	Secretariat's Response
Germany	8	2.2.4.2	Erroneous calculation; refers to v instead to v_{min}; calculation should be done in analogy to 2.2.1.2	Existing language retained. See response to comment on clause 2.2.1.2.
Germany	8	2.2.5.2	Missing calculations; they shall refer to v_{min}, see 2.2.1.2	Existing language retained. See response to comment on clause 2.2.1.2.
Germany	8	2.2.6.2	Erroneous calculation; refers to v instead to v_{min}; calculation should be done in analogy to 2.2.1.2	Existing language retained. See response to comment on clause 2.2.1.2.
Germany	8	2.2.7.2	Erroneous calculation; refers to v instead to v_{min}; calculation should be done in analogy to 2.2.1.2	Existing language retained. See response to comment on clause 2.2.1.2.
Germany	9	2.2.8.2	Missing calculations; they shall refer to v_{min}, see 2.2.1.2	Existing language retained. See response to comment on clause 2.2.1.2.
Germany	9	2.2.9.2	Missing calculations; they shall refer to v_{min}, see 2.2.1.2	Existing language retained. See response to comment on clause 2.2.1.2.
Germany	13	4.3.2	2nd table: Change "load cells equipped with electronics" by "digital load cell" Editorial change	"load cells equipped with electronics" has been replaced with "digital load cells" for consistency with R60-1
Germany	22	4.9.1	Row 5: Change "load cells equipped with electronics" by "digital load cell" Editorial change	"load cells equipped with electronics" has been replaced with "digital load cells" for consistency with R60-1
Germany	23	4.9.3	Head line: Change "load cells equipped with electronics" by "digital load cell" Editorial change	"load cells equipped with electronics" has been replaced with "digital load cells" for consistency with R60-1
Germany	31	4.10	Table, row 7: Change "load cells equipped with electronics" by "digital load cell" Editorial change	"load cells equipped with electronics" has been replaced with "digital load cells" for consistency with R60-1
Germany	38	4.10.8	Chapter 4.10.7 is missing. Leads to changes in the numbering of the following chapters Editorial change	Amended
Germany	38	4.10.8	Head line: Change "load cells equipped with electronics" by "digital load cell" Editorial change	"load cells equipped with electronics" has been replaced with "digital load cells" for consistency with R60-1

Member State	Page number	Document clause	Comment	Secretariat's Response
Germany	40	4.10.12	Head line: Change "load cells equipped with electronics" by "digital load cell" Editorial change	"load cells equipped with electronics" has been replaced with "digital load cells" for consistency with R60-1
Germany	45	6.1.1	Head line: Change "load cells equipped with electronics" by "digital load cell" Editorial change	"load cells equipped with electronics" has been replaced with "digital load cells" for consistency with R60-1
Germany	48	6.2.1	Table, row 7: Change "load cells equipped with electronics" by "digital load cell" Editorial change	"load cells equipped with electronics" has been replaced with "digital load cells" for consistency with R60-1
Germany	71	Form 6.11	Table 6.11: Change the "span" in the first line in "span in counts" Substantial correction	Existing language retained. See response to comment on clause 2.2.1.2.
Germany	71	Form 6.11	Table 6.11: Change the "span" in the second line in "span in units of vmin" Substantial correction	Existing language retained. See response to comment on clause 2.2.1.2..
Germany	71	Form 6.11	Table 6.11: Change the "change" in the third line in "change of span in units of vmin" Substantial correction	Existing language retained. See response to comment on clause 2.2.1.2.
Germany	71	Form 6.11	Table 6.11: Delete "mpe v" in the last column Substantial correction	Existing language retained. See response to comment on clause 2.2.1.2.
Germany	71	Form 6.11	Add the following remark: The change of span must not exceed vmin. Substantial correction	Existing language retained. See response to comment on clause 2.2.1.2.

Member State	Page number	Document clause	Comment	Secretariat's Response
Germany	72	Form 6.12	Table 6.12: Change the "span" in the first line in "span in counts" Substantial correction	Existing language retained. See response to comment on clause 2.2.1.2.
Germany	72	Form 6.12	Table 6.12: Change the "span" in the second line in "span in units of vmin" Substantial correction	Existing language retained. See response to comment on clause 2.2.1.2.
Germany	72	Form 6.12	Table 6.12: Change the "change" in the third line in "change of span in units of vmin" Substantial correction	Existing language retained. See response to comment on clause 2.2.1.2.
Germany	72	Form 6.12	Table 6.12: Delete "mpe v" in the last column Substantial correction	Existing language retained. See response to comment on clause 2.2.1.2.
Germany	72	Form 6.12	Add the following remark: The change of span must not exceed vmin. Substantial correction	Existing language retained. See response to comment on clause 2.2.1.2.
Germany	73	Form 6.12	The Table on page 73 is not named and has no head line (table 6.13 or table 6.12 b ?). Editorial change	Table has been titled 6.12 (b)
Germany	73	Form 6.12	Table ???: Change the "span" in the first line in "span in counts" Substantial correction	Existing language retained. See response to comment on clause 2.2.1.2.
Germany	73	Form 6.12	Table ???: Change the "span" in the second line in "span in units of vmin" Substantial correction	Existing language retained. See response to comment on clause 2.2.1.2.

Member State	Page number	Document clause	Comment	Secretariat's Response
Germany	73	Form 6.12	Table ???: Change the "change" in the third line in "change of span in units of vmin" Substantial correction	Existing language retained. See response to comment on clause 2.2.1.2.
Germany	73	Form 6.12	Table ???: Delete "mpe v" in the last column Substantial correction	Existing language retained. See response to comment on clause 2.2.1.2.
Germany	73	Form 6.12	Add the following remark: The change of span must not exceed vmin. Substantial correction	Existing language retained. See response to comment on clause 2.2.1.2.
Germany	73	Form 6.13	Erroneous calculations and designations (v_{min} instead of v); should be done as on in Form 6.11	Existing language retained. See response to comment on clause 2.2.1.2.
Germany	74 / 75	Form 6.14	Erroneous calculations and designations (v_{min} instead of v); should be done as on in Form 6.11	Existing language retained. See response to comment on clause 2.2.1.2.
Germany	74 / 75	Form 6.14	Erroneous calculations and designations (v_{min} instead of v); should be done as on in Form 6.11	Existing language retained. See response to comment on clause 2.2.1.2.
Germany	76 / 77	Form 6.15	Erroneous calculations and designations (v_{min} instead of v); should be done as on in Form 6.11	Existing language retained. See response to comment on clause 2.2.1.2.
Germany	78 - 80	Form 6.16	Erroneous calculations and designations (v_{min} instead of v); should be done as on in Form 6.11	Existing language retained. See response to comment on clause 2.2.1.2.
Germany	80 - 81	Form 6.17	Erroneous calculations and designations (v_{min} instead of v); should be done as on in Form 6.11	Existing language retained. See response to comment on clause 2.2.1.2.
Germany	82 - 83	Form 6.18	Erroneous calculations and designations (v_{min} instead of v); should be done as on in Form 6.11	Existing language retained. See response to comment on clause 2.2.1.2.
Germany	84 - 92	Form 6.18	Erroneous calculations and designations (v_{min} instead of v); should be done as on in Form 6.11	Existing language retained. See response to comment on clause 2.2.1.2.
Japan	(not specified)	(not specified)	In the present R60 (2000), there are many recording examples in Annex E. We propose to add such examples also in this draft.	These examples appear in R60-1, Annex B

Member State	Page number	Document clause	Comment	Secretariat's Response
Japan		2 Applicability of this Report Format	We consider that the contents of Clause 2 may not appropriate for Part 3 (test report format). Such contents are usually placed under Part 1 or 2 in many OIML Recommendations. We cite the present titles under Clause 2 for your reference. 2. Applicability of this Report Format 2.1. Calculation procedures 2.2. Additional tests for load cells equipped with electronics 2.3. General notes 2.4. Formula signs and list of symbols	Considering that the conclusions of the calculations of test results will be recorded in the report formats provided in Part 3, this portion of OIML R60 seems an appropriate location for these clauses
Japan	6	2.1.5.8.	Delete "Emin" as it is unnecessary. Correct the equation as shown below. DR = (Emax - ~~Emin~~ × CDR) / nmax	Amended as proposed
Japan	10	2.4 and throughout the document	In Part 1and 2, "n_{max}" was changed to "n_{LC}". Therefore, "n_{max}" should be replaced with "n_{LC}" in Part 3.	Amended as proposed
Japan	After 56	After 6.8 Creep (Cc) and DR (C_{DR})	It is not clear where to record data of D_{min} and D_{max} in some datasheets. Add a comment to clarify where to record the data.	Reports and data tables seem to have locations for these values when it is necessary to record them. Please identify those missing locations
Japan	50	Table 6.3	There are several "0"s in the column of "Test load (units)". The lowest "0" is written in the wrong row. It should be written in a-row-above (the same row in which asterisk is written).	Amended as proposed

Member State	Page number	Document clause	Comment	Secretariat's Response
Japan	50 and 52	Table 6.3 and Table 6.4	Preload is required only once. Therefore, cells which are not necessary for recording in the datasheet should be shadowed with a grey background like Table D.1 in the present R60 (2000).	Amended as proposed
Japan	10, 53, 54, 57, 69 and 72		For the expression of "MPE", both upper and lower cases are used. Correct "mpe" to "MPE" (p.10, 53, 54, 57, 69 and 72) for consistency.	Amended as proposed