

		OIML TC9 P1 Comments		
		TC9P1 Comments on: OIML R60-1, 2CD: Metrological Regulation for Load Cells		
		TC9 Secretariat: United States of America john.barton@nist.gov		
Member State	Page number	Document clause	Comment	Convener's Response
Australia	General		We welcome the opportunity to discuss the issues which you have identified. Suggest that the group also discusses whether the terms force, quantity or mass are most appropriate so that they can be applied consistently throughout document.	A number of significant changes were made to this Recommendation based on the discussions taking place during the 17 March, 2014 TC9P1 meeting.
Australia	4	3.3.2	The term 'tuning fork' is not used in the document. Suggest removing definition.	This definition has been removed per resolution of the TC9P1 meeting 17 March, 2014.
Australia	5	3.5.4	Suggest reverting to previous version. The inclusion of reference to ratios does not add any clarification.	Previous version of this definition has been restored
Australia	5	3.5.5	Suggest that the original CD1 version is clearer. As E _{max} is a declared value, a definition which refers to the 'load which may be applied' instead of the 'load which is applied' is more accurate.	Paragraph has been revised to consider comment
Australia	7	3.5.12	'smallest value of a quantity (mass) which is applied to a load cell during test or use.' Suggest replacing with: 'smallest load which is applied to a load cell during test or use.'	Paragraph amended in consideration of this comment
Australia	18	6.3.1.1	'Where "m" is the value (expressed in mass) representing the force introduced by the load applied' Suggest replacing with: 'Where "m" is the applied load'	Wording in 2CD was amended based on comments from 1CD and has been supported by most TC9P1 members and therefore retained.

Australia	21	6.6.3.1	<p>'The influence of exposure to temperature cycles specified in 9.10.5.12 on the load cell output for minimum load shall not be greater than 4 % of the difference between the output on the maximum capacity, Emax, and that at the minimum dead load Emin.</p> <p>The influence of exposure to temperature cycles specified in 9.10.5.12 on the load cell output for the maximum load shall not be greater than the load cell verification interval v. '</p> <p>Suggest replacing 'temperature cycles' with 'environmental cycles'</p> <p>'The influence of exposure to environmental cycles specified in 9.10.5.12 on the load cell output for minimum load shall not be greater than 4 % of the difference between the output on the maximum capacity, Emax, and that at the minimum dead load Emin.</p> <p>The influence of exposure to environmental cycles specified in 9.10.5.12 on the load cell output for the maximum load shall not be greater than the load cell verification interval v. '</p>	<p>Since the humidity conditions are to be maintained at a high humidity (within 80 – 96%) and it is the temperature that is varied, it seems that the existing wording "temperature cycles" is appropriate.</p>
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Australia	26	7.2.1	<p>We would prefer that the mandatory markings always remain on the loadcell and that Emax expressed in N, kN, MN not be allowed. Also the information on the loadcell should be sufficient to identify all applicable parameters.</p> <p>Suggest replacing 7.2.1 with the following:</p> <p>7.2.1. Mandatory markings on the load cell</p> <p>The following mandatory markings shall be clearly and indelibly marked on the load cell:</p> <ul style="list-style-type: none"> a. 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 or t) e. Year of production f. Type approval number <p>The information above shall be sufficient to identify which specific parameters in 7.2.2 apply to that loadcell.</p>	<p>OIML Certificate number (if applicable) deleted under 7.2.2 and placed under 7.2.1 as a mandatory marking on the load cell. The certificate number should be sufficient to identify all applicable parameters as requested. The project group is being asked to confirm this action by indicating their support or opposition. Force units N, kN, and MN have been removed since MPE is expressed only in units of mass.</p>
Australia	41	9.4.5	We would prefer the original R60 2000ed wording.	As per resolution of the TC9P1 meeting (17 March, 2014), wording from 2000 edition reinstated.
Australia	48	Table 9	We agree with the proposed table.	As per resolution of the TC9P1 meeting on 17 March 2014, a revised table will be included in R60 3CD and the associated paragraph (9.8.3.2) will be slightly modified so that the examples provided do not conflict with the values mentioned in the amended table

Australia	50	9.10.1.2	<p>We prefer that reference temperature should always be 20C so that comparisons can more easily be drawn between different temperature ranges, unless the temperature range does not include 20C.</p> <p>Suggest replacing ‘In case the total temperature range has been shifted, the initial (reference) temperature may differ from 20°C (e.g. range from -20°C to 30°C, reference / initial temperature: 10°C). ‘</p> <p>With ‘In the case where the total temperature range does not include 20C another reference temperature may be selected.’</p>	Amended as proposed
Austria	-	General	<p>The uncertainty of the temperature ($20\text{ °C} \pm 2\text{ °K}$) is inconsistent throughout the document. (e.g. 9.10.7.11; 9.7.2.1; 9.10.7.11;...)</p> <p>We suggest using the same unit (°C).</p> <p>Please check the consistency.</p>	Following the wishes of the majority of comments received, 3CD will use only 2 °C. Kelvin units will not be used.
Austria	-	General	<p>Is it useful to have definitions spread in the document (at the beginning and in the annex)?</p> <p>We suggest amending all definitions in one chapter (with reference to the original document).</p>	Format for definitions follows OIML template.
Austria	5	3.5.2	Please correct “DR” to “D _R ”	Amended
Austria	19	6.5.1	Please change in the second paragraph “after of exposure...” to “after 20 minutes of exposure...”	Amended
Austria	67	9.10.7.7	In the heading please correct “Surge (see 6.7.1.5” to “Surge (see 6.7.1.5)”	Amended
Austria	56	9.10.5.3	We suggest amending “before commencing any further tests” like 9.10.6.3	Amended as proposed
Austria	41	9.4.5	Remain wording from R60 2000 edition	As per resolution of the TC9P1 meeting (17 March, 2014), wording from 2000 edition reinstated.

Austria	44	9.7.2.1 Table 8	In our opinion the Environmental conditions values in Table 8 seem to be appropriate.	According to the resolution of TC9P1 meeting 17 March, 2014 Table 8 will not be included in 3CD. It was determined that these conditions are specified in the test procedures when the control of specific conditions is necessary.
Austria	45	9.7.3.3.	Support	As per resolution of the TC9P1 meeting (17 March, 2014) new wording is used.
Austria	48	9.8.3	Table 9: we suggest replacing the column "Loading" by "Loading or unloading" (like France comment)	As per resolution of the TC9P1 meeting on 17 March 2014, a revised table will be included in R60 3CD and the associated paragraph (9.8.3.2) will be slightly modified so that the examples provided do not conflict with the values mentioned in the amended table
Austria	B-1 ff.	Annex B / Annex C	We prefer Annex C.	Resolution of TC9P1 meeting (17 March, 2014) was to retain the certificate format presented in Annex C in the 2CD as an example for more detail that could be added in a certificate and that this Annex should be listed as "informative" rather than mandatory. Annex B will remain as "mandatory."
0	23	6.7.2 and 9.10.7 §	AC and DC supplies should be considered. Considering a modular approach in the case of other instruments a battery power supply test should be performed in R60. We strongly support the comment of the German colleagues (2cd paragraphs related to disturbance tests (6.11.3.4 1 CD)).	Clause referring to AC mains power supply and DC battery power supply (6.7.2.1 & 6.7.2.2 in 3CD) have been reinstated into R60 per resolution of TC9P1 meeting. In addition, test procedures for power voltage variations (9.10.7.4) have been amended to include provisions for testing load cells powered by AC or DC mains.

Austria	52	9.10.1.13	Support opinion of the German colleagues and suggest amending/changing wording	Per resolution of TC9P1 meeting (17 March, 2014), accuracy and creep testing will be conducted at the “normal” (-10 °C to 40 °C) range of temperatures and may also be conducted at any extended temperatures specified by the manufacturer that is outside the “normal” range. Wording in R60 3CD (6.6) will be amended to reflect this decision.
Austria	C-2	Annex C, 5	We understand essential changes in that way, that if changes are performed an influence on the metrological outcome would occur and the compliance with the essential requirements could be questioned.	Per resolution of the TC9P1 meeting (17 March, 2014), changes identified as “essential” must be clearly communicated to the issuing authority; the issuing authority will be empowered to either reject or accept those changes based on their effect(s) on the certification process. Also that enough information must be included on the certificate to describe the patent design of the load cell.
Austria	39	9.4.1	We support remaining the illustration.	The descriptions associated with the illustrations have been altered in their sequence as necessary to coincide with the correct illustrations.
Austria	19	6.5.2	We suggest not including the asterisk. In 8.2.1.the technical shortcoming of the instrument is considered indirectly.	The explanatory note in 6.5.1 simply provides further clarification on the use of Table 4 for creep tests. It is not perceived to detract from the content or meaning of this clause.

Austria	20	6.6.2	We support remaining the mentioned test procedure in the 2 CD.	Per resolution of TC9P1 meeting (17 March, 2014), the test procedure is to be amended to specify that only two separate readings are required. The minimum test is to be conducted by recording the first reading at ambient pressure conditions followed by a second reading taken after the barometric pressure has been increased by a minimum of 1kPa. The resulting reading would be allowed the MPE of 1 v_{\min} per 1kPa of pressure change. These changes are reflected also in the associated test procedure 9.10.4.6
Austria	22	6.7.1.1.-b; §	No adding some wording suggested.	Wording added in 6.7.1.1 to indicate that communication and reporting of any significant faults may need to be evaluated under other Recommendations.
Austria	35	8.2.1	We suggest remaining 1/3 MPE like in other recommendations.	Proposal to reduce MPE from 1/3 to 1/5 by the Netherlands was not supported by TC9P1, no changes will be made to 8.2.1.
Austria	37	9.3	In general we are in favour to have stable specimen during type evaluation. In our opinion a modification during the type evaluation should be avoided. In the other case it is the competence of the issuing authority to determine if the modification may cause different outcome.	Per resolution of TC9P1 meeting 17 March, 2014 any modifications made to be determined permissible or not by evaluator and specific information regarding modifications or repairs should be documented according to CPR format. Language stating that 2 different specimens will be subject to the entire compliment of tests is deleted.

Austria	50	9.10.1.5	Is it meant to take the Stabilisation time in Table 8 as a stable criterion? Otherwise a stability criterion would be useful.	Table 9 (stabilization times) is not intended for use in this step of the test procedure. During the meeting of TC9P1 17 March, 2014 the issue of establishing criteria for determining stability was debated however, no criteria was decided on. TC9P1 members did not believe this to be an issue that creates an urgent need to establish definitive parameters. Some members agreed to independently develop criteria that can be offered for review by the project group at some time in the future.
Austria	52	9.10.2	In our opinion Creep is defined as an essential characteristic and could provide useful information. Hence it should be performed in all cases.	Per resolution of TC9P1 meeting 17 March, 2014: Due to the scope of R60 being limited to static weight applications (see 2.1), exemptions for dynamic weight types of load cells will not be included in this Recommendation.
Canada	19	6.5.1	2 nd paragraph of missing the word “minutes” 6.5.1. Creep 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 minutes of exposure to shall not exceed 0.15 times the absolute value of MPE.	Amended

Canada	23	6.7.2.2	<p>Unclear about title. Span stability is already defined in 3.7.9. Proposal is to delete or modify title with better punctuation</p> <p>Option 1 6.7.2.2. Span stability maximum allowable variation requirements (not applicable to class A load cells)</p> <p>Option 2 6.7.2.2. Span stability : maximum allowable variation requirements (not applicable to class A load cells)</p>	Title modified as proposed under option 2.
Canada	26	7.2.1	<p>Bullet a) is not specific 7.2.1. Mandatory markings on the load cell The following mandatory markings shall be clearly and indelibly marked on the load cell: a. Manufacturer's name Name or trade mark</p>	Bullet "A" amended
Canada	26	7.2.1	<p>All other mandatory information shall be provided in an accompanying document, supplied by the manufacturer, and submitted to the user.</p>	Wording: "supplied by the manufacturer" added.
Canada	26	7.2.2	<p>"accompanying" is mentioned in the first sentence as clarification. It could be deleted from the title. Text added to 2nd sentence to make consistent with 7.2.1. 7.2.2. Mandatory accompanying 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).</p>	"accompanying" deleted as proposed

Canada	27	7.2.3	Grammatical only : extra space between multiple range: a. for a weighing instrument (for example a multiple range instrument according to OIML R 76) [8], the relative v_{min} , Y, where $Y = E_{max} / v_{min}$ (see 3.5.15);	Amended
Canada	39	9.4.2	9.4.2 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 best most stringent metrological characteristics being tested.	Amended as proposed
Canada	41	9.4.5	Prefer wording in the Amended paragraph.	As per resolution of the TC9P1 meeting (17 March, 2014), wording from 2000 edition reinstated.
Canada	50	9.10.1.2	Unclear why in this clause CECIP requested in comments in 1CD that $\pm 2\text{ }^{\circ}\text{C}$ be replaced by ($\pm 2\text{ K}$). I think the units should remain consistent. If the Kelvin unit is to remain please delete the $^{\circ}$ symbol as unlike the degree Fahrenheit and degree Celsius, the Kelvin is not referred to or typeset as a degree. <i>9.10.1.2 Insert load cell</i> Insert the load cell into the force-generating system, load to the minimum test load, D_{min} , and stabilize at $20\text{ }^{\circ}\text{C}$ ($\pm 2\text{ }^{\circ}\text{C K}$).	Following the majority of comments received, 3CD will use $2\text{ }^{\circ}\text{C}$ solely. Kelvin units will not be used.
Canada	52	9.10.2.2	Same comment as 9.10.1.2	Following the majority of comments received, 3CD will use $2\text{ }^{\circ}\text{C}$ solely. Kelvin units will not be used.

Canada	54	9.10.3.2	Same comment as 9.10.1.2	Following the majority of comments received, 3CD will use 2 °C solely. Kelvin units will not be used.
Canada	56	9.10.5.2	Same comment as 9.10.1.2	Following the majority of comments received, 3CD will use 2 °C solely. Kelvin units will not be used.
Canada	59	9.10.6.2	Will need to be consistent with 9.10.1.2, 9.10.2.2, 9.10.3.2, 9.10.5.2,	Following the majority of comments received, 3CD will use 2 °C solely. Kelvin units will not be used.
Canada	60	9.10.6.11	All references to temperature and humidity should include an acceptable limits to be maintained during test	The test procedures in Section 9.10 have been reformatted for 3CD where test procedures are copied from D11. IEC 60068-2-78 Ed. 1.0 (2001) indicates that temperature should be maintained within ± 2 °C and humidity maintained within $\pm 3\%$ RH of test conditions. Since this section of R60 includes the appropriate IEC reference and simply a “test procedure in brief,” it does not seem necessary to include these details in this location.
Canada	64	9.10.7.3	Same comme	The test procedures in Section 9.10 have been reformatted for 3CD where test procedures are copied from D11. IEC 60068-2-78 Ed. 1.0 (2001) indicates that temperature should be maintained within ± 2 °C and humidity maintained within $\pm 3\%$ RH of test conditions. Since this section of R60 includes the appropriate IEC reference and simply a “test procedure in brief,” it does not seem necessary to include these details in this location.

CECIP		General	<p>The objective of the OIML R60 has always been a general use in scales.</p> <p>Once we leave a specified test with a lot of know-how and experience over the years the objectives of the OIML R60 is lost.</p> <p>Therefore sensors which only suitable for certain scales and not pass all OIML R60 tests can be tested as a scale module. These sensors are usually not so commonly used to OIML R76 in the general way.</p>	Specific recommendations for changes to R60-1 will be given appropriate consideration.
CECIP	39	9.4.1	A and B are interchanged in the declaration statement.	The descriptions associated with the illustrations have been altered in their sequence as necessary to coincide with the correct illustrations.
CECIP		9.4.5	I prefer to use the old wording from R60/2000.	As per resolution of the TC9P1 meeting (17 March, 2014), wording from 2000 edition reinstated.
CECIP		9.7.2.1	Here a note should be insert. This describe the general laboratory conditions and not the testing or test conditions.	<p>Per resolution of TC9P1 meeting 17 March, 2014 Table 8 containing a list of reference conditions was considered not to be needed and has been removed. The participants of the meeting agreed that many of the criteria listed in this table is not typically monitored or controlled during routine procedures and are considered only when the load cell is being evaluated under those specific conditions.</p> <p>New explanatory language has been added to 9.7.2.1</p>
CECIP		9.8.3	These values appear very theoretical. Personally I don't know a test system with 100 tons dead weight for Class I or II scales. We should use table 6 from OIML R60/2000 this was maintained as these times have been proven in all those years.	According to resolution of TC9P1 meeting 17 March, 2014 a revised version of Table 8 will be used in 3CD.

CECIP		AnnexB/C	The format of the OIML Certificate should be extended as discussed further with more information and a picture of the load cell.	According to resolution of TC9P1 meeting 17 March, 2014 Annex B which is mandatory, will be retained as the prescribed format for the OIML Certificate and the format in Annex C will simply provide an example for supplemental information on the certificate. Annex C will be listed as “informative” in 3CD.
France	General		Pages 25 to 34 are missing in the clean document (error in the numbering of the pages as no requirements seems to be missing)	Amended
France		General	For clauses that are not dealt with hereafter, we are open for discussion in a next meeting according to comments made and, where applicable, according to answers from the secretariat.	See summary of resolutions from the TC9P1 meeting 17 March, 2014.
France	2	3.1.2	<i>Load cell equipped with electronics</i> Japan has suggested adding new criterion. We have at present no special comment, except that at the end, there should be no doubt or no possible interpretation about examinations and tests required according to the load cell type.	According to resolutions of TC9P1 meeting 17 March, 2014 the minimum function of a digital load cell would be analog to digital (A/D) conversion. There may be additional, optional functions associated with the load cell (i.e., temperature compensation and the filtering of the output signal) that should be added to the definition.
France	3	3.3	<i>Construction of load cells</i> Not an easy issue to discuss because of the non exhaustivity of technologies defined. If there are additional definitions, then tests and/or characteristics might be affected together with compatibility criteria with other modules. This should be handled with care.	According to resolutions of TC9P1 meeting 17 March, 2014 while other technologies are recognized, only the term “strain gauge” will be included in this section as it is the only terminology that actually appears in the text of the current R60.

France	4	3.4.2	<p><i>Load cell family</i></p> <p>Germany has proposed addition of figure and text in draft See comment on §9.4.1</p> <p>We agree with such addition provided that it is completed with a decision saying for each point (A., B. and C.) that load-cells having such differences belong or don't belong to the same family.</p>	The descriptions associated with the illustrations have been altered in their sequence as necessary to coincide with the correct illustrations.
France	4	3.5.2	<p><i>Load cell measuring range (D_R)</i></p> <p>Read D_R and not DR in the last item. Load cell measuring range D_R appellation is confusing compared to minimal dead load output return DR of §3.5.10</p>	Amended
France	5	3.5.4	<p><i>Load cell verification interval</i></p> <p>the added text seems to be specific to strain gauge technology. To be adapted according to outcome of the discussion on § 3.3 TC9 p 1</p>	Text revised – previous version reinstated.
France	6	3.5.10	<p><i>Minimum dead load output return (DR)</i></p> <p>For practical testing reasons, we will prefer “at the minimum load of the measuring range (D_{min})” instead of “minimum dead load (E_{min})”. At evaluation step D_{min} has to be chosen as close as possible of E_{min} value (a maximal limit of 1/10 of E_{max} might be acceptable). See also comment on §9.7.3.3</p>	Considering that the test procedure for determining minimum dead load output return (DR) indicates that the test is to begin with minimum test load (D_{min}), this text is amended as proposed.

France	16	6.5.1	<p><i>Creep</i></p> <p>METAS has described creep test as non relevant for load-cells to be integrated in an instrument weighing dynamically. Although it would probably complicate the understanding we could agree but only on the condition that a lot of precautions are taken to avoid misuse of such “non creep-tested load-cells”. e.g.: restriction of use shall be written in test report(s) and clearly stated in certificate(s). “Minutes” is missing in the second item.</p>	Per resolution of TC9P1 meeting 17 March, 2014: due to the scope of R60 being limited to static weight applications (see 2.1), exemptions for dynamic weight types of load cells will not be included in this Recommendation.
France	16	6.5.2	<p><i>Minimum dead load output return</i></p> <p>CECIP has made a comment including: “...or as close as possible to D_{max}, considering the technical shortcoming of the test equipment”. What is meant under “technical shortcoming of the test equipment”? Such an approach was not accepted for R 76. This could lead to unfair competition between labs and between manufacturers if test are adapted to the means and not the contrary. “30 minutes”</p>	This clause has not been amended, the load cell is to be exposed to a load of 90% to 100% of E _{max} as required in R60 2000 edition.
France	17 + 52	6.6.2 + 9.10.4.6	<p><i>Barometric pressure</i></p> <p>Discussion should be on basis of CECIP’s comment.</p>	Per resolution of TC9P1 meeting (17 March, 2014), the test procedure is to be amended to specify that only two separate readings are required. The minimum test is to be conducted by recording the first reading at ambient pressure conditions followed by a second reading taken after the barometric pressure has been increased by a minimum of 1kPa. The resulting reading would be allowed the MPE of 1 v _{min} per 1kPa of pressure change. These changes are reflected also in the associated test procedure 9.10.4.6

France	18	6.7.1	<p><i>General requirements</i></p> <p>The second item, as it is rewritten, is confusing. It seems it is permitted that digital load cell could to be certified and sold without all functions being covered. It will also be the same with A/D conversion, gravity compensation... This could create unclear situations Of course the test report and the test certificates shall mentioned what is covered and what is not. This point is important to be discussed with members of OIML TC9 project 1.</p>	<p>Considering the amendment of the definition of “load cell equipped with electronics” including the term digital load cells, in 3.1.2, this paragraph is amended to indicate that digital type load cells may also be covered in this Recommendation.</p>
France	18	6.7.1.1	<p><i>Faults</i></p> <p>Whether there is sufficient intelligence to detect or act on significant faults in the load cell or not, the evaluation the load cell under electrical disturbances and fulfilment the requirements of §6.7.2.3 will not be sufficient for certification of a complete instrument .</p>	<p>Wording added in 6.7.1.1 to indicate that communication and reporting of any significant faults may need to be evaluated under other Recommendations.</p>
France	21	7.1	<p><i>Software</i></p> <p>We support Australian position that suggests achieving the security level I with validation procedure A, that we also consider sufficient, knowing that functions dedicated to an instrument will be out of the scope of R60. A load cell that is fitted with NAWI or AWI functions has to be evaluated under the appropriate recommendation (R76, R61, R51, ...)</p>	<p>Per resolution of TC9P1 meeting (17 March, 2014), language in this clause indicating that a severity level II validation may be necessary has been deleted.</p>

France	35	8.2	<p><i>Responsibility for compliance with the requirements</i></p> <p>We propose to amend 1st paragraph as follows : “...the manufacturer (or their formal representative) has the full responsibility that the load cells comply with the requirement in part 1 and the <i>certificate.....</i>”</p> <p>Open to discussion about deletion of the 2nd paragraph of 8.2</p>	Paragraph amended.
France	37	9.4	<p><i>Selection of load cells within a family</i></p> <p>Read “span stability” instead of “span” in the second item.</p>	Amended
France	38	9.4.1	<p><i>Load cell shape</i></p> <p>The text associated to the illustration seems to be inverted: text C and A correspond respectively with figure A and C. These examples are not exhaustive and too simplified, and the risk it is to forgot some influent characteristics.</p> <p>We propose to simply keep out these examples that will not serve the analysis and judgment of the evaluator.</p>	The descriptions associated with the illustrations have been altered in their sequence as necessary to coincide with the correct illustrations.
France	39	9.4.5	<p><i>Ratio of largest capacity to the nearest smaller capacity</i></p> <p>Our preference goes to the wording of R60/2000 edition.</p>	As per resolution of the TC9P1 meeting (17 March, 2014), wording from 2000 edition reinstated.
France	43	9.7.3.2	<p>9.7.4.14 (2CD) suppressed and transferred to 9.7.3.2</p> <p>Information was lost during the transfer: “<u>the aim of this test is not to measure the influence of mounting / dismounting...</u>”.</p>	Paragraph amended.

France	43	9.7.3.3	<p><i>Measuring range limits</i></p> <p>We think E_{min} increased by 10% of E_{min} is now excessively low.</p> <p>Considering a mobile pallet weighing instrument or a crane scale, and some off-center LC applications, the E_{min} required can be very low or null. 10% of E_{min} is also necessarily very low. It will be quite impossible to test a 500kg capacity shear beam load cell in such conditions especially with a direct mass test facility.</p> <p>It's why we require keeping a proportion of 10% of E_{max} for the higher limit of D_{min}.</p>	As per resolution of the TC9P1 meeting (17 March, 2014), paragraph has been amended.
France	45	9.8.3.2 & Table 9	<p>We are in favour of simple figures for loading/unloading and stabilization times instead of formulas to apply.</p>	As per resolution of the TC9P1 meeting on 17 March 2014, a revised table will be included in R60 3CD and the associated paragraph (9.8.3.2) will be slightly modified so that the examples provided do not conflict with the values mentioned in the amended table
France	46	9.8.3.2	<p><i>Loading/unloading times impracticable</i></p> <p>If times cannot be achieved, only for high capacities load cells (e.g. capacities > 10t for weighbridge applications), we are more in favour of testing the load cell for creep at a lower value of D_{max} with compatible loading/unloading + stabilization times of Table 9 and the corresponding MPE.</p> <p>This test will be more realistic and certainly more pertinent than fractions of MPE's depending of time.</p>	Per resolution of the TC9P1 meeting on 17 March 2014, a revised table 8 with more flexible times for loading and stabilization will be included in R60 3CD. The additional flexibility detailed in Table 8, 9.8.3.1, and 9.8.3.2 should allow creep to be evaluated as specified in 9.10.2.

France	46	9.9.2	<p><i>Minimum load output return</i></p> <p>We are not in favour of the paragraph rewording.</p> <p>The load cell has to be loaded to D_{min} permanently during all the §9.11 test sequence, not only 30 minutes before the test.</p>	<p>9.10.3.3 requires that the load cell recover after preloading and returning to D_{min} for one hour before commencing with further testing. This is in conflict with 9.9.2.</p> <p>9.9.2 amended to indicate that the load of D_{min} is applied as specified in the test procedure in 9.10.3.3.</p>
France	46	9.9.3	<p><i>Hysteresis error (see 3.7.5)</i></p> <p>This new paragraph generates an additional requirement</p> <p>The necessity to include it should be explained</p>	<p>The appearance of this requirement was generated by the assumption that since R60 included the terminology “hysteresis” (3.7.5) there was a need to determine the variation (error). This assumption was made without proper justification and unless there is support from TC9P1 to retain 9.9.3, it will be deleted.</p>
France	47	9.10.1.2	<p><i>Insert load cell</i></p> <p>Why is it possible to shift the reference temperature of 20°C even if the temperature range is extended ?</p> <p>We propose to suppress the new text added. Moreover the units of temperature are mixed. We propose to write always “+/- 2 °C” as in §9.10.6.2. Idem for §9.10.2.2, §9.10.3.2, §9.10.5.2, §9.10.7.3, §9.10.7.4, and §9.10.7.11</p>	<p>New text is replaced with proposed text from Australia:</p> <p>“In the case where the total temperature range does not include 20C another reference temperature may be selected.”</p> <p>The range allowed for stabilization has been uniformly established as +/- 2 °C.</p>
France	59	9.10.7.3	<p><i>Warm-up time</i></p> <p>Requirement on warm-up time test has been suppressed and disappeared of the document. It should be placed in a new §6.7.2.3 for influence factors as it concerns <u>the absolute value of EMT at D_{max}</u> defined in Table 4</p>	<p>Requirement restored (6.7.2.1) as proposed.</p>
France	61	9.10.7.5	<p>Remarks on zero setting or zero tracking device: add “if applicable”.</p> <p>Idem for § 9.10.7.6; 9.10.7.8 and; 9.10.7.9</p>	<p>Inserted “if applicable” where appropriate.</p>

France	66	9.10.7.10	<i>Immunity to conducted electromagnetic field</i> Test load paragraph : we propose to complete the sentence (like in § 9.10.7.5 ...) missing in this new paragraph “During the test, the effect of any automatic zero-setting or zero-tracking features shall be switched off or suppressed, for example by applying a small test load.”	Amended
France	68	9.10.7.11	<i>Span stability</i> A recovery time of minimum 48 h after the SH humidity test should be allowed. If not, it will increase the requirement for the humidity test itself and it is not the aim of the span stability test to track recovery time of a particular test.	Per resolution of TC9P1 meeting 17 March, 2014 change will be made to 9.10.7.11 which will provide a total period of recovery time of at least 28 days or a period necessary for the performance tests to be carried out. It was believed that this will allow sufficient time for a recovery period after the humidity tests.
France	B-2	Annex B	4-wire or 6-wire system is not mentioned in the document.	Annex C “informative” may be used to provide supplemental information such as 4/6 wire system.
France	B-1 & C-1	Annex B & C	We prefer Annex B format of certificate	Per resolution of the TC9P1 meeting 17 March, 2014, Annex B will be retained as “mandatory” and Annex C will be retained as “informative”
Germany			The comments Germany submitted on the 1CD of R 60 are still true; Technical aspects have not been taken into account.	Technical aspects are being addressed in subsequent drafts.
Japan		General	We appreciate great efforts by the secretariat for providing R 60 2CD. However, we have to submit a negative vote on 2CD as a conclusion of the domestic mirror committee to respond OIML because we consider the draft needs further revisions until final publication. If important issues (3.5.2, 6.7.2.2, 9.3, 9.8.3, 9.10.4.6 and 9.10.7.9) in our comments could be taken into consideration positively, we would support future revisions of R 60.	The vote is acknowledged and further development of the Recommendation is underway.

Japan	4, 6, 7, 23, 50, 52, 68, 69, A-1, B-1, C-1, D-1, E-1	3.5.2, 3.5.10, 3.5.14, 3.5.15, 7.2.3, 9.10.3, 9.10.3.12, 9.11.1 and Annexes	In this draft, <u>load cell measuring range</u> is expressed with ' D_R ' and <u>minimum dead load output return</u> is expressed with ' DR '. These two symbols look similar and confusing. We request using an easily distinguishable symbol for <u>load cell measuring range</u> such as D_{range} , or use another symbol for ' DR '. In addition, some of the symbols ' DR ' should be corrected to ' D_R ' in 3.5.2 and several other clauses.	Attention has be taken to ensure that DR is used solely to indicate minimum deadload output return and that D_R is used solely for load cell measuring range. Locations where appearing incorrectly have been amended.
Japan	4-5	3.5.2 load cell measuring range	<p>Definition of D_R (load cell measuring range) and the difference between D_R and E_R (maximum measuring range) are not clear.</p> <p>D_R is equivalent to $(D_{max} - D_{min})$, and 3.5.12 / 3.5.6 define D_{min} / D_{max} as "<i>minimum / maximum force introduced to a load cell during test or use.</i>"</p> <p>However, the second sentence of 3.5.2 "<i>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)</i>" could be interpreted that D_R is '<i>a range in which <u>measurement errors remain within MPE</u></i>'. If this interpretation is correct, the quantity represented by D_R practically becomes equivalent to $E_R (=E_{max} - E_{min})$ because 3.5.9 / 3.5.5 define E_{min} / E_{max} as "<i>minimum / maximum force introduced to a load cell expressed in units of mass, <u>without exceeding the MPE.</u></i>"</p> <p>In conclusion, we request deleting the second sentence "<i>range of values error (MPE) (see Annex A: A.1.11)</i>" of 3.5.2 which is ambiguous in meaning.</p>	There is a subtle difference between E_{max} and D_{max} in that E_{max} will be the manufacturer's stated maximum capacity or the largest value of force introduced to a load cell that will be processed without exceeding MPE. D_{max} would be the largest value of forced introduced to a load cell during a test that can be processed without exceeding MPE and may be smaller than E_{max} due to mounting hardware in the force generating system and it's dead load value.

Japan	5	3.5.4 load cell verification interval	<p><u>We</u> request to restore the original expression in 2.3.4 of R60 (2000) as shown below because the term ‘<i>a ratio of the output signal / excitation signal</i>’ is ambiguous in meaning and unnecessary.</p> <p><i>Load cell interval, as a ratio of the output signal (mV)/excitation signal (V), expressed in units of mass, used in the test of the load cell for accuracy classification.</i></p>	Original version reinstated.
Japan	5, 6, 11	3.5.8, 3.5.11 and 6.1.2	<p>We request replacing the term ‘load cell measuring range’ with ‘maximum measuring range’ because the meaning of the former term is ambiguous as we point out for 3.5.2.</p>	The use of the term “load cell measuring range” refers to a value that is determined by the nature of the load cell’s design and would not be decreased during testing due to the ancillary forces (deadload) imparted by the force generating system.
Japan	6, 7	3.5.14 and 3.5.15	<p>We request replacing the term ‘load cell measuring range D_R’ with ‘maximum measuring range E_R’ because the meaning of the former term is ambiguous as we point out for 3.5.2.</p>	The use of the term “load cell measuring range” refers to a value that is determined by the nature of the load cell’s design and would not be decreased during testing due to the ancillary forces (deadload) imparted by the force generating system.
Japan	16	6.5.1 Creep	<p>It is not clear if the term ‘MPE’ in this clause includes an apportionment factor (p_{LC}). It is our understanding that a practical value of ‘0.7 times the value of MPE’ becomes equivalent to ‘0.7 x p_{LC} x 1.5 v’ in the case of Class A (200 000 v < m) in Table 4. Is our understanding correct? In addition, we would like to know the reason for choosing a value ‘0.7’ as the coefficient in the expression ‘0.7 times the value of MPE.’</p>	<p>The source for the value of “0.7” as the coefficient is most likely found in the archival records of the development of the original edition of R60 (1985-?).</p> <p>My interpretation of this clause is the same as you have stated in your statement regarding $MPE = 0.7 \times p_{LC} \times 1.5 v$. Considering the last statement in this clause (with *), I would calculate the MPE as:</p> <p>$MPE = 0.7 \times \underline{0.7} \times 1.5 v$</p>

Japan	16	6.5.2. Minimum dead load output return	<p>We support the proposal by Germany to 1CD (6.4.2) and request revising the entire clause as shown below.</p> <p><i>The difference between the initial reading of the minimum load output (D_{min}) and the reading of D_{min} after being exposed to a load of 90% to 100% of E_{max} for 30 minutes shall not exceed half the value of the load cell verification interval (0.5 v).</i></p>	Amended as proposed
Japan	19	6.7.2.2. Span stability maximum allowable variation requirements	<p>The aim of this clause is to measure the influence on electronic components. We therefore request adding the sentence below as a note which was originally included in 6.6.2.2 of 1CD.</p> <p><i>Note: The aim of this test is not to measure the influence on the metrological performances of mounting or dismounting the load cell on or from the force-generating system, so the installation of the load cell in the force-generating system shall be carried out with particular care.</i></p>	This notion is expressed under 9.7.3.2 Loading Conditions where it is applicable to all performance tests.
Japan	22	7.2.1. Mandatory markings on the load cell	<p>Delete the units of force in the item d as shown below because only the units of mass are used in other clauses.</p> <p><i>d. Maximum capacity as: E_{max} = (in units g, kg, t, N, kN, or MN)</i></p>	Amended as proposed

Japan	36	9.3 Selection of specimens for evaluation	This clause refers practical test procedures for type evaluation conducted by a testing laboratory in each member state including even a process for handling a breakage or a malfunction. However, we believe that such procedures should be specified by the member state, and it is not appropriate to mention them in an OIML International Recommendation. Therefore, we consider this clause is not necessary and should be deleted.	This clause was discussed during the TC9P1 meeting 17 March, 2014 and a resolution was made to modify the language however, the clause will be retained.
Japan	37	9.4 Selection of load cells within a family	We propose revising the second paragraph as shown below because an expression ' <i>equipped with electronics</i> ' is used in other clauses. <i>All accuracy and influence tests including span test for digital load cells <u>equipped with electronics</u>, shall be performed on the same unit. Disturbance tests on digital load cells <u>equipped with electronics</u>, may be (simultaneously) carried out on not more than 2 an additional load cell instruments.</i>	Digital load cells are identified as an example of "load cells equipped with electronics" in 3.1.2. Adding this language would seem unnecessary.
Japan	38	9.4.1 Load cell shape	The three figures (A, B and C) do not correspond with the three sentences of explanation correctly. Correct the correspondence as shown below. Figure A = Explanation C. Figure B = Explanation A. Figure C = Explanation B.	The descriptions associated with the illustrations have been altered in their sequence as necessary to coincide with the correct illustrations.
Japan	39	9.4.5 Ratio of largest capacity to the nearest smaller capacity	We prefer the expression in R60 (2000).	As per resolution of the TC9P1 meeting (17 March, 2014), wording from 2000 edition reinstated.

Japan	41	9.6 Examinations	<p>The same name/title with those in the referred clauses should be used as shown below.</p> <p><i>a. accuracy classes and their symbols (6.1.1 and 7.2.4.1);</i></p> <p><i>b. maximum number of load cell verification intervals (6.1.2 and 7.2.4.5);</i></p> <p><i>c. load cell measuring ranges (3.5.2 and 3.6);</i></p> <p><i>d. apportioning of errors apportionment factor (3.7.2);</i></p> <p><i>e. construction of load cells (3.3);</i></p> <p><i>f. software (7.1) (if applicable);</i></p> <p><i>g. inscriptions and presentation of load cell information (7.2); and</i></p> <p><i>h. installation instructions/recommendations.</i></p>	Amended as proposed
Japan	41	9.7.2.1 Environmental conditions, Table 8	<p>The expression of pressure in 'c) Atmospheric pressure' should be corrected as shown below in compliance with the expression in 6.6.2.</p> <p><i>Ambient pressure, stable within 10 hPa 1 kPa</i></p>	Table 8 deleted per resolution of TC9P1 meeting 17 March, 2014
Japan	41	9.7.2.1 Environmental conditions, Table 8	<p>Use a period (.) instead of comma (,) to express the decimal point in '$f_{nom} \pm 0,5 \%$' and '$< 0,2 V_{e.m.f.}$'</p>	Table 8 deleted per resolution of TC9P1 meeting 17 March, 2014
Japan	43	9.7.3.3 Measuring range limits	<p>Replace E_{min} with E_{max} in the sentence below.</p> <p><i>With consideration and shall not be higher than the value of E_{min} increased by 10% of E_{min}</i></p> <p>E_{max}.</p>	Paragraph amended per TC9P1 comments and resolutions of TC9P1 meeting.

Japan	45	9.8.3 Initial readings, Table 9	<p>We recommend combining the loading time and stabilization time, and the total time as a sum of these values would be given in the Table 9. A revised table is shown below in which changes are shown with the underlines.</p> <p>Table 9. Combined Loading and Stabilization Times to be Achieved Prior to Reading (revised)</p> <table border="1"> <thead> <tr> <th colspan="2">Change in load</th><th colspan="3">Time allowed for:</th></tr> <tr> <th>Greater than</th><th>Up to and including</th><th>Classes C&D</th><th>Class B</th><th>Class A</th></tr> </thead> <tbody> <tr> <td>0 g</td><td>10 kg</td><td><u>10 sec</u></td><td><u>15 sec</u></td><td><u>20 sec</u></td></tr> <tr> <td>10 kg</td><td>100 kg</td><td><u>20 sec</u></td><td><u>30 sec</u></td><td><u>40 sec</u></td></tr> <tr> <td>100 kg</td><td>1 000 kg</td><td><u>30 sec</u></td><td><u>45 sec</u></td><td><u>60 sec</u></td></tr> <tr> <td>1 000 kg</td><td>10 000 kg</td><td><u>40 sec</u></td><td><u>60 sec</u></td><td><u>80 sec</u></td></tr> <tr> <td>10 000 kg</td><td>100 000 kg</td><td><u>50 sec</u></td><td><u>75 sec</u></td><td><u>100 sec</u></td></tr> <tr> <td>100 000 kg</td><td></td><td><u>60 sec</u></td><td><u>90 sec</u></td><td><u>120 sec</u></td></tr> </tbody> </table>	Change in load		Time allowed for:			Greater than	Up to and including	Classes C&D	Class B	Class A	0 g	10 kg	<u>10 sec</u>	<u>15 sec</u>	<u>20 sec</u>	10 kg	100 kg	<u>20 sec</u>	<u>30 sec</u>	<u>40 sec</u>	100 kg	1 000 kg	<u>30 sec</u>	<u>45 sec</u>	<u>60 sec</u>	1 000 kg	10 000 kg	<u>40 sec</u>	<u>60 sec</u>	<u>80 sec</u>	10 000 kg	100 000 kg	<u>50 sec</u>	<u>75 sec</u>	<u>100 sec</u>	100 000 kg		<u>60 sec</u>	<u>90 sec</u>	<u>120 sec</u>	<p>As per resolution of the TC9P1 meeting on 17 March 2014, a revised table will be included in R60 3CD and the associated paragraph (9.8.3.2) will be slightly modified so that the examples provided do not conflict with the values mentioned in the amended table</p>
Change in load		Time allowed for:																																										
Greater than	Up to and including	Classes C&D	Class B	Class A																																								
0 g	10 kg	<u>10 sec</u>	<u>15 sec</u>	<u>20 sec</u>																																								
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100 000 kg		<u>60 sec</u>	<u>90 sec</u>	<u>120 sec</u>																																								
Japan	45	9.8.3.1 Loading / unloading times	<p>In connection with our proposal to 9.8.3 on Table 9, the expression in this clause should be revised as shown below.</p> <p><i>The loading or unloading times shall be <u>approximately a half of the time as shown specified</u> in Table 9. <u>The remaining time shall be utilized for stabilization.</u> The tests shall be conducted under constant conditions. <u>The loading or unloading time and the stabilizing time shall be recorded in the test report in absolute, not relative values.</u></i></p>	<p>As per resolution of the TC9P1 meeting on 17 March 2014, a revised table will be included in R60 3CD and the associated paragraph (9.8.3.2) will be slightly modified so that the examples provided do not conflict with the values mentioned in the amended table</p>																																								

Japan	46	9.8.3.2 Loading / unloading times impracticable	<p>We recommend changing the term 'loading' to 'unloading' in the paragraphs shown below. It is because unloading time is more important in the test procedures mentioned in this clause.</p> <p><i>(1). A change in load of 10 kg, unloading time is increased to 7.5 seconds (150% of 5 s), MPE is reduced to 50%; or</i></p> <p><i>(2). A change in load of 1500 kg, unloading time of 20 seconds is increased to 25 seconds (125% of 20 seconds), MPE is reduced to 75%.</i></p>	Wording has been amended.
Japan	52	9.10.4.6 Change barometric pressure	<p>The procedure in this clause is not clear. We support this procedure if it is understood that a test should be repeated for 11 times with 1 kPa step over the entire range from -5 kPa to +5 kPa. Regarding the range of barometric pressure, we contrarily prefer the former expression in 5.5.2 of R60 (2000), in which the range was specified using absolute values. It is because the characteristic of load cells is usually sensitive to absolute pressure. Therefore, we request changing the expression as shown below.</p> <p><i>Change the barometric pressure in increments of 1 kPa over the range from 95 kPa to 105 kPa and record the indicating instrument indication.</i></p>	<p>Per resolution of TC9P1 meeting (17 March, 2014), the test procedure is to be amended to specify that only two separate readings are required. The minimum test is to be conducted by recording the first reading at ambient pressure conditions followed by a second reading taken after the barometric pressure has been increased by a minimum of 1kPa. The resulting reading would be allowed the MPE of 1 v_{min} per 1kPa of pressure change.</p> <p>These changes are reflected also in the associated test procedure 9.10.4.6</p>

Japan	64-65	9.10.7.9 Electromagnetic susceptibility	<p>In compliance with B.3.5 of R76 (2006), the lower limit of test frequency should be changed from 26 MHz to 80 MHz as shown below. <i>Frequency range: 26 80 MHz to 2 000 MHz;</i> In addition, a test starting from 26 MHz should be required only to the instruments without I/O ports for which the test for conducted electromagnetic fields (9.10.7.10) is not applicable. Therefore, add a note shown below at the end of this clause in compliance with R76 (2006). <i>Note: For instruments having no mains or other I/O ports available so that the test according to 9.10.7.10 cannot be applied, the lower limit of the radiation test is 26 MHz.</i></p>	Test procedures are amended in 3CD by copying portions of OIML D11 and replacing existing language with these D11 tables. Changes suggested are reflected in these amendments.
Japan		Annexes B and C: OIML Certificate of conformity for load cells - Format of certificate	<p>We prefer the format specified by the Annex B based on the additional comments below.</p> <ol style="list-style-type: none"> 1. Annex B contains appropriate items to be included in an OIML certificate. However, B.3 (tests) might not be necessary because it shall be covered by a separate test report. 2. The format given in Annex C requires too detailed and unnecessary information as an OIML certificate such as pictures of load cells, pictures of name plates and colours of wires. 2. Annex C does not have items explaining the conformity to be covered by the certificate. On the other hand, Annex B contains such items in the beginning part including issuing authority, applicant and model designation. 	Per resolution of the TC9P1 meeting 17 March, 2014, Annex B will be retained as “mandatory” and Annex C will be retained as “informative” Annex C may be used to provide supplemental information for a certificate.
NL		general	We observed great progress in the drafting	

NL	3	3.3.2	A tuning fork is not a usual element of a load cell. A vibrating string is. Consider a more general description (if the definition is needed?)	3.3.2 Tuning Fork – deleted.
NL	4	3.4.2	The definition of family is very wide now, the shape of the deformation area is of high importance, so should belong to the definition, not as example.	Examples of load cell shapes relocated from 9.4 to 3.3.2.
NL	5	3.5.2	The DR is also used for minimum dead load output return! If needed it would be advisable not to apply an abbreviation like “LCMR” which may be made shorter	DR changed to D_R
NL	5	3.5.8	Propose improved definition: replace “shall” with “will”	Amended as proposed
NL	6	3.5.10	n_{max} will not change so <i>difference in verification intervals</i> is not correct. It concerns the output of which the difference is <i>expressed in verification intervals</i> . So add ... <i>expressed in..</i>	Amended as proposed
NL	6	3.5.10	Suggest to use MDLOR instead of DR unless DR is removed from 3.5.2	Use of DR and D_R are being carefully used to avoid any further confusion.
NL	6	3.5.14	Suggest to remove “relative DR”	Definition retained
NL	7	3.5.15	Suggest to remove “relative v_{min} ” ; Is D_R the same as DR?	Use of DR and D_R are being carefully used to avoid any further confusion.
NL	13	6.1.5 Figure 2	The Universal symbol is not correct. Revert to the R60: 2000 symbol	Figure from R60 2000 used
NL	37	9.3	In our opinion there is no need to test 2 specimens after a modification, at least one is sufficient	Per resolution of TC9P1 meeting 17 March, 2014 any modifications made to be determined permissible or not by evaluator and specific information regarding modifications or repairs should be documented according to CPR format. Language stating that 2 different specimens will be subject to the entire compliment of tests is deleted.

NL	39	9.4.1	The figures and explanations do not match. A concerns figure B. B concerns figure C and C concerns figure A	The descriptions associated with the illustrations have been altered in their sequence as necessary to coincide with the correct illustrations.
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NL		9.7.2.1	<p>The values presented in table 8 should concern background levels expected suitable for performing tests. (reference conditions) In principle these should be sufficiently low for being negligible when the EUT is tested on sensitivity for one of the environmental parameters. The approach could be an inventory on test laboratory reference conditions, but another approach could be to specify a maximum level for the parameters based on the test levels applied.</p> <p>In the latter case to at least a 1 to 10 ratio would be needed to avoid a parameter becoming dominant in the uncertainty budget. Since the tests concern levels expected to actually exist this means that for testing measures need to be taken to maintain the reference conditions.</p> <p>When applying this approach the reference levels for</p> <p>AC frequency : based on IEC/TR 61000-2-5 (5.2.1.1) 0,2 % is rather normal. and 4% is considered quite a disturbance. The reference value of below 0,5 % therefore could be supported</p> <p>Power frequency magnetic field: IEC/TR 61000-2-5 (5.2.1) : household/commercial environment level is between 1 and 10 A/m. Above 80 A/m (uniform field) is considered becoming hazardous. 1 A/m is rather easy to realize even within 1 m distance from standard electric wiring and small transformers (adaptors).</p> <p>J should not be specified in the way it is done in the draft and in the template. This was a misintepretation. What should be stated is the maximum electric field level in the range 150 kHz to 6 GHz. When specifying the reference level one could best take a level of at least 20 dB below the test level This implies a</p>	<p>Per resolution of TC9P1 meeting 17 March, 2014 Table 8 containing a list of reference conditions was considered not to be needed and has been removed. The participants of the meeting agreed that many of the criteria listed in this table is not typically monitored or controlled during routine procedures and are considered only when the load cell is being evaluated under those specific conditions.</p> <p>New explanatory language has been added to 9.7.2.1</p>
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NL	43	9.7.2.1	Suggest to add "rate of change < 5 °C" equivalent to R76-1, A.4.1.2	See above response
NL	44	9.7.2.1	The presented humidity range is not the usual applied as reference range; propose (50 ± 20) % RH	See above response
NL	48	Table 9	"sec" is incorrect, replace with "s"	Amended
NL	50	9.10	Suggest to use °C consequently	Amended as proposed due to majority of comments received.
NL	50	9.10	Several environmental tests to be updated on basis of OIML D 11 (to be approved October 2013)	test procedures amended by copying tables from D11 and replacing current text in R60 with these tables.
NL	A-1 to A-8	Annex A	Definitions to be updated to VIML 2 (to be approved October 2013) (Note :most D 3, D9 and D 11 definitions are implemented in VIML 2)	Existing format for OIML Certificate is maintained in Annex B
NL		Annex B	There is no need to repeat the information in the test report.	Annex C is merely an informational example to include supplemental information if desired
NL		Annex C	There is no need to repeat the information in the test report.	Corrected
Poland	15	6.3.1.1	In the column Class D a sign "<" is omitted (should be: 50 v < m ≤ 200 v)	Corrected
SCAIME	2	3.1.2	We agree with Japan comment.	According to resolutions of TC9P1 meeting 17 March, 2014 the minimum function of a digital load cell would be analog to digital (A/D) conversion. There may be additional, optional functions associated with the load cell (i.e., temperature compensation and the filtering of the output signal) that should be added to the definition.
SCAIME	4	3.4.2	See comment on §9.4.1	Examples for classifying load cells on the basis of their shape has been relocated to 3.3.2 in the 3CD. The illustrations and descriptions are provided here merely as examples and not absolutes.

SCAIME	4	3.5.2	Read D_R and not DR in the last item. Load cell measuring range D_R appellation is confusing compared to minimal dead load output return DR of §3.5.10	Amended
SCAIME	5	3.5.4	We consider that the added text is specific to strain gage technology <u>only</u> . To modify according to § 3.3 TC9 pl	Previous version of this definition has been restored
SCAIME	6	3.5.10	For practical testing reasons, we will prefer “at the minimum load of the measuring range (D_{min})” instead of “minimum dead load (E_{min})”. At evaluation step D_{min} has to be chosen as close as possible of E_{min} value (a maximal limit of 1/10 of E_{max} might be acceptable). See also comment on §9.7.3.3	Considering that the test procedure for determining minimum dead load output return (DR) indicates that the test is to begin with minimum test load (D_{min}), this text is amended as proposed.
SCAIME	9	3.7.9	For clarity, read “...maintain the load cell output of load cell measuring range (D_R) over a period...”	Amended as proposed
SCAIME	9	3.7.10	Read “change in minimum load output” instead of “change in minimum dead load output”	This proposed change does not appear to add to the clarity of the definition. Original language retained.
SCAIME	10	4	Add at the end of the second item “change in wavelength for optical Bragg sensors”	Clause amended per resolutions of TC9P1 meeting 17 March, 2014.
SCAIME	16	6.5.1	Mix of “ D_{max} ” and “90% to 100% of E_{max} ” is not correct. We will prefer reformulating first item as follow “... upon the application of 90% to 100% of E_{max} and the reading observed within and after 30 minutes of exposure shall not exceed...”. “Minutes” is missing in the second item.	Clause amended per comments received
SCAIME	16	6.5.2	Suppress “maximum”	Clause amended per comments received

SCAIME	18	6.7.1	<p>We are not in favour with the rewriting of the second item. In our point of view, A/D conversion, levelling device correction, gravity compensation device, thermal compensation,...etc are typically functions (if fitted inside a load cell) <u>that have to be under the scope of this recommendation.</u></p> <p>Taring, zeroing, zero tracking, dosing functions are not under the scope. So rewrite the example.</p>	Language amended per comments received
SCAIME	18	6.7.1.1	<p>In our point of view electronics of load cell have to deal with significant fault (detection meaning, error flag...etc).</p> <p>When there is no sufficient intelligence to detect or act on significant faults, it will be impossible to evaluate the load cell under electrical disturbances and respect the compliance with the requirements of §6.7.2.3. It is especially true with analog output load cells or with other technologies load cells. We are in favour to report all these disturbances requirements on the complete instrument for such load cells.</p>	Wording added in 6.7.1.1 to indicate that communication and reporting of any significant faults may need to be evaluated under other Recommendations.
SCAIME		6.7.2 - 2CD	Battery powered applications. We prefer to exclude this point of the scope of R60.	Per resolutions of the TC9P1 meeting 17 March, 2014 – R60 scope to include evaluation of devices supplied by battery power
SCAIME	21	7.1	<p>We support Australian position that suggests achieving the security level I with validation procedure A, that we also consider sufficient, knowing that functions dedicated to an instrument will be out of the scope of R60. A load cell that is fitted with NAWI or AWI functions has to be evaluated under the appropriate recommendation (R76, R61, R51,...)</p>	Per resolution of TC9P1 meeting (17 March, 2014), language in this clause indicating that a severity level II validation may be necessary has been deleted.

SCAIME	General		Pages 25 to 34 are missing in the clean document	Amended
SCAIME	37	9.4	Read “span stability” instead of “span” in the second item.	Amended
SCAIME	38	9.4.1	<p>Firstly, the text associated to the illustration is inverted.</p> <p>We consider LC shapes described in A, B and C illustrations examples as identical in terms of effects.</p> <p>Certainly some discrepancies will appear with the modifications, but not more than screw type, length and diameter or surface state of contact fixing parts.</p> <p>Necessarily if extrapolation rules apply, shape will be smoothly different between the highest and the lowest capacity models, with some details on the body shape modified. There will be no exact proportionality rules that will apply (it will be too much easy and simple to develop load cells).</p> <p>We propose to simply keep out these examples that will not serve the analysis and judgment of the evaluator.</p>	The descriptions associated with the illustrations have been altered in their sequence as necessary to coincide with the correct illustrations.
SCAIME	39	9.4.5	We can deal with the amended paragraph.	As per resolution of the TC9P1 meeting (17 March, 2014), wording from 2000 edition reinstated.
SCAIME	40	9.4.7	<p>Load cells equipped with electronics are not necessary fitted with an A/D converter (e.g. analog output).</p> <p>Not applicable for other technologies than strain gages load cells.</p>	<p>Paragraph amended.</p> <p>See other amendments made in 3CD (e.g., 4)</p>

SCAIME	43	9.7.3.3	<p>We think E_{\min} increased by 10% of E_{\min} is now excessively low.</p> <p>Considering a mobile pallet weighing instrument or a crane scale, and some off-center LC applications, the E_{\min} required can be very low or null. 10% of E_{\min} is also necessarily very low. It will be quite impossible to test a 500kg capacity shear beam load cell in such conditions especially with a direct mass test facility. It's why we require keeping a proportion of 10% of E_{\max} for the higher limit of D_{\min}.</p>	See amendment per resolution of TC9P1 meeting
SCAIME		9.7.4.13 - 2CD	<p>§ suppressed and transferred to §9.7.3.2</p> <p>Information is lost during the transfer: <u>"the aim of this test is not to measure the influence of mounting / dismounting..."</u>. To reconsider the formulation.</p>	Language reinstated in 3CD (9.7.3.2)
SCAIME	45	Table 9	<p>We are in favour of simple figures for loading/unloading and stabilization times instead of formulas to apply.</p>	As per resolution of the TC9P1 meeting on 17 March 2014, a revised table will be included in R60 3CD and the associated paragraph (9.8.3.2) will be slightly modified so that the examples provided do not conflict with the values mentioned in the amended table
SCAIME	46	9.8.3.2	<p>If times cannot be achieved, only for high capacities load cells (e.g. capacities > 10t for weighbridge applications), we are more in favour of testing the load cell for creep at a lower value of D_{\max} with compatible loading/unloading + stabilization times of Table 9 and the corresponding MPE.</p> <p>This test will be more realistic and certainly more pertinent than fractions of MPE's depending of time.</p>	Clause amended per resolutions of TC9P1 meeting 17 March, 2014

SCAIME	46	9.9.2	We are not in favour of the paragraph rewording. The load cell has to be loaded to D_{min} permanently during all the §9.11 test sequence, not only 30 minutes before the test.	9.10.3.3 requires that the load cell recover after preloading and returning to D_{min} for one hour before commencing with further testing. This is in conflict with 9.9.2. 9.9.2 amended to indicate that the load of D_{min} is applied as specified in the test procedure in 9.10.3.3.
SCAIME	46	9.9.3	New paragraph. We are not in favour of adding an additional requirement on hysteresis (requirement of the absolute value of EMT) when evaluating the load cell. We require suppressing this new paragraph that has not been proposed earlier and discussed.	The appearance of this requirement was generated by the assumption that since R60 included the terminology “hysteresis” (3.7.5) there was a need to determine the variation (error). This assumption was made without proper justification and lacking support from TC9P1 to retain 9.9.3, it will be deleted.
SCAIME	47	9.10.1.2	Why is it possible to shift the reference temperature of 20°C even if the temperature range is extended? Suppress the new text added.	New text replaced with proposal from Australia: “In the case where the total temperature range does not include 20 °C another reference temperature may be selected”
SCAIME	48	9.10.1.13	Why mixing the units of temperature? Idem at §9.10.2.2, §9.10.3.2, §9.10.5.2, §9.10.7.3, §9.10.7.4, §9.10.7.11 (§9.10.6.2 always written +/- 2°C)	Following the majority of comments received, 3CD will use 2 °C solely. Kelvin units will not be used.
SCAIME	59	9.10.7.3	Requirement on warm-up time test has been suppressed and disappeared of the document. It should be placed in a new §6.7.2.3 for influence factors as it concerns <u>the absolute value of EMT at D_{max}</u> defined in Table 4	Requirement restored (6.7.2.1)
SCAIME	62 - 64	9.10.7.6 to 9.10.7.8	Remarks on zero setting or zero tracking device: add “if applicable” §9.10.7.10, add the complete remark that is missing in this new paragraph.	Amended

SCAIME	63	9.10.7.7	Rewriting of the 4 th paragraph: we will prefer “it is also applicable to DC powered load cells if the power supply comes from the mains”	Significant changes made to test procedures. Tables from D11 used. “where applicable” inserted as recommended in reference to zero tracking feature
SCAIME	68	9.10.7.11	One more time, we request a <u>recovery time of min 48h after the SH humidity test</u> . If not, it will increase the requirement for the humidity test itself and it is not the aim of the span stability test to track recovery time of a particular test.	Clause amended per resolutions of TC9P1 meeting 17 March, 2014
SCAIME	B-2	Annex B	4-wire or 6-wire system is not mentioned in the document.	Annex C “informative” may be used to provide supplemental information such as 4/6 wire system.
SCAIME		Annex B & C	We prefer Annex B format of certificate	Resolution of TC9P1 meeting (17 March, 2014) was to retain the certificate format presented in Annex C in the 2CD as an example for more detail that could be added in a certificate and that this Annex should be listed as “informative” rather than mandatory. Annex B will remain as “mandatory.”
Sweden	16	(5.3.1) 6.5.1	Editorial: Missing word “minutes” 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.* 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.	Amended

United Kingdom	3	3.3.2.	tuning fork (vibration of) device used to detect a change of resonance frequency of a tuning fork caused by an external load. Unable to find any other reference to “tuning fork” in the document – therefore suggest deleting the definition	Deleted as proposed
United Kingdom	4	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 D_R is the range between the maximum load of the measuring range D_{max} and minimum load of the measuring range D_{min} $DR D_R = (D_{max} - D_{min})$ (Editorial: the “R” should be subscript, as. DR is the term for the minimum D ead load output R eturn)	Clause amended editorially
United Kingdom	5	3.5.4	mV/V is only applicable to analogue load cells	Wording has been revised to previous edition per comments received
United Kingdom	5	3.5.5	maximum capacity (E_{max}) largest value of a force introduced to a load cell expressed in units of mass, without the result exceeding the MPE	Paragraph amended per comments received
United Kingdom	6	3.5.9	minimum dead load (E_{min}) smallest value of force introduced by a load (expressed in mass units) that may be applied to a load cell without the result exceeding the MPE	Paragraph amended per comments received

United Kingdom	6	3.5.11	<p>minimum load cell verification interval (v_{min})</p> <p>smallest load cell verification interval into which the load cell measuring range can be divided.</p> <p>[Repetition of “load cell”,] suggested replacement text:</p> <p>smallest load cell verification interval (into which the measuring range D_R ($D_{max} - D_{min}$) can be divided</p>	Amended as proposed
United Kingdom	8	3.6 Figure 1	Amend figure to include D_R (see 3.5.2), e.g. Load Cell Measuring Range D_R	Amended as proposed
United Kingdom	8	3.7.2.	<p>Apportionment factor (p_{LC})</p> <p>the value of a dimensionless fraction expressed as a decimal (for example, 0.7) representing that portion of an error produced by a weighing instrument which is assigned to the load cell alone.</p> <p>the value of a dimensionless fraction expressed as a decimal (for example, 0.7) representing that portion of the error , produced by the (weighing) instrument which is attributed to the load cell alone.</p> <p>Comment: A load cell may is not solely dedicated for use in a Weighing Instrument.</p>	Amended as proposed

United Kingdom	11	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 weighing system where the design allows such Remove reference “ in a weighing instrument/system”. The recommendation should not limit the use to Weighing e.g. 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 where the design allows such	“Weighing” removed from statement.
United Kingdom	12	5.	Units of measurement The units of measurement resulting from the output of a load cell that is incorporated as a component of a weighing instrument are required to conform to the Recommendation(s) applicable to the weighing instrument. Remove reference to “weighing instrument”. The recommendation should not limit the use to Weighing e.g. The units of measurement resulting from the output of a load cell are required to conform to the Recommendation(s) applicable to the measuring system.	“Weighing” removed from statement.
United Kingdom	13	6.1.5	Figure 2: Complete Load Cell classification Universal ↑ ↓ ↑ ↑ To be amended to: Universal ↑, ↓, ↓ ↑ e.g. Compression and Tension	Figure has been amended to represent the original from R60 2000

United Kingdom	15	6.3.1.1	Type Evaluation [- see text below table] The limits of error shown in Table 4 (above) include errors due to nonlinearity hysteresis and temperature effect on sensitivity over certain temperature ranges, specified in 6.56.1.1 and 6.56.1.2 Editorial – delete “in” before Table 4 (above), so that sentence makes sense	Amended as proposed
United Kingdom	16	6.5.1	Creep The difference between the reading taken upon the application of a maximum load (D_{max}) and the reading observed within and after 30 minutes of exposure of 90% to 100% E_{max} shall not exceed 0.7 times the value of MPE for the applied load.* Add text before 1st paragraph “Test as described in 9.9.1”	Other metrological requirements in this section do not contain a reference to the associated test procedures. Due to the possibility of numbering changes to paragraphs during revisions, this practice should be avoided other than where necessary.

United Kingdom	16	6.6	<p>Influence quantities (Rated operating conditions)</p> <p>Load cells are to be evaluated under the conditions specified in 6.86.1 - 6.86.3. In addition, load cells that are equipped with functions typically performed by weighing instruments (e.g., analog to digital conversion) may be required to be evaluated against additional requirements contained in other OIML Recommendations for those weighing instruments. These additional evaluations are outside the scope of this Recommendation.\</p> <p>Remove reference to “weighing instrument”. The recommendation should not limit the use to Weighing</p> <p>Load cells are to be evaluated under the conditions specified in 6.6.1 - 6.6.3. In addition, load cells that are equipped with functions typically performed by measuring instruments (e.g., analog to digital conversion) may be required to be evaluated against additional requirements contained in other OIML Recommendations for those measuring instruments. These additional evaluations are outside the scope of this Recommendation.</p>	<p>“weighing instruments” replaced with “complete instruments”</p>
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United Kingdom	22	7.2.1	<p>Mandatory markings on the load cell</p> <p>Information required in 6.1.5 not 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 on the load cell itself. All other mandatory information shall be provided in an accompanying document provided supplied by the manufacturer. Where such a document is provided, the information required in 7.2.2 shall also be given therein</p> <p>The paragraph is confusing, re-word paragraph as follows:</p> <p>If due to the limitation of the size of the load cell, it is impossible to apply all mandatory markings, 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 provided supplied by the manufacturer. Where such a document is provided, the information required in 7.2.2 shall also be given therein..</p>	Paragraph amended per comments received
United Kingdom	22	7.2.2	(e) The working temperature markings to only be required if the cell is approved outside of the standard -10 to +40°C range, [or is this now required for all ranges of temperatures?]	Amended wording - “when required” added to clarify
United Kingdom	22	7.2.2	(f) The humidity markings only be required if outside the standard CH range, [or is this now required for all ranges of humidity?]	Amended wording - “when required” added to clarify

United Kingdom	22	7.2.2	Regarding the OIML certificate number, what happens when multiple OIML certificate numbers, are issued e.g. from Europe, Australia & China – do they all have to be present?	OIML Certificate number requirement relocated to mandatory markings on the load cell, found in 7.2.1. Examples where multiple OIML Certificate numbers are issued appears to be an less than desirable situation. Is this an issue that would best addressed by the CPR?
United Kingdom	35	8.1.1	<p>Imposition of controls This Recommendation prescribes performance requirements for load cells used in weighing instruments subjected to legal metrological control. National legislation may impose metrological controls that verify compliance with this Recommendation.</p> <p>Unless the wording of the Introduction (or scope) is reworded so that this Recommendation is for <u>Load Cells used in weighing instruments subjected to legal metrological control</u>, I would suggest the following text so as to be more general::</p> <p>Imposition of controls This Recommendation prescribes performance requirements for load cells used in systems subjected to legal metrological control. National legislation may impose metrological controls that verify compliance with this Recommendation.</p>	The term “weighing” was deleted in the 2CD from this paragraph.

United Kingdom	38	9.2	<p>Test requirements</p> <p>Test procedures for the pattern type evaluation of load cells are provided in Section 9 and the Test Report Format is provided in Part 3. Initial and subsequent verification of load cells independent of the measuring system in which they are used is normally considered inappropriate if the complete system performance is verified by other means. Consider deleting the 2nd sentence, as I am not aware that “Initial and subsequent verification of load cells independent of the measuring system in which they are used” is conducted.</p>	Statement retained. Provides the intent that independent verification may not be appropriate if the system in which the load cells are installed in has received its own approval.
United Kingdom	38	9.4.1	<p>The definitions of each geometry do not appear to be correctly identified.</p> <p>The definition for Image A would appear to be “C”, Image B “A” and Image C “B”</p>	The descriptions associated with the illustrations have been altered in their sequence as necessary to coincide with the correct illustrations.
United Kingdom	39	9.4.5	<p>The wording is still a little confusing</p> <p>Suggested alternative text:</p> <p>When selecting load cells, contained within a group, for testing the lowest capacity shall be selected and the ratio between this and the next capacity may be up to 5:1.</p> <p>When the ratio of the largest capacity load cell in each group to the nearest smaller capacity having been selected for test is greater than 5, then another load cell, from within the group, shall be selected. The selected load cell shall have the next capacity in the series which is the closest to 5 times that of the nearest smaller capacity load cell which has been selected. The same principle shall be used throughout the range to be certified.</p>	As per resolution of the TC9P1 meeting (17 March, 2014), wording from 2000 edition reinstated.

United Kingdom	41	9.7.2.1	The heading in the Table to be changed from “Value” to “Variation”	Table 8 has been deleted per resolutions of TC9P1 meeting 17 March, 2014
United Kingdom	48	9.8.3	Whilst these timings for Class B & A may assist in achieving the higher accuracy it is questionable if theses timings would apply during in-service use therefore negating the accuracy.	Table was amended per resolutions of TC9P1 meeting 17 March, 2014

United Kingdom	66	9.7.11	<p>We reiterate what we said last time – this is not acceptable!</p> <p>There is a difference in the wording between OIML R60:2012 and OIML R76-1:2006 regarding the calculation of the maximum allowable span stability variation.</p> <p>R60 states: in Form D.171.2 of R60:2000 (not yet incorporated in the R60:2012 draft), the following is present in the notes section:-</p> <p>1 Variation: the difference in the span value from the span value of run no. 1.</p> <p>2 Maximum allowable variation: half the load cell verification interval or half the absolute value of the maximum permissible error for the maximum test load applied.</p> <p>These additional clauses are not present in R76, leading to the situation whereby the Maximum Allowable Variation in R60 can be interpreted as $\pm 0.5e$ (referenced to the span value of run no 1), whereas in R76 this can be interpreted as just $0.5e$, as defined in the clause:-</p> <p>The variation in the errors of indication shall not exceed half the verification scale interval or half the absolute value of the maximum permissible error on initial verification for the test load applied, whichever is greater, on any of the n measurements.</p> <p>Clarification needs adding to OIML R60 (and potentially in the future to OIML R76) to define the required method to be adopted, unless they are intentionally different.</p>	<p>The difference or conflict referred to here is not apparent to me. After reading these clauses a number of times, I am unable to identify the conflict.</p> <p>The term variation refers to a difference in indications which would infer a range (i.e., plus or minus).</p> <p>Other members have not identified this issue as a potential problem. I apologize for a lack of technical expertise, and I am concerned that I have failed to recognize this problem and do not wish to allow it to stand if a change is necessary. I ask for your understanding and your assistance to help clarify this concern for myself and other TC9P1 members by providing specific amendments.</p>
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United Kingdom		General comment	Several of the issues appear to hinge on the outcome of TC9 p1 meeting. Is this going to occur before OIML R60 is finalised?	Meeting was held 17 March, 2014. It is not yet known whether all concerns with the current draft of R60 will be resolved.
USA		3.1.2	In the “Note”, revise as follows: “Load cells equipped with electronics that produce an output in digital form are often referred to as digital load cells” It is not necessary that the digitising means be limited to solely an electronic means. Also, this note would be better located if placed in clause 3.1.1	According to resolutions of TC9P1 meeting 17 March, 2014 minimum functions of a digital load cell were agreed to be analog to digital (A/D) conversion. Additional language added to 3.1.2 reflect this notion.
USA		3.3	The Recommendation is travelling down an incorrect road with this “construction” clause and it should be eliminated. It is design related and not performance related; it is not all-inclusive, nor can it be - what about capacitance, hydraulic, optical fringe, LVDT, etc.? A metrological recommendation should cover all performance requirements, but not become a compendium of mass measuring devices. Besides, Clause 4 - Description of Load Cells already covers this subject in a better way.	The addition of specific examples for load cell construction is being suppressed in the current draft. More generic references are being used in terms of load cell design
USA		3.5.4	Why only consider voltage devices, i.e. (mV), (V)? Should not be design oriented; eliminate these unit of measure symbols.	Amended, former language reinstated
USA		Various	Certain error definitions (e.g. load cell error, MPE, etc.) have been deleted from the main body of the Recommendation on the basis that they are later covered in Annex E. However, Annex E is not only at the end of the document but its status is informative and not mandatory, nor should it be. Why are these important definitions being so relegated? They have become obscure.	Formatting of the revised draft is being done according to the prescribed OIML template

