

CERTIFICATE
TRANSFORMATION
REQUIREMENTS

**Supplement to
OIML R 60**

Edition 2000 (E)

Metrological regulation for load cells:
CERTIFICATE TRANSFORMATION REQUIREMENTS

Réglementation métrologique des cellules de pesée:
EXIGENCES SUR LA TRANSFORMATION DES CERTIFICATS



Supplement to OIML R 60 (2000) *Metrological regulation for load cells:*

Certificate transformation requirements

1 Introduction

OIML Recommendation R 60 (2000) incorporates a number of changes to the 1991 edition, which is now therefore superseded. However, OIML certificates issued against R 60 (1991) will remain valid without limitation and will remain applicable in certain countries or regions until national and regional regulations are aligned with R 60 (2000). It should also be noted that R 60 (1991) certificates may be issued up to the end of 2000. In parallel, R 60 (2000) certificates may be issued to manufacturers as of March 2000, assuming they have manufactured load cells that meet the requirements of the new Recommendation.

Therefore, manufacturers who hold R 60 (1991) certificates and whose load cells also meet the requirements of R 60 (2000) may wish to receive R 60 (2000) certificates without having to be subjected to all the examinations and tests of R 60 (2000), since a number of the requirements are the same as those in R 60 (1991).

This document identifies those requirements in R 60 (2000) that have changed compared with R 60 (1991), as well as new requirements.

Based on this document, an Issuing Authority that issued an R 60 (1991) certificate for a given model of load cell to a given manufacturer may consider the possibility of issuing an R 60 (2000) certificate without performing all the tests and examinations which were carried out for the R 60 (1991) certificate. This is conditional on a manufacturer or representative being able to submit a model and documentation providing evidence that it is the same model as evaluated for the R 60 (1991) certificate and test report. Changes in or additions to items, such as the markings or indications on the load cell to conform to requirements of R 60 (2000) and not affecting the load cell performance, shall be permitted.

In the same way, the Issuing Authority may decide to use the former test report with supplements for new and different examinations and tests.

2 Summary of additional requirements

2.1 Load cell information

R 60 (1991) required certain information about the load cell (see table starting on page 4) to be provided, either on the load cell or in accompanying documentation. However, it did not require any markings to be on the body of the load cell other than a serial number to identify the load cell with the documentation containing the required information.

R 60 (2000) requires four items to be marked on the load cell and in the accompanying documentation:

- name or trademark of manufacturer;
- manufacturer's designation or load cell model;
- serial number; and
- maximum capacity of the load cell, E_{\max} .

Other information about the load cell is required to be provided in the accompanying documentation (see table). The following information is required in R 60 (2000) which was not required in R 60 (1991):

- the humidity symbol, if necessary (CH or no symbol, SH or NH); and
- the value of the apportionment factor, p_{LC} , which is required if not equal to 0.7.

R 60 (2000) no longer requires the manufacturer's address to be specified.

2.2 Temperature limits

R 60 (1991) required class A and B load cells to perform within the limits of error over the temperature range + 10 °C to + 30 °C and class C and D load cells over the range – 10 °C to + 40 °C (unless otherwise specified).

R 60 (2000) requires all classes of load cell to perform within the limits of error over the temperature range – 10 °C to + 40 °C (unless otherwise specified).

2.3 Definition of load cell family and group within a load cell family to be covered on an OIML certificate

R 60 (1991) did not define these concepts.

R 60 (2000) contains a definition of what comprises a “load cell family” for a particular model, the requirements for which cells in the family are to be tested, and what ranges can be covered on the certificate, as below:

- ***Lowest capacity of the model tested***

R 60 (2000) requires the lowest capacity within a group of cells to be tested. If an R 60 (1991) certificate covers a group of load cells and the lowest capacity has not been tested, the manufacturer may be required to have the lowest capacity tested.

- ***Range of load cells covered for a model on a certificate***

The ratio of the lowest capacity tested to the next capacity tested on the certificate can be greater than 5:1 but not greater than 10:1.

- ***Maximum range of capacities covered for a model on a certificate for one capacity tested***

This ratio of the maximum capacity covered to the capacity tested shall be less than or equal to 5:1.

3 Comparison of new or revised requirements in R 60 (2000)

Tables of the new or revised requirements in R 60 (2000) are given on the following pages. For each item, the requirements in R 60 (2000) are detailed alongside those of R 60 (1991).

The far right column under the heading “**Does R 60 (1991) certificate comply with R 60 (2000) on this item?**” contains one of three statements:

Yes: Yes, models of load cell for which there is an existing R 60 (1991) OIML certificate will comply with R 60 (2000) on this item.

Re-evaluate: Models of load cell for which there is an existing R 60 (1991) OIML certificate may or may not comply with R 60 (2000) on this item. The model and/or documentation will need to be re-evaluated to determine compliance.

New in R 60 (2000): These items did not exist in R 60 (1991), and must therefore be considered. This may require on a case by case basis a review of the documentation, a visual examination, or tests of the type submitted.

Item	R 60 (1991)		R 60 (2000)		Does R 60 (1991) certificate comply with R 60 (2000) on this item?
	Requirements	Reference	Requirements	Reference	
Apportionment factor, P_{LC}	Not specified, assumed to be 0.7	-	Must be within the range $0.3 \leq P_{LC} \leq 0.8$ Must be declared by the manufacturer if $P_{LC} \neq 0.7$	2.4.2 4.6.6.1 5.1.1	Yes
Units of measure	Kilogram (kg)	3	Gram (g), kilogram (kg) or tonne (t)	3	Yes
Marking requirements on cell	None (except the serial number if the information below is given in an accompanying document)	4.6 4.7	Minimum markings required: • Name or trademark of manufacturer • Manufacturer's designation or load cell model • Serial number • Maximum capacity, E_{max}	4.7.1	Re-evaluate
Markings required either on load cell or in documentation supplied by manufacturer	Using standard classification marking: • Accuracy class • Maximum number of load cell intervals • Direction of loading, if necessary (i.e. if not apparent) • Special limits of working temperature, if necessary (i.e. if not + 10 °C to + 30 °C for classes A and B or - 10 °C to + 40 °C for classes C and D) • NH symbol, if not to be subjected to humidity test Other information: • Name and address of manufacturer or his trademark • If appropriate, manufacturer's own designation • Serial number and year of manufacture • Minimum dead load • Maximum capacity • Safe load limit • Minimum load cell verification interval, V_{min} • Other: pertinent conditions that must be observed to obtain the specified performance (for example, electrical characteristics of the load cell)	4.6.1 - 4.6.5 4.6.7 - 4.6.8 4.7 4.6.6 4.7	Using standard classification marking: • Accuracy class • Maximum number of load cell verification intervals, n_{max} • Type of load, if necessary (i.e. if not apparent) • Special limits of working temperature, if necessary (i.e. if not - 10 °C to + 40 °C) • Humidity symbol, if necessary (requires CH or no symbol, SH, or NH) Other information: • Year of manufacture • Minimum dead load, E_{min} • Safe load limit, E_{lim} • Minimum load cell verification interval, V_{min} • Other: pertinent conditions that must be observed to obtain the specified performance (for example, electrical characteristics of the load cell such as output rating, input impedance, supply voltage, cable details, etc.) • Value of the apportionment factor, P_{LC} , which is required if not equal to 0.7	Figure 2 4.6.1 - 4.6.5 4.6.7 - 4.6.8 4.7.2 4.6.6.1 4.7.2	Yes for class C and D; however, for class A or B in R 60 (1991) the special temperature range of + 10 °C to + 30 °C must be marked on the load cell or specified in the documentation
Non-mandatory additional information	None specified	-	The following may optionally be specified: • For a weighing instrument (for example, multiple range instrument according to OIML R 76), the relative v_{min} , Y , where $Y = E_{max} / v_{min}$ (see 2.3.14) • For a weighing instrument (for example, multi-interval instrument according to OIML R 76), the relative DR, Z , where $Z = E_{max} / (2 \times DR)$ (see 2.3.13) and the value of DR (see 2.3.9) is set at the maximum permissible minimum dead load output return according to 5.3.2	4.6.6.2 4.7.2	Yes. Evaluate if manufacturer has specified them

Item	R 60 (1991)		R 60 (2000)		Does R 60 (1991) certificate comply with R 60 (2000) on this item?
	Requirements	Reference	Requirements	Reference	
OIML certificate	No criteria given for certificate	-	Criteria established for certificate	4.8 Annex E	Re-evaluate
Load cell error, mpe (function of verification interval and class)	Function of class, load and verification interval: <ul style="list-style-type: none"> • $mpe = \pm 0.35 v$ • $mpe = \pm 0.7 v$ • $mpe = \pm 1.05 v$ according to load	Table 2 5	Function of class, load, verification interval and apportionment factor: <ul style="list-style-type: none"> • $mpe = \pm p_{LC} \times 0.5 v$ • $mpe = \pm p_{LC} \times 1.0 v$ • $mpe = \pm p_{LC} \times 1.5 v$ according to load	Table 5 5	Yes
Loading / unloading time intervals	Times specified in Table 3, with note that actual times shall be recorded when these cannot be achieved.	Table 3 + note	Slightly modified times specified in Table 6. If these loading times are impracticable: <ol style="list-style-type: none"> a) The time may be increased from 100 % to a limit of 150 % of the specified time provided that the permissible variation of the result is proportionally reduced from 100 % to 50 % of the allowable difference between the initial reading of the minimum load output upon unloading and the reading before loading, and b) In other cases, the actual times shall be recorded in the test report. 	5.2.3 Table 6 5.2.3.2	Yes. However, the Issuing Authority should have an evaluation performed if the times specified in Table 3 of R 60 (1991) were not achieved in the previous testing
Humidity test	Two options: <ol style="list-style-type: none"> 1. No humidity test: Mark cell NH 2. 12-day cyclical test: No symbol 	7.3 15.5	Three options: <ol style="list-style-type: none"> 1. No humidity test: Mark cell NH 2. 12-day cyclical test: Mark cell CH or no symbol 3. 2-day steady state test: Mark cell SH 	4.6.5 5.5.3 A.4.5 A.4.6	Yes. Evaluate if manufacturer has marked SH on the load cell(s)
Additional tests for load cells with electronics	Does not cover load cells with electronics	-	New section 6 for load cells with electronics: <ul style="list-style-type: none"> • $p_{LC} = 1.0$ • Warm-up time • Power voltage variations • Short time power reductions • Bursts (transients) • Electrostatic discharge • Electromagnetic susceptibility • Span stability 	6.1 6.4	New in R 60 (2000)
Temperature limits	Unless otherwise stated: <ul style="list-style-type: none"> • Classes A and B: + 10 °C to + 30 °C • Classes C and D: - 10 °C to + 40 °C 	4.6.4 10.1.1 - 10.1.2	Unless otherwise stated: <ul style="list-style-type: none"> • All classes: - 10 °C to + 40 °C 	5.5.1.1 5.5.1.2	Re-evaluate
Temp. effect on minimum dead load output	Minimum dead load output shall not vary by more than: <ul style="list-style-type: none"> • $0.7 \times v_{min} / 2$ °C for class A • $0.7 \times v_{min} / 5$ °C for classes B, C and D 	10.1.3	Requirements are now a function of the apportionment factor, but only differ if $p_{LC} \neq 0.7$. Minimum dead load output shall not vary by more than: <ul style="list-style-type: none"> • $p_{LC} \times v_{min} / 2$ °C for class A • $p_{LC} \times v_{min} / 5$ °C for classes B, C and D 	5.5.1.3	Yes

Item	R 60 (1991)		R 60 (2000)		Does R 60 (1991) certificate comply with R 60 (2000) on this item?
	Requirements	Reference	Requirements	Reference	
Temperature sequence for test	<ul style="list-style-type: none"> Perform test at 20 °C Repeat test for both lower temperatures and higher temperatures, including the approximate temperature range limits for the accuracy class intended Repeat test at 20 °C 	15.1.11	<ul style="list-style-type: none"> Perform test at 20 °C Repeat test first at the higher temperature, then at the lower temperature, including the approximate temperature range limits for the accuracy class intended Repeat test at 20 °C 	A.4.1.13	Yes
Definition of a family	No definition of a load cell family	-	<p>Load cell family: For the purposes of type evaluation/pattern approval, a load-cell family consists of load cells that are of:</p> <ul style="list-style-type: none"> The same material or combination of materials (for example, mild steel, stainless steel or aluminum) The same design of the measurement technique (for example, strain gauges bonded to metal) The same method of construction (for example, shape, sealing of strain gauges, mounting method, manufacturing method) The same set of specifications (for example, output rating, input impedance, supply voltage, cable details) One or more load cell groups <p><i>Note:</i> The examples provided are not intended to be limiting</p>	2.2.3	New in R 60 (2000)
Definition of a load cell group within a family	No definition of a load cell group with a family	-	<p>Load cell group: All load cells within a family possessing identical metrological characteristics (for example, class, n_{max}, temperature rating, etc.)</p> <p><i>Note:</i> The examples provided are not intended to be limiting</p>	2.2.3.1	New in R 60 (2000)
Load cells tested	Not specified	-	<p>Provisions now applied:</p> <ul style="list-style-type: none"> Lowest capacity within a group Range of lowest capacity tested to next capacity tested shall be between 5:1 and 10:1 Humidity (if applicable): select one cell and select most severe characteristics, for example, the greatest value of n_{max} or the lowest value of Y (relative v_{min}) Load cell with electronics (if applicable): select most severe characteristics; for example, the greatest value of n_{max} or the lowest value of Y (relative v_{min}) 	7.3 Annex B	New in R 60 (2000)
Maximum range of capacities covered for one capacity tested	Not specified	-	Not over 5 times the capacity tested	7.3.3	New in R 60 (2000)

