Leaflet for Testing and Certification of Load Cells

In Europe load cells for use in legal metrology to be applied and tested under the concept of the Modular Approach have to be tested according to the International Recommendation OIML-R60 "Metrological regulations for load cells". In case of reminding questions decisions are made on base of OIML-R76 or WELMEC 2 Agreements.

1. Application
The order for testing has to be signed, where appropriate a FAX(signed) will do. To issue a parallel certificate an additional letter of agreement signed by the business partner is necessary.

2. Prepayment
After a request a foreign applicant normally is asked for prepayment before starting the investigation.

3. Time needed in total for testing and certification
Testing and certification normally are finished within 3 month after receipt of order, pattern and documentation.
If prepayment is necessary delays caused by transmitting of bill and bank transfer may occur.
For testing of load cells with capacities of more than 5 tons early planning will be necessary.
The used loading equipment a 1 MN deadload force standard is very engaged in calibration and intercomparison measurements. A load cell test according to R60 needs at least 5 days caused by inserting the temperature box and the variations of test temperature.

4. Documentation and accessories
A sufficient documentation as follows in the listing is necessary.
To keep handling charges small the best is to supply the documents in electronic form.
- photo
- dimensions
- load introduction drawings
- cable, wiring
- data sheet

Further more for verifying of the family conditions to allow the selection of patterns according to OIML-R60 No 4.8.2 (guarantee of manufacturer):
- for documentation and to be inserted into the test certificate, for check of compatibility with the metrological data of the test certificate for better completion respectively dual language listing the best is in doc-file,

Inserting devices for load introduction have to be supplied with the pattern (e.g. compression parts or load fitting elements for beam load cells).

For digital load cells electronic indicating and controlling devices have to be supplied with including manual as well as the description of parameter variation possibilities and if provided with software securing this has to be described too.

5. Special remarks
5.1 Manufacturer test results
For load cell testing PTB prefers comparing of test results from manufacturer and PTB to generate confidence and to allow inspection of test application and test procedures too. Hereby PTB submit regardless the own test results to the manufacturer.
(For preparation of test results according to OIML R60 PTB offers an own evaluation software which is acquirable by contract.)

Detailed drawings and manufacturer test results are kept at PTB and not passed outside PTB, only in case of special order of the manufacturer PTB-test results are passed on directly.
5.2 Selection of load cells for testing having a load cell family

The procedure for the selection of patterns referring to R60 Nr. 7.3 is described in Annex B. Selected are those load cells with the best metrological data to cover all other qualities. This concern

\[ n \]  
number of verification intervals

\[ Y \left( Y = \frac{E_{\text{max}}}{v_{\text{min}}} \right) \]  
reciprocal relatively prime minimum verification interval as well as

\[ Z \left( Z = \frac{E_{\text{max}}}{0.5 \times DR} \right) \]  
reciprocal relatively prime minimum dead load output return

Further according to OIML-R60 No 7.3.4 the smallest capacity has to be tested.

To gain a low number of to be tested pattern it is allowed for the manufacturer to submit a pattern with combined best qualities without the aim to produce in series "such best quality combination". The products of the manufacturer are specified by the data sheet of the manufacturer and approved by the test certificate.

Vice versa PTB cannot approve qualities not covered by the manufacturer issued data sheet. Compare OIML-R60 No 4.8.2.

5.3 Further evaluation of test results

For weighing instruments the requirements according to OIML-R76 ask to test the instrument additionally with a loads where the error limits have a step (e.g. for class III weighing instrument when \( n = 500 \)). The error limits have to be kept.

For load cell testing the load values for the steps are not known hence the load cell may be applied partial loaded whereas the weighing instrument is loaded with Max. In OIML-R60 some checks shall be applied see R60, Page 50 and Annex C.4. This is an evaluation procedure which is not documented directly. This check need time if it is done only by figures. A quick overview is to watch the slope of the characteristics like it is shown in Figure C.1 on Page 44 of R60.

Tare and hysteresis

For weighing instruments the error limits must be kept according to OIML-R76 No 3.5.1 for increasing and decreasing loads (load cell compare R60 No 5.1) This also is required for net loads according to R76 No 3.5.3.3 still for increasing and decreasing loads, consequently weighing instruments with any tare device may not have hysteresis more than \( 0.5 \varepsilon \).

The test procedures for load cells do not consider the tare application in weighing instruments, therefore all load cells must meet hysteresis not more than \( 0.5 \varepsilon \).

In practice hysteresis of load cells get a little bit better under partial loading, so at the end \( 0.6 \varepsilon \) hysteresis may be acceptable.

6. Estimation of fees for load cell testing and certification

Generally the charge must be calculated from the actual afford of work:

a.) 1 hour of work (from \( 57 \text{ €} / h \) up to \( 82 \text{ €} / h \)) further for

b.) increased afford in case of use of expensive test equipment

( for EMC irradiation and / or force standard above 5 t test load )

The listed charges are average values of experience but without any troubleshooting during the procedures.

6.1 Charges for Load Cells (LC) up to 5 t capacity

<table>
<thead>
<tr>
<th>PTB-Test certificate</th>
<th>Family-PTB-Test certificate</th>
<th>digital LC</th>
</tr>
</thead>
<tbody>
<tr>
<td>one LC (smallest ( E_{\text{max}} ))</td>
<td>additionally charge for each further tested LC with higher ( E_{\text{max}} ) in case of revision of the certificate ( 2300 \text{ €} )</td>
<td>additionally charge EMC, warm up, discharges &amp; span-stability tests approx. ( 3000 \text{ €} )</td>
</tr>
<tr>
<td>approx. ( 3000 \text{ €} )</td>
<td>tested in the same time as smallest ( E_{\text{max}} ) approx. ( 2000 \text{ €} )</td>
<td>approx. ( 3000 \text{ €} )</td>
</tr>
</tbody>
</table>

6.2 Charges for Load Cells (LC) with more than 5 t capacity

<table>
<thead>
<tr>
<th>PTB-Test certificate</th>
<th>Family-PTB-Test certificate</th>
<th>digital LC</th>
</tr>
</thead>
<tbody>
<tr>
<td>one LC (smallest ( E_{\text{max}} ))</td>
<td>additionally charge for each further tested LC with higher ( E_{\text{max}} ) tested in the same time as smallest ( E_{\text{max}} ) in case of revision of the certificate ( 4200 \text{ €} )</td>
<td>additionally charge EMC, warm up, discharges &amp; span-stability tests approx. ( 3000 \text{ €} )</td>
</tr>
<tr>
<td>approx. ( 5500 \text{ €} )</td>
<td>approx. ( 3500 \text{ €} )</td>
<td>approx. ( 3000 \text{ €} )</td>
</tr>
</tbody>
</table>
6.3 Issuing of a parallel PTB-Test certificate  
for another applicant after a PTB-Test certificate/Test report has been issued, but not older than 2 years  
about 600 €  about 7,5 h  
Additionally there are costs for the issuing of test reports of approx. 200€ for each report.  
Note: If for marketing purpose the photo must be changed or varied or the  
data sheet and drawings are to be changed a higher afford will be necessary.

6.4 Issuing of an OIML Certificate  
after a PTB-Test certificate has been issued, but not older than 2 years  
about 600 €  about 7,5 h  
Additionally there are costs for the issuing of test reports of approx. 200€ for each report.  
Note: If for marketing purpose the photo must be changed or varied or the  
data sheet and drawings are to be changed a higher afford will be necessary.

6.5 Issuing of a PTB Test certificate on base of a not PTB-issued OIML-R60 Test report  
First issue  
about 900 €  about 11 h  
Additionally there are costs for the issuing of test reports of approx. 200€ for each report.  
Note: If the measurement results do not exist in electronical form the costs will be higher.  
Following parallel issue see No 6.3

7. Form and Acceptance of the Certificates and Reports  
PTB Test certificate  
is accepted in Europe, issued bilingual in German/English.  
The PTB Test certificate contains in about 5 pages all information necessary for incorporation of the load cell in a weighing instrument.

PTB OIML-R60 Certificate  
is accepted in Europe when issued by a European notified body and is issued in English. An OIML Certificate contains usually 2 pages and has the status of an international recommendation but must not be accepted as a legally valid document.

PTB OIML-R60 Test report  
is issued in English and accompanies the OIML Certificate. It contains the test results.

8. Acceptance of other OIML-R60 Test reports  
- PTB accepts for issuing of PTB Test certificates "Test reports according to OIML-R60" issued by an European notified body or  
an accredited Testing Lab which has been examined by PTB. The examinations are repeated.
- The Test report must be complete like OIML is asking for.
- The requirements No 1 to No 5 of this leaflet still are remaining.