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# WELMEC

European Cooperation in Legal Metrology

## Guide defining non-critical constructions for NAWI and AWI



For information:

This guide is available to the Working Group Measuring Instruments for future reference on the Europa Website.

# WELMEC

European Cooperation in Legal Metrology

WELMEC is cooperation between the legal metrology authorities of the Member States of the European Union and EFTA.

This document is one of a number of Guides published by WELMEC to provide guidance to manufacturers of measuring instruments and to Notified Bodies responsible for conformity assessment of their products.

The Guides are purely advisory and do not themselves impose any restrictions or additional technical requirements beyond those contained in relevant EU Directives.

Alternative approaches may be acceptable, but the guidance provided in this document represents the considered view of WELMEC as to the best practice to be followed.

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## 1 Introduction

Weighing instruments (WIs) are often constructed from typical parts such as an indicator, mechanical construction and a load cell produced by different Original Equipment Manufacturers (OEMs), in this document referred to as “producers”.

This guide aims to harmonize the conditions for general acceptance of load transmissions (LTs) and load receptors (LRs) in the Type Examination Certificate (TEC) of WIs.

- Notes:*
- *The general and administrative aspects of the voluntary system of modular evaluation of measuring instruments are given in WELMEC guide 8.8.*
  - *The technical implementation of parts is given in WELMEC guide 2.10.*
  - *With respect to the compatibility of load cells, analogue data processing device and indicators of a WI, Annex F of the EN45501: 2015 applies.*

## 2 Scope

The European Type-evaluation certificate (EU TEC) of the WI typically mentions the allowed parts and combinations, together with references to drawings of the load receptors (LRs) and load transmissions (LTs).

This guide defines for which LR or LT general acceptance is possible.

It should be noted that a manufacturer is free to choose that the allowed parts and combinations, together with references to drawings of LR and LT, are mentioned in the TEC in the form of LC tables or to choose both the LC tables and the general acceptance statement in a TEC (see below).

### 3 Non-critical constructions

This chapter has tables with an overview of:

- Table A1.1: the types of NAWIs that are regarded as being “non-critical”. Types ***not mentioned in this table*** are considered ***critical***, for example weighing instrument built in trucks, movable pallet weighers, weighing chairs or hospital beds.
- Table A1.2: Examples of load receptors considered as being common and non-critical.
- Table A1.3: Non-critical load transmissions for compression and tension load cells.
- Table A1.4: Non-critical load transmissions for beam load cells.

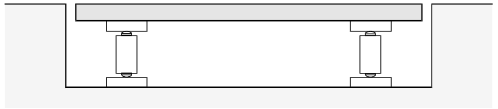
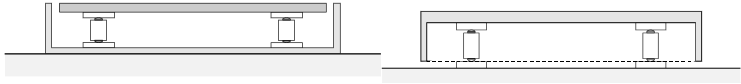
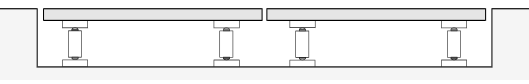
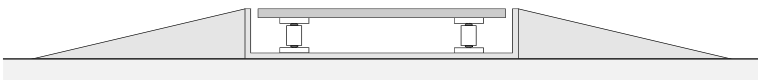
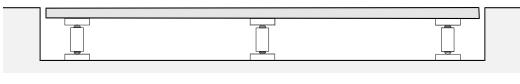
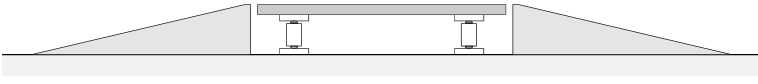
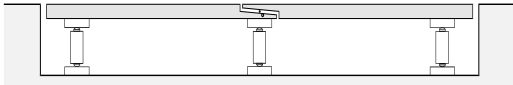
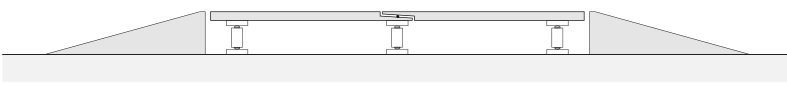
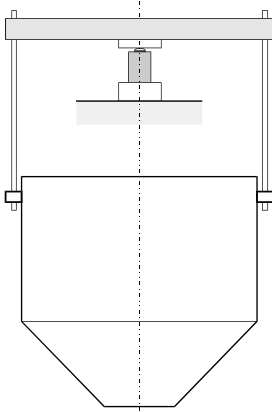
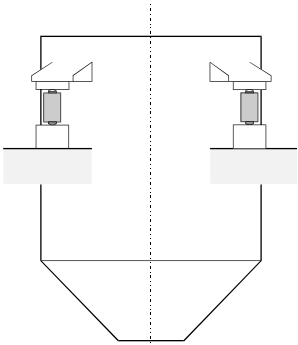
Type of NAWI	Load receptor		Load Cell	
	Type		Type	load transmission
<b>scales with lever system</b>				
	all load receptors with lever system according to No. 6.3 EN 45 501		{ compression tension beam	co- 1-7-8 te- 1-2 be- 1-4-5-6
<b>scales without lever system</b>				
<b>weighbridge</b>	1 or more platforms	<i>in floor</i> <i>over floor</i>	{ compression tension beam double ended beam	co- 2-3-4-5-6 te- 1-2 be- 2-3-7-8-9-10-11 de- 1-2-3
	multiple platform with joint	<i>in floor</i> <i>over floor</i>		
<b>platform scale</b>	1 or more platforms	<i>in floor</i> <i>over floor</i>	{ compression " tension beam double ended beam	co- 2-3-4-5-6 co- 7-8 te- 1-2 be- 1-2-3-4-5-6-7-8 9-10-11 de- 1-2-3
	multiple platform with joint	<i>in floor</i> <i>over floor</i>		
	platform maximum dimensions if necessary			
<b>hopper scale</b>	hopper suspended hopper supported		{ compression " tension beam double ended beam	co- 2-3-4-5-6 co- 7-8 te- 1-2 be- 1-2-3-4-5-6-7-8 9-10-11 de- 1-2-3
	hopper, by unsymmetric loading maximum dimensions if necessary			
<b>crane scale</b>	crab double crab hoist		{ compression tension beam double ended beam	co- 2-3-4-5-6 te- 1-2 be- 2-3-7-8-10-11 de- 1-2-3
	hook			
<b>overhead track scale</b>	rail	( for combinations with platforms see „platform scale“ )	{ tension beam	te- 1-2 be- 1-2-3-4-5-6-7-8 9-10-11
	rail	maximum linear length if necessary		

Abbreviations used:

- co compression load cell
- te tension load cell
- be beam load cell, either double bending or shear beam, but not single bending beam
- sp single point load cell
- de double ended beam load cell

Table A1.1: Load receptors (LRs) and load transmissions that are regarded as being “non-critical” in combination with certain types of load cells.

In the following Table A.1.2 some examples of acceptable solutions of LRs are given which are regarded as common types. The examples shown in Table A.1.2 need not be mentioned in the TEC of a weighing instrument.

in floor	over floor
	
	
	
<b>Double platform with joint</b>	
	
<b>Hopper suspended</b>	
	

Hopper supported		
Crab	Hoist	Hook

Table A1.2: Examples of load receptors considered as being common and non-critical

Tables A1.3 and A1.4 identify different types of LCs, (compression, tension, ...) and typical load cell mounting parts suitable for them. The symbols below classify the mobility between one point of contact on the load cell and its counterpart on the load receptor or mounting base.

Symbol	Description
	Movement possible normal to load axis Note: allows for temperature dilatation
	Movement possible normal to load axis, with reversing force (spring-back effect) Note: allows for temperature dilatation, also used for damping of lateral shock
	Inclination possible Note: allows for tilt of load cell or deflection of load receptor, no movement normal to load axis possible
	Indicates auto-centering effect of the complete mounting assembly of one load cell



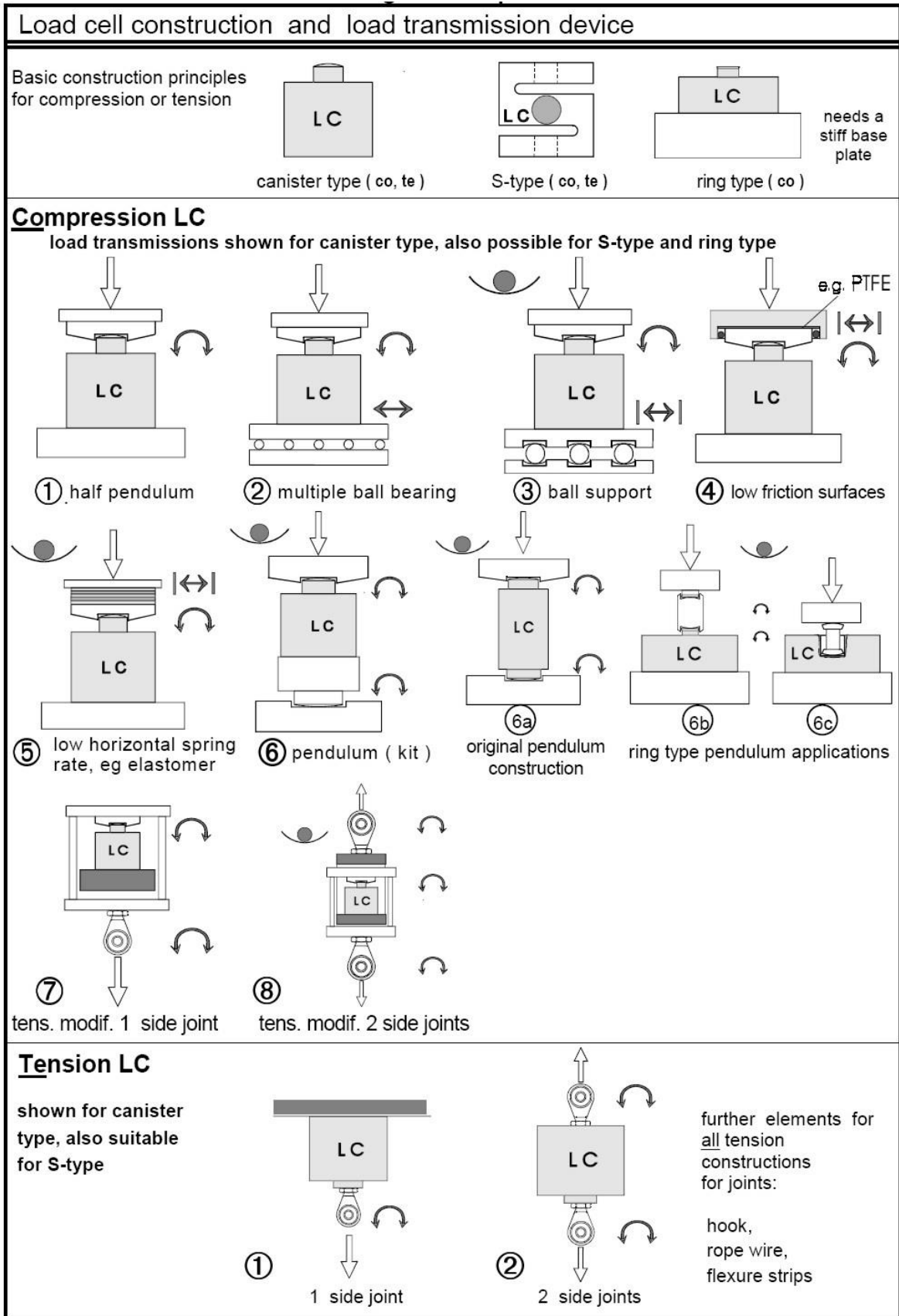


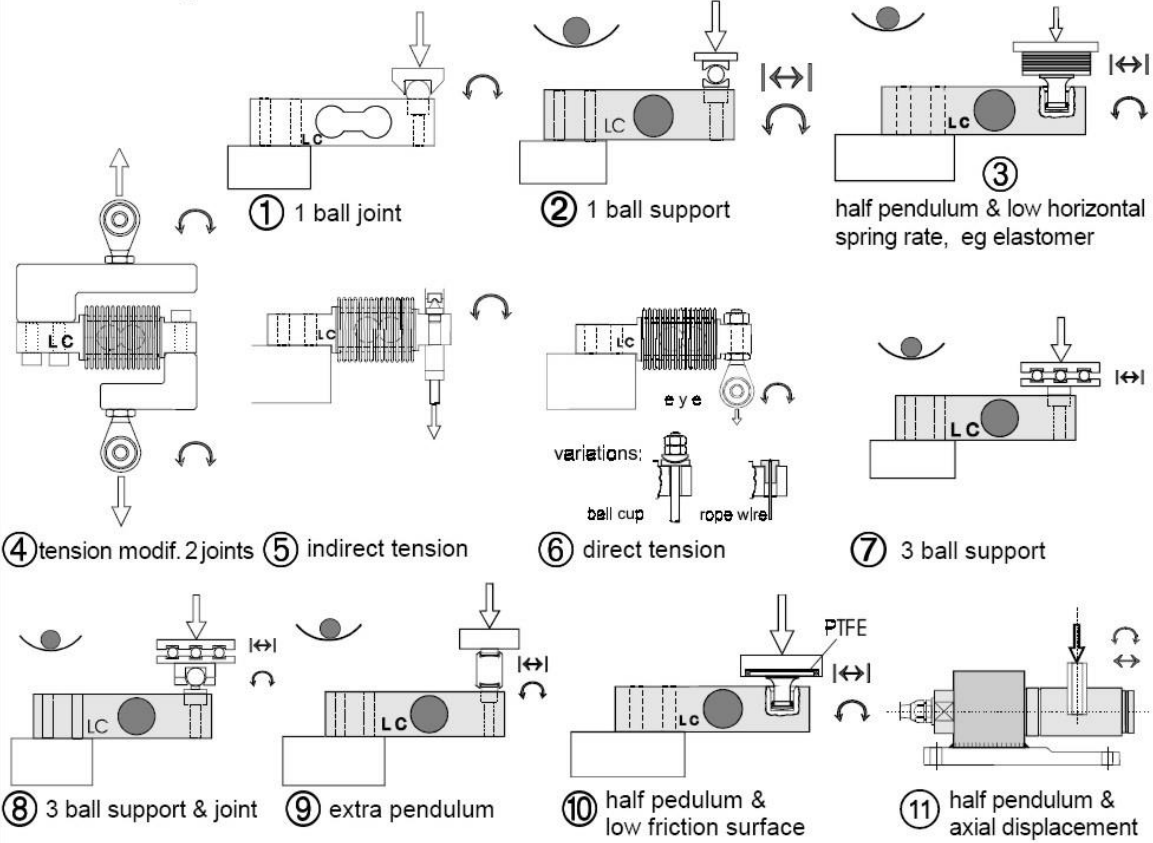
Table A1.3: Non-critical load transmissions for compression and tension load cells

### Load cell construction and load transmission device

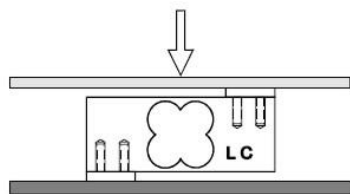
The load transmission device is independent of the encapsulation, potting or housing and the mounting at the fixed end shown below

#### Beam LC - Cantilever beam

Double bending beam & Shear beam LC

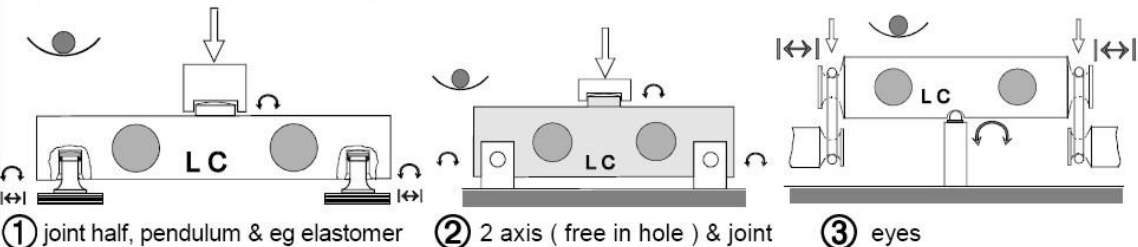


#### Single point LC



The single point LC has no degree of freedom for horizontal displacement or inclination, using more than one LC in a load receptor decoupling elements are necessary.  
The load transmissions 1 to 10 for the beam LCs may be applied.  
Max. platform dimensions may be mentioned in the TC or the TAC.

#### Double ended beam LC



Constructions with fixed clamping at the two ends need for minimum displacement and inclination some elasticity of the supporting construction.

Table A1.4: Non-critical load transmissions for beam load cells

Remarks on the standard load transmission parts presented in Tables A1.3 and A1.4:

- (a) All combinations of load cell and transmitting device shown in Tables A1.3 and A1.4 can also be utilized in a completely reversed manner.
- (b) The load transmission device is independent of the encapsulation, potting or housing which are shown in the examples.
- (c) Compression LCs (Table A1.3, upper part)
  - The load transmissions 1 to 8 are presented for canister type LCs. Instead, all load transmissions may be constructed for S-type or ring-type load cells.
  - 6a shows a pendulum construction built as a complete unit.
  - 6b and 6c show external pendulum rocker pins combined with ring-type LCs.
  - The bearings for all compression load cells may be installed either below or above the LC.
- (d) Tension LCs (Table A1.3, lower part)
  - The load transmissions 1 and 2 are presented for canister type LCs. Alternatively, both load transmissions may be used for S-type LCs.
- (e) Beam LCs (Table A1.4, upper part)
  - The drawings present double bending and shear beams, as well as plastic potted and encapsulated constructions; all these constructions may be combined with either of the load transmissions 1 to 10.
  - The direction of loading, which is given by the manufacturer, must be observed.
- (f) Single point LCs (Table A1.4, middle part)
  - The load transmissions 1 to 10 for the beam LCs may be applied to all single point LCs.
  - The direction of loading, which is given by the manufacturer, must be observed.
- (g) Double ended beam LCs (Table A1.4, lower part)
  - The table shows examples of common constructions. Variations are possible provided the constructions allow enough horizontal flexibility between both ends.
  - The direction of loading, provided by the manufacturer, must be observed.

## 4 Essential information within the TEC

In addition to the requirements specified in the NAWID or MID, WELMEC 8.8 and the WELMEC guide x.x on the technical implementation, the TEC of the NAWI or AWI must contain the following general statement in the case of general acceptance of non-critical constructions:

“Any load cell(s) may be used for instruments under this TAC, provided the following conditions are met:

- 1) There is a respective certificate (EC or PC) or an OIML R60 Certificate of Conformity issued for the load cell by a Notified Body responsible for type examination under Directive 2014/31/EU
- 2) The certificate contains the load cell types and the necessary load cell data required for the manufacturer’s declaration of compatibility of modules.  
A load cell marked NH is allowed only if humidity testing to EN 45501 has been conducted on this load cell.
- 3) The compatibility of load cells and indicator is established by the manufacturer by means of the compatibility of modules form, contained in Annex F of the EN45501:2015 at the time of EU verification or declaration of EU conformity of type.
- 4) The load transmission must conform to one of the examples shown in the WELMEC Guide 2.4. “

Remarks on this statement:

- Neither Table A.1.1 nor Tables A1.2, A.1.3 or A.1.4 need to be included in a TEC because the general statement in the TEC refers to the examples given in this WELMEC guide.
- If general acceptance is not used, all the different types and combinations of parts of the complete NAWI has to be defined in the TEC and the constructions drawings have to be supplied to the Notified Body.

## 5 Revision of this guide

Issue	Date	Significant changes
1	October 1997	Guide first issued.
2	August 2001	<p>Replacement of some references to R60 by references to R60 (1991) and R60 (2000).</p> <p>Changes to references to Part B in the Introduction.</p> <p>Numerous changes to Part B, mainly in its introduction and in Parts B.1.1 and B.1.2.</p> <p>Removal of the Annex C1 to C3. Addition off Drawing 11 in Table 3. Replacement of “uncritical” by “non-critical”. Addition of this Revisions section.</p>
3	2020	The guide was modified in accordance with WELMEC 8.8 and the technical implementation guide, 2.x