Verification of mechanical weighing scales

OIML R76 Edition 1992

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Weighing instrument

Measuring instrument that serves to determine the mass of a body by using the action of gravity on this body.

The instrument may also be used to determine other quantities, magnitudes, parameters or characteristic related to mass.

According to its method of operation, a weighing instrument is classified as an automatic or non-automatic instrument.

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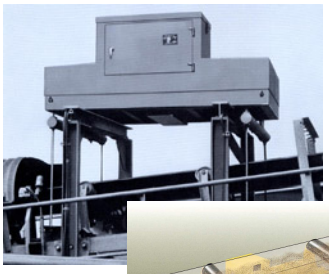
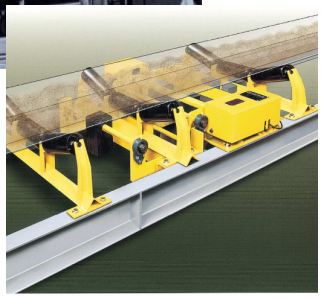
Automatic weighing instrument

An instrument that weighs without the intervention of an operator and follows a predetermined program of automatic processes characteristic of the instrument.



Non-automatic weighing instrument

Instrument that requires the intervention of an operator during the weighing process, for example to deposit on or remove from the receptor the load to be measured and also to obtain the result.

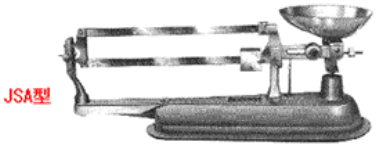


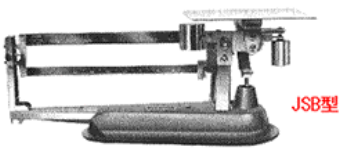



What's Mechanical Weighing Scale ?

Mechanical weighing scales use mechanical principle such as spring and lever when weighing is measured.

Various Mechanical Weighing Scale





Measurement principle

Lever

Elasticity

Spring

Load cell (electronically)

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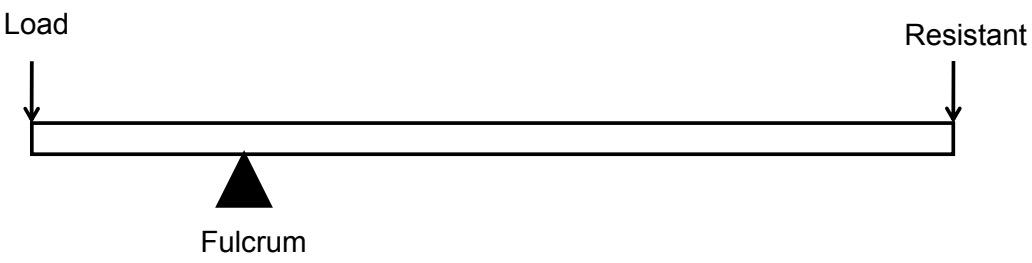
Levers in Mechanical Weighing Instruments

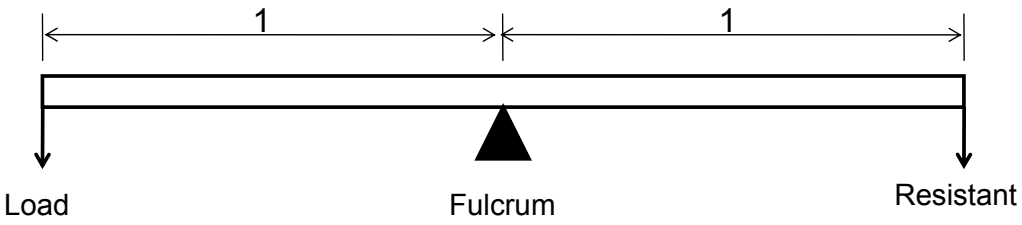
First order levers

The fulcrum is between the Load and Resistant. The resistant is usually either to the load or is less. In the case the lever has a mechanical advantage.



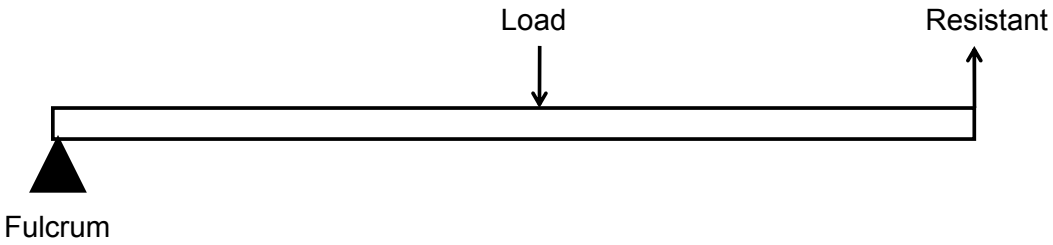
Example of First order levers

Simple beam (equal arm) Leverage 1 to 1



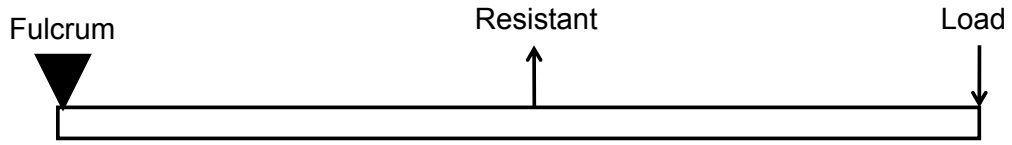
Second order levers

The fulcrum is at one end of the lever and the resistant is at the other. The lever has a mechanical advantage.

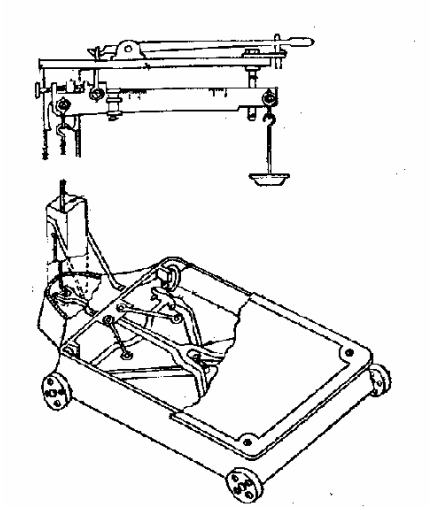


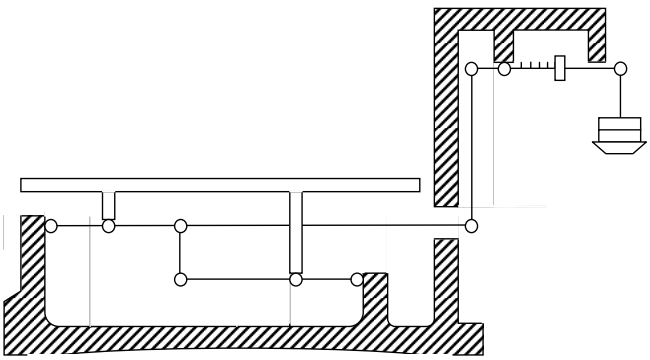
Third order levers

The fulcrum is at one end of the lever and the resistant is between the fulcrum and load. The lever has a mechanical advantage.

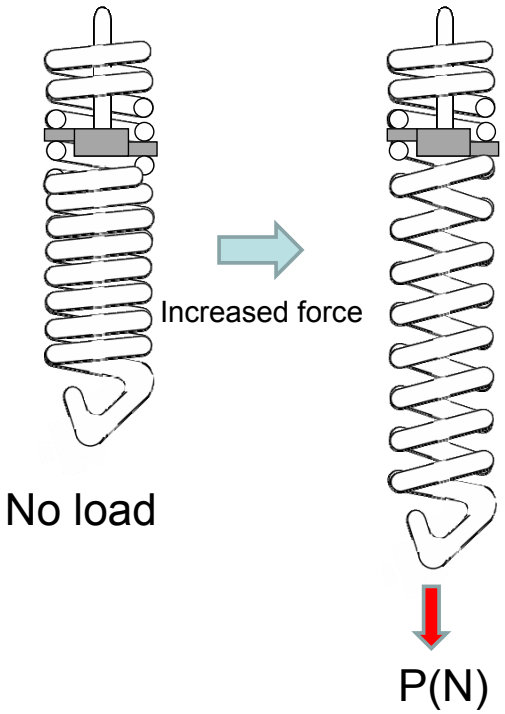


Combination of levers





Elasticity : Spring



Hooke's law

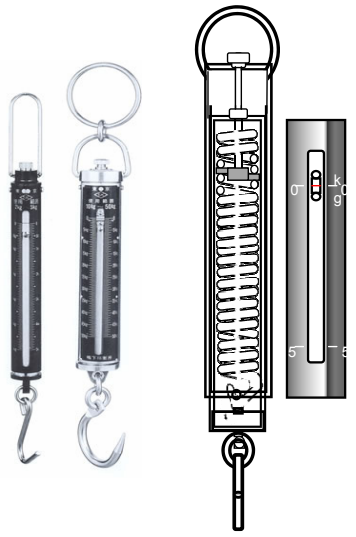
Growth of the spring is in proportion to increased force

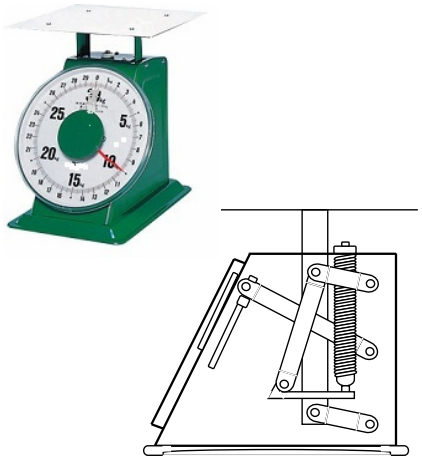
$$F = -kx$$

$$k = \frac{P}{\delta} = \frac{Gd^4}{8nd^3}$$

F : *Restoring force exerted by the spring*
k : *Spring constant (N/mm)*
x : *The distance by which the spring is elongated*
P : *Load (N)*
σ : *Displacement (mm)*
G : *Rigidity of spring materials (N/mm²)*
d : *Diameter of spring (mm)*
N : *Reel number*
D : *Diameter of the coil*

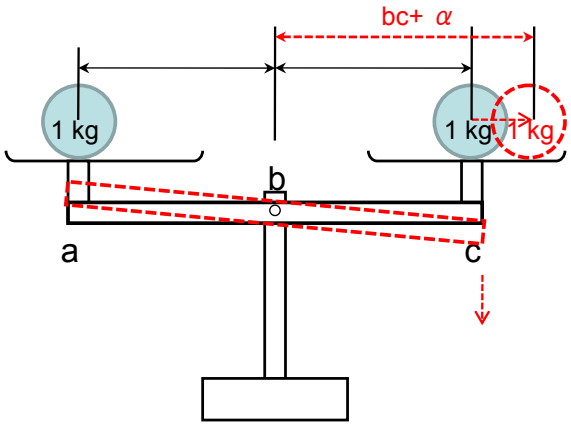
Spring type





Roberval mechanism

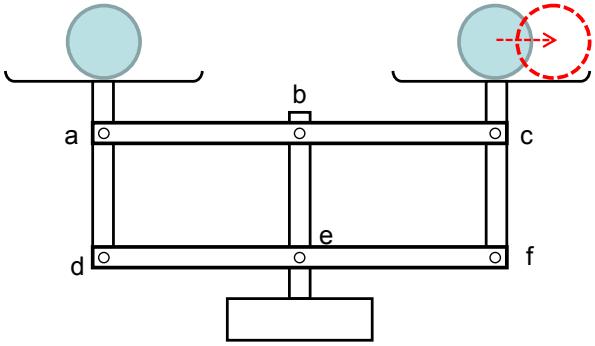
Simple lever



Same mass and same ratio of “ab” and “bc” ⇨ Balanced

Same mass and difference ratio of “ab” and “bc” ⇨ Not balanced

Roberval mechanism



It’s form two parallelogram “abde”, bcef” which connected the joint of length and breadth with a pin, and move freely.
“abc” becomes level when it’s put the same mass on a plate in the extension of “ad”,”ef”.
“abc” becomes always level even if it’s move a position of the mass then on a plate.

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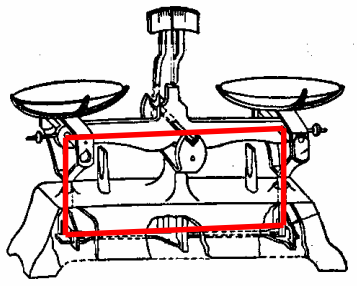
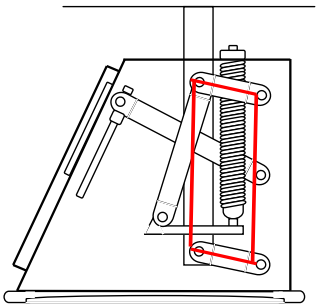
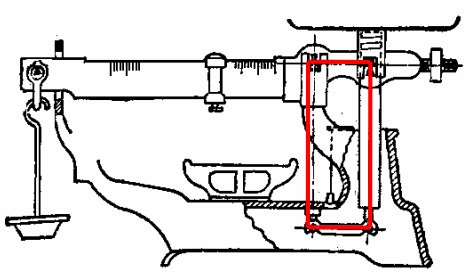
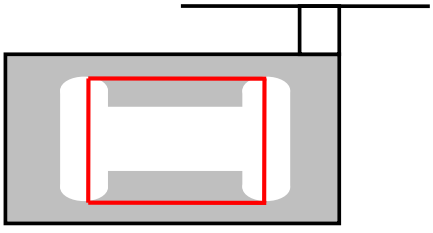
Use example of the Roberval mechanism



Roberval mechanism







OIML R76 Edition1992

Constitution of OIMLR76 1992

T. **Terminology**

1. Scope
2. Principles of the Recommendation
3. Metrological requirements
4. **Technical requirements for a self or semi self indication instruments**
5. Requirements for electronic instruments
6. **Technical requirements for a non self indication instruments**
7. Marking of an instruments
8. **Metrological controls**

Annex A Testing procedures for non automatic weighing instruments

Annex B Additional tests for electronic instruments

The related term of the mechanical weighing scale

T.1.2 Non automatic weighing instrument

Instrument that requires the intervention of an operator during the weighing process, for example to deposit on or remove from the receptor the load to be measured and also to obtain the result.

The instrument permits direct observation of the weighing results either displayed or printed; both possibilities are covered by the word “indication”.

Note: Terms such as “indicate”, “indicating component” and their derivatives do not include printing.

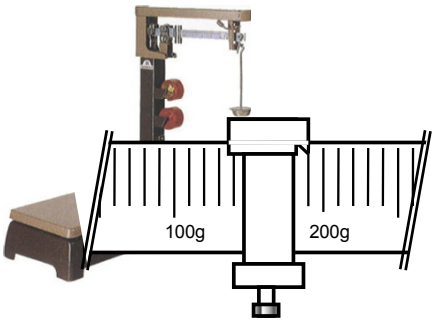
A non automatic weighing instrument may be:

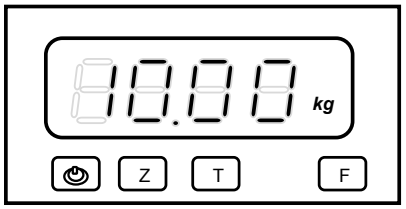
-graduated or non-graduated,

- self-indicating, semi-self indicating or non-self-indicating.

T.1.2.1 Graduated instrument

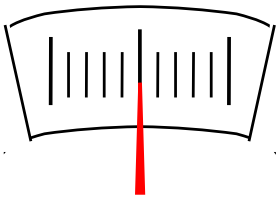
Instrument allowing the direct reading of the complete or partial weighing result.





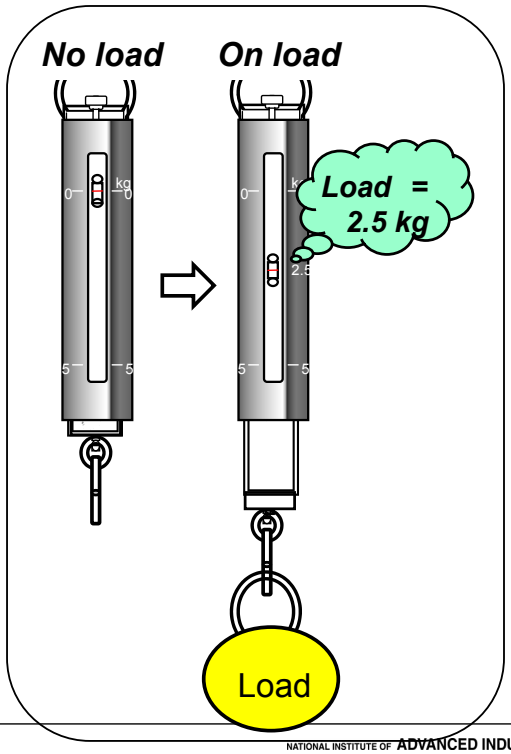
T.1.2.2 Non graduated instrument

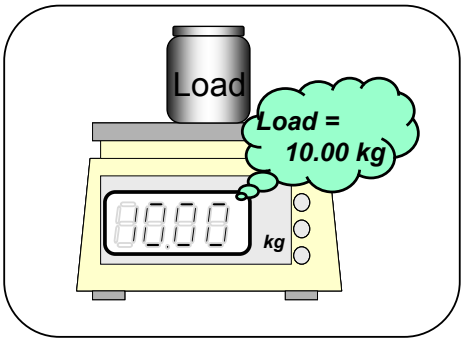
Instrument not fitted with a scale numbered in units of mass.

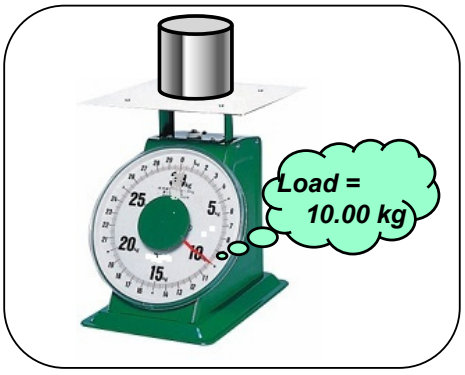


T.1.2.3 Self indicating instrument

Instrument in which the position of equilibrium is obtained without the vention of an operator.



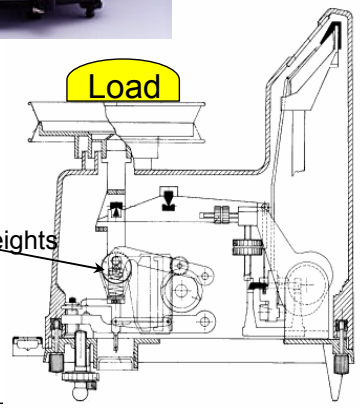




T.1.2.4 Semi self indicating instrument

Instrument in which a self indication weighing range, in which the operator venes to alter the limits of this range.

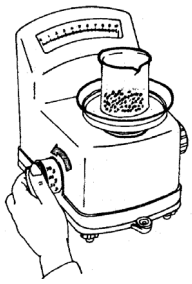
Example



Measurement procedure

1. Load applies to load receptor

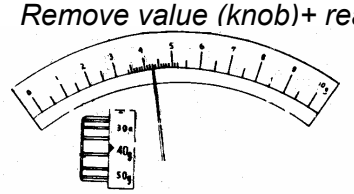
2. Remove inside weights by a knob



3. Repeat 2 till it is balanced in a weighing range

4. Load =

Remove value (knob)+ reading for indicator

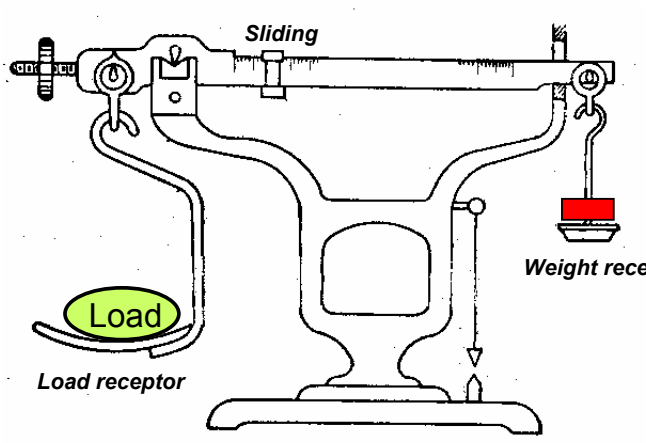


Knob = 40g
Indicator = 4.3g
Load = 44.3g

T.1.2.5 Non self indicating instrument

Instrument in which the position of equilibrium is obtained entirely by operator.

Example



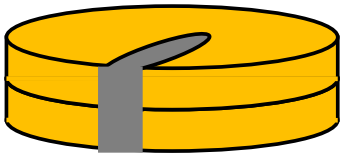
Measurement procedure

1. Load applies to load receptor

2. Weight applies to take the rough equilibrium.

3. Sliding moves to complete equilibrium

4. Load =
total weight value + reading of the sliding



T.2.1 Main device

T.2.1.1 Load receptor

Part of the instrument intended to receive the load.

T.2.1.2 Load-transmitting device

Pare of the instrument for transmitting the force produced by the load acting on the load receptor, to the load measuring device.

T.2.1.3 Load measuring device

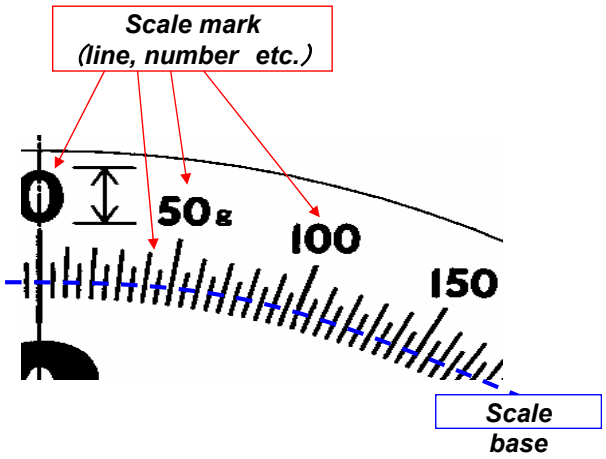
Part of the instrument for measuring the mass of the load by means of an equilibrium device for balancing the force coming from the load transmitting device, and an indicating or printing device.

T.2.4 Indicating device (of a weighing instrument)

Part of the load measuring device on which the direct reading of the result is obtained.

T.2.4.1 Indicating component

Component indicating the equilibrium and /or the result.
On an instrument with several positions of equilibrium it indicates only the equilibrium (so-call zero).
On an instrument with several positions of equilibrium it indicates both the equilibrium and the result. On an electronic instrument, this is the display.



T.2.4.2 Scale mark

A line or other mark on an indicating component corresponding to a specified value of mass.

T.2.4.3 Scale base

An imaginary line through the centers of all the shortest scale marks.

T.2.7.2 Zero setting device

Device for setting the indication to zero when there is no load on the load receptor.

T.2.7.2.1 Non automatic zero setting device

Device for setting the indication to zero by an operator.

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T.2.7.4 Tare device

Device for setting the indication to zero when a load is on the load receptor:
Without altering the weighing range for net loads (additive tare device), or
Reducing the weighing range for net loads (subtractive tare device).

It may function as;
- A non automatic device (load balanced by an operator),
- A semi automatic device (load balanced automatically following a single manual command),
- An automatic device (load balanced automatically without the intervention of an operator).

T.3.2 Scale divisions

T.3.2.1 Scale spacing *(instrument with analogue indication)*

Distance between any two consecutive scale marks, measured along the scale base.

T.3.2.2 Actual scale interval (d)

Value expressed in units of mass of:

The difference between the values corresponding to two consecutive scale marks, for analogue indication, or

The difference between two consecutive indication values, for digital indication.

T.3.2.3 Verification scale interval (e)

Value, expressed in units of mass, used for the classification and verification of an instrument.

T.3.2.4 Scale interval of numbering

Value of the difference between two consecutive numbered scale marks.

T.3.2.5 Number of verification scale intervals *(single-interval instrument)*

Quotient of the maximum capacity and the verification scale interval:

$$n = Max / e$$

T.4 Metrological properties of an instrument

T.4.1 Sensitivity

For given value of the measured mass, the quotient of the change of the observed variable I and the corresponding change of the measured M

$$k = \Delta I / \Delta M$$

Metrological requirements

Accuracy classes for NAWI's

1. Class 1 Special accuracy
   ultramicro-,micro-,semimicro,macro-

2. Class 2 High accuracy
   precision balances,

3. Class 3 Medium accuracy
   NAWI's for trade use

4. Class 4 Ordinary accuracy
   NAWI's for lower accuracy

Accuracy classes for NAWI's

Accuracy class	Verification scale interval	Number of verification scale interval		Minimum capacity
		Minimum	Maximum	
I	0.001g≦e	50 000	-	100 e
II	0.001 g≦ e ≦0.05 g	100	100 000	20 e
	0.1g≦e	5 000	100 000	50 e
III	0.1 g≦ e ≦2 g	100	10 000	20 e
	5 g≦ e	500	10 000	20 e
IIII	5 g≦ e	100	1 000	10 e

Maximum permissible error

mpe for verification

Maximum permissible errors on inititial vrification	for load m expressed in verification scale interval e			
	I	II	III	IIII
±0.5 e	0 ≦ m ≦ 50 000	0 ≦ m ≦ 5 000	0 ≦ m ≦ 500	0 ≦ m ≦ 50
±1.0 e	50 000 < m ≦ 200 000	5 000 < m ≦ 20 000	500 < m ≦ 2 000	50 < m ≦ 200
±1.5 e	200 000 ≦ m	20 000 < m<100 000	2 000 < m<10 000	200 < m<1 000

mpe for in-service inspection

Maximum permissible errors on inititial vrification	for load m expressed in verification scale interval e			
	I	II	III	IIII
±1.0 e	0 ≦ m ≦ 50 000	0 ≦ m ≦ 5 000	0 ≦ m ≦ 500	0 ≦ m ≦ 50
±2.0 e	50 000 < m ≦ 200 000	5 000 < m ≦ 20 000	500 < m ≦ 2 000	50 < m ≦ 200
±3.0 e	200 000 ≦ m	20 000 < m<100 000	2 000 < m<10 000	200 < m<1 000

Calculate of Maximum permissible error

Max : 5 kg,
Verification scale Interval (e): 10 g,
n : 500,
Class : 4

Mpe ?

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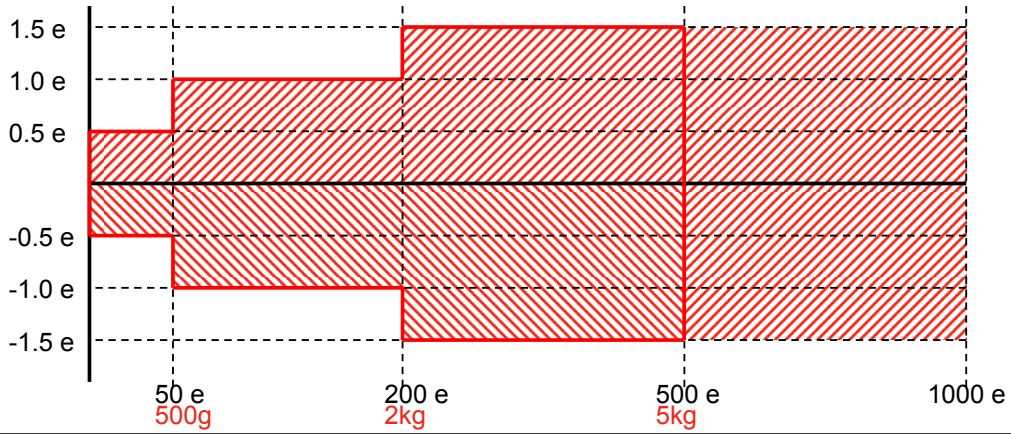
Calculate of Maximum permissible error

Max : 5 kg, Verification scale Interval (e): 10 g, n : 500, Class : 4

Mpe	e	e	gram
± 0.5 e	0 ≦ n ≦??	0 ≦ n ≦50e	0 ≦ n ≦500g
± 1 e	??< n ≦???	50e< n ≦200e	500g< n ≦2kg
± 1.5 e	???< n ≦ ????	200e< n ≦ 1000e	2kg< n ≦ 10kg



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Calculate of Maximum permissible error

Max : 3 kg,
e : 1 g,
n : 3000,
Class : 3

⇒ ***Mpe ?***

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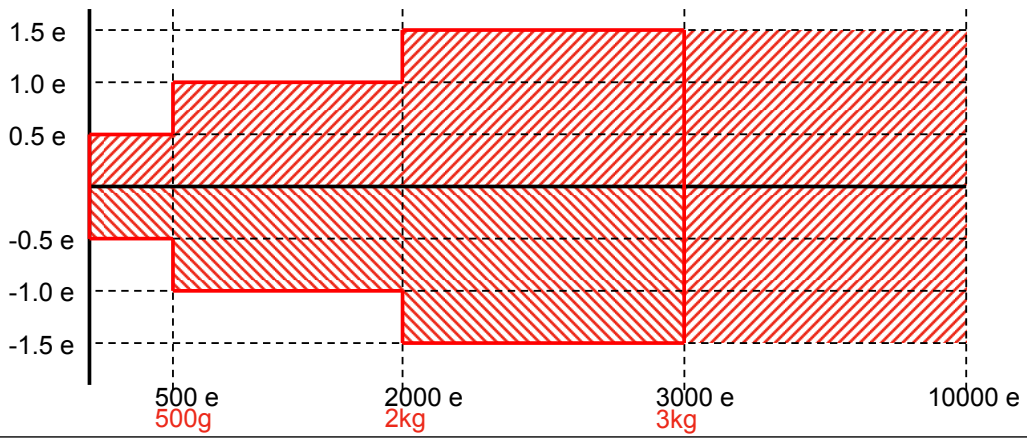
Calculate of Maximum permissible error

Max : 3 kg, e : 1 g, n : 3000, Class : 3

Mpe	e	e	gram
± 0.5 e	0 ≦ n ≦???	0 ≦ n ≦500e	0 ≦ n ≦500g
± 1 e	???< n ≦????	500e< n ≦2000e	500g< n ≦2kg
± 1.5 e	????< n ≦ ?????	2000e< n ≦ 10000e	2kg< n ≦ 10kg



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Verification standards(3.7)

Weights 3.7.1

The standard weights or standard masses used for the verification of an instrument shall not have an error greater than 1/3 of the maximum permissiblle error of the strument for the applied.

Max : 3 kg, Verification scale interval (e) : 1 g, Min : 20 g ,Class 3

Test points	Test load	Mpe (e)	Mpe(g)	Mpe/3	Weights
Zero	0	0.5 e	0.5 g	0.17 g	-
Min	20 g	0.5 e	0.5 g	0.17 g	***M2 (3mg)***
500 e	500 g	0.5 e	0.5 g	0.17 g	***M2 (75mg)***
Any	1000 g	1 e	1.0 g	0.33 g	***M2 (150mg)***
2000 e	2000 g	1 e	1.0 g	0.33 g	***M2 (300mg)***
Max	3000 g	1.5 e	1.5 g	0.5 g	***M2 (450mg)***

OIML R 111 Weights of classes E1, E2, F1, F2, M1, M1–2, M2, M2–3 and M3

Minimum accuracy class of weights

The accuracy class for weights used as standards for the verification of weights or weighing instruments should be
in accordance with the requirements of the relevant OIML Recommendations.

The OIML weight classes are defined as follows:

Class E1: Weights intended to ensure traceability between national mass standards (with values derived from the International Prototype of the kilogram) and weights of class E2 and lower. Class E1 weights or weight sets shall be accompanied by a calibration certificate (see 15.2.2.1).

Class E2: Weights intended for use in the verification or calibration of class F1 weights and for use with weighing instruments of special accuracy class I. Class E2 weights or weight sets shall be accompanied by a calibration certificate (see 15.2.2.2). They may be used as class E1 weights if they comply with the requirements for surface roughness, magnetic susceptibility and magnetization for class E1 weights, and if their calibration certificate gives the appropriate data as specified in 15.2.2.1.

Class F1: Weights intended for use in the verification or calibration of class F2 weights and for use with weighing instruments of special accuracy class I and high accuracy class II.

Class F2: Weights intended for use in the verification or calibration of class M1 and possibly class M2 weights. Also intended for use in important commercial transactions (e.g. precious metals and stones) on weighing instruments of high accuracy class II.

Class M1: Weights intended for use in the verification or calibration of class M2 weights, and for use with weighing instruments of medium accuracy class III.

Class M2: Weights intended for use in the verification or calibration of class M3 weights and for use in general commercial transactions and with weighing instruments of medium accuracy class III.

Class M3: Weights intended for use with weighing instruments of medium accuracy class III and ordinary accuracy class IIII.

Classes M1–2 and M2–3 : Weights from 50 kg to 5 000 kg of lower accuracy intended for use with weighing instruments of medium accuracy class III.

Note: The error in a weight used for the verification of a weighing instrument shall not exceed 1/3 of the maximum permissible error for an instrument. These values are listed in section 3.7.1 of OIML R 76 *Nonautomatic Weighing Instruments (1992).*

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Metrological requirements

Maximum permissible error

Values of maximum permissible error on initial verification
Values of maximum permissible error in service

Maximum permissible errors for net value

Repeatability

Eccentric load

Discrimination

Tilting

Static temperature

Temperature effect on no load indication

Power supply

Zero return

Creep

Technical requirements for a self or semi self indication instruments

【Excerpt concerning mechanical weighing scales】

Security

Indication of weighing results

Analogue indication device

Zero setting device

Tare device

Locking position

AIST

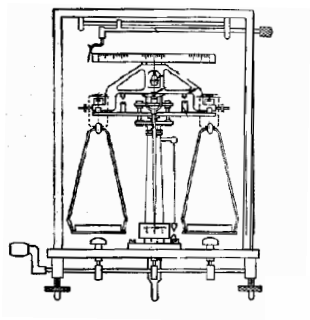
Technical requirements for a non self indication instruments

Mechanical weighing scale in OIML R 76

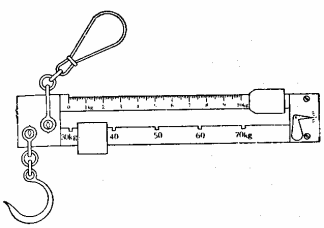
Non self indication instrument

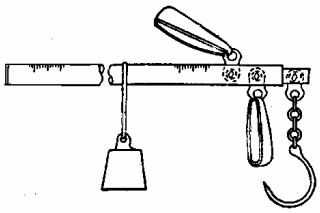
Simple instruments

Simple equal arm and 1/10 ratio beams



Simple steelyards with sliding poise





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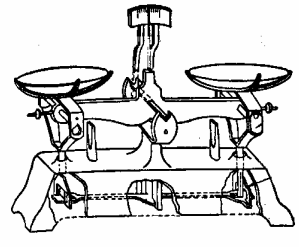
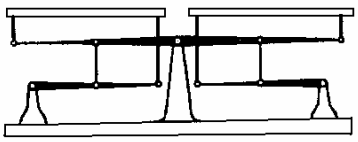
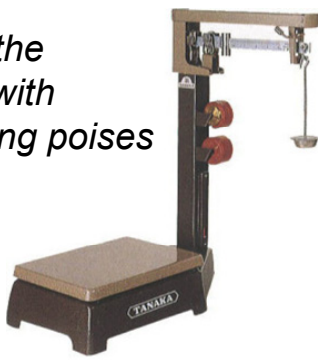
Roberval and Beranger instruments





Instruments of the steelyard type with accessible sliding poises



Instruments with ratio platforms

Minimum sensitivity

Acceptable solutions for indicating device

Conditions of construction

AIST

Metrological controls

Verification procedure

Verification Item

1. Values of maximum permissible error on initial verification
2. Maximum permissible error for net values
3. Discrimination
4. Repeatability
5. Tare weighing device
6. Eccentricity
7. Accuracy of zero setting device
8. Accuracy of tare device

※ ***Visual inspection***

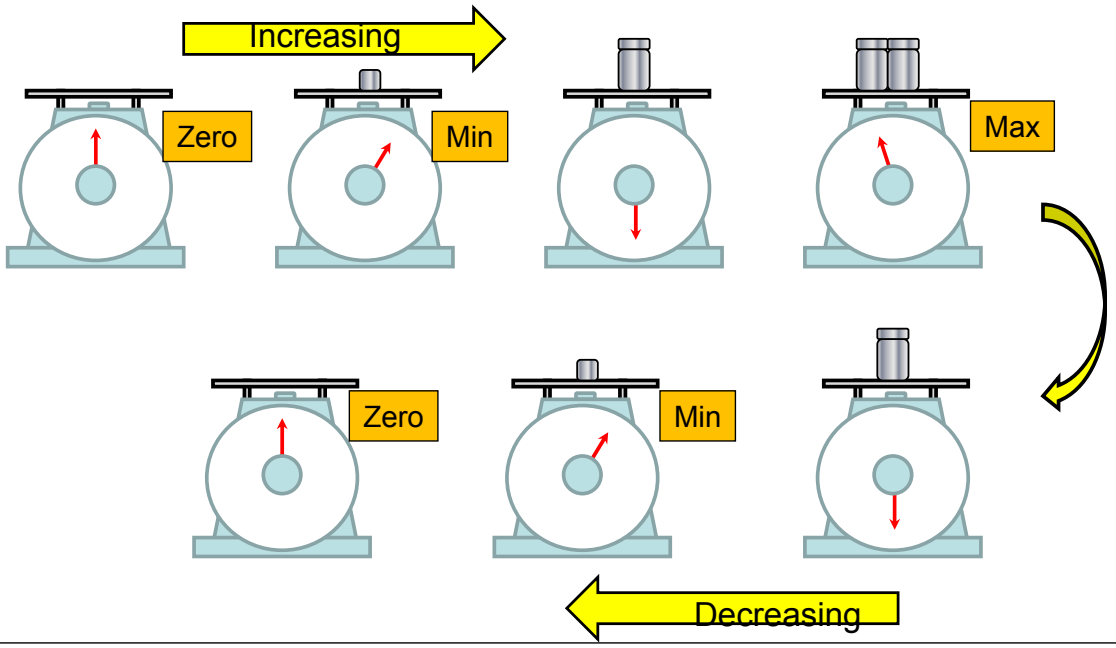
1) metrological characteristic

2) prescribed inscription and position for verification and control marks

Weighing Performance Test

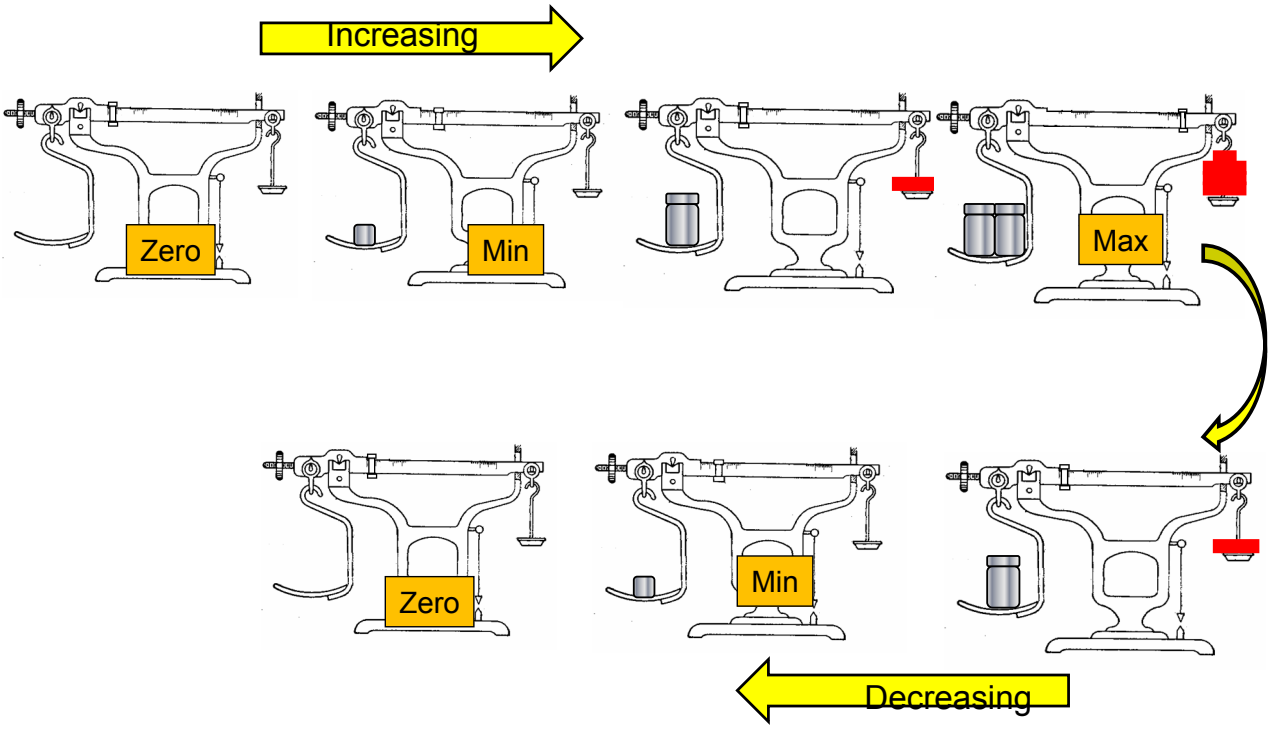
Apply test loads from zero up to and including Max, and similarly remove the test loads back to zero.

Self indication instruments



Non self indication instruments

Platform instrument



Determining the verification for weighing tests at least 5 shall be selected. The test loads selected shall include Max, and Min, and values at or near those at which the mpe changes.

Example : ***Max : 2 kg, e : 5 g, Min : 50 g, class 4***

Determining the test loads and mpe

Test load : Zero,
1 Min,
2 ??(mpe changes 1),
3 ??(mpe changes 2),
4 ??(any load),
5 Max

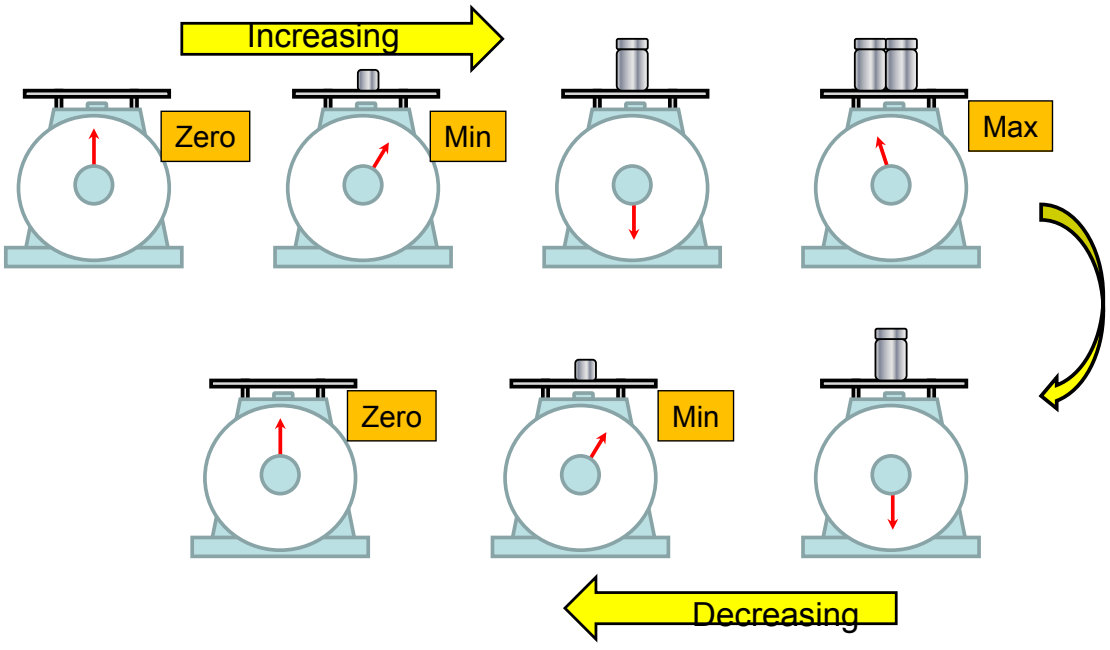
Test load : 0 g,
1 50 g,
2 250 g (mpe changes 1),
3 1000 g (mpe changes 2),
4 1500 g (Any load),
5 2000 g

Test load : 0 g,
1 50 g,
2 250 g
3 1000 g
4 1500 g
5 2000 g

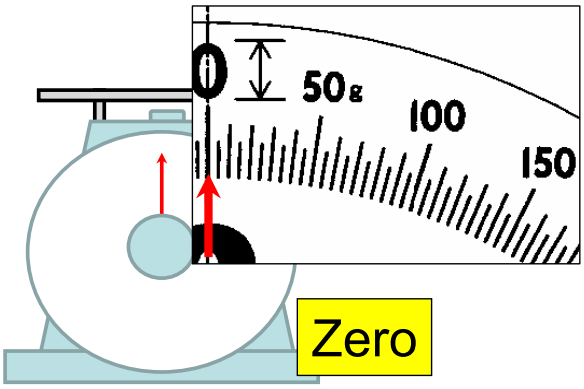
mpe ?

Test load : 0 g : 2.5 g
1 50 g : 2.5 g
2 250 g : 2.5 g
3 1000 g : 5 g
4 1500 g : 7.5 g
5 2000 g : 7.5 g

Load	Indication		Add.load		Error		Corrected error		mpe
0									2.5
50									2.5
250									2.5
1000									5
1500									7.5
2000									7.5

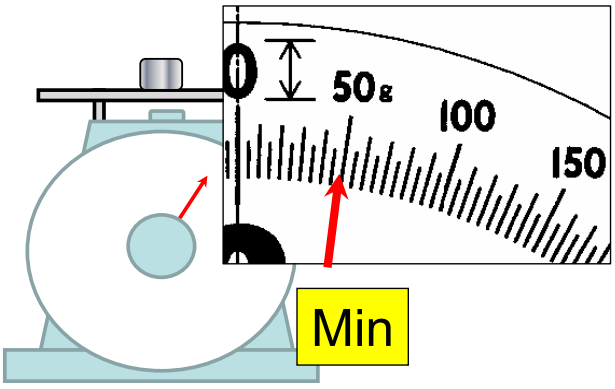


Weighing Performance Test



I = 0.0 g

L = 0 g



I = 49.5 g

L = 50 g

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Load	Indication		Add.load		Error		Corrected error		mpe
0	0.0	0.0							2.5
50	49.5	49.5							2.5
250	249.5	249.5							2.5
1000	999.5	999.5							5
1500	1499.5	1499.5							7.5
2000	1999.0								7.5

Error Formula

$$E = I - L$$

I = Indication L = Load

$$E_c = E - E_0$$

Load	Indication		Add.load		Error		Corrected error		mpe
0	0.0	0.0			0	0	0	0	2.5
50	49.5	49.5			-0.5	-0.5	-0.5	-0.5	2.5
250	249.5	249.5			-0.5	-0.5	-0.5	-0.5	2.5
1000	999.5	999.5			-0.5	-0.5	-0.5	-0.5	5
1500	1499.5	1499.5			-0.5	-0.5	-0.5	-0.5	7.5
2000	1999.0				-1.0		-1.0		7.5

Pass or Failed ?

Load	Indication		Add.load		Error		Corrected error		mpe
0	1.0	1.5							2.5
50	49.0	49.0							2.5
250	248.0	249.0							2.5
1000	998.0	999.0							5
1500	1498.0	1498.0							7.5
2000	1997.5								7.5

Pass or Failed ?

AIST

Load	Indication		Add.load		Error		Corrected error		mpe
0	1.0	1.5			1.0	1.5	0	0.5	2.5
50	49.0	49.0			-1.0	-1.0	-2.0	-2.0	2.5
250	248.0	249.0			-2.0	-1.0	-3.0	-2.0	2.5
1000	998.0	999.0			-2.0	-1.0	-3.0	-2.0	5
1500	1498.0	1498.0			-2.0	-2.0	-3.0	-3.0	7.5
2000	1997.5				-2.5		-3.5		7.5

Pass or Failed ?

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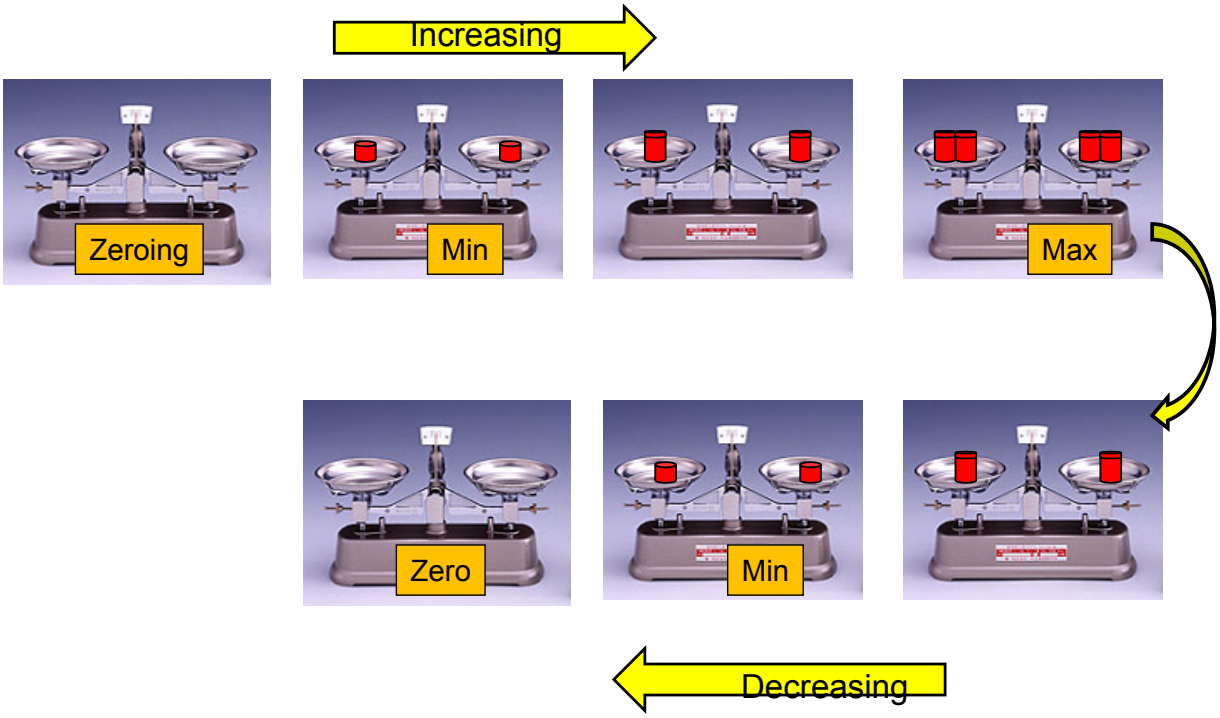
Non self indication instruments

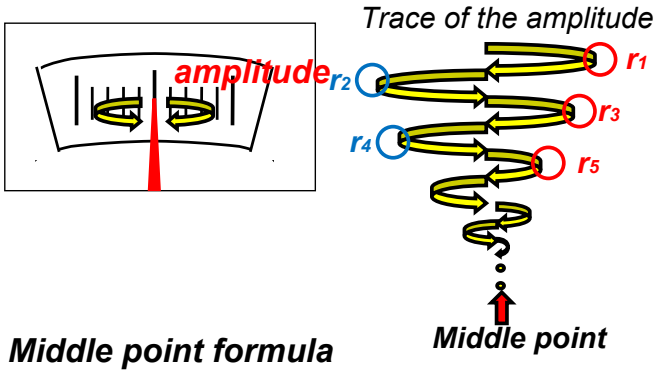
Equal arm balance (Non graduation)



Calculations

Error formula

$$E = \frac{\Delta}{2} \times \frac{n_1 + n_2 - 2n_0}{|n_2 - n_\Delta|}$$



Δ = e

n_0 : Middle point of zero

n_1 : Middle point of on loads

n_2 : Middle point when changed the load of right and left

n_Δ : Middle point when burdened Δ after the measurement of n_2

Middle point formula

$$\frac{1}{2} \times \left(\frac{r_1 + r_3 + r_5}{3} + \frac{r_2 + r_4}{2} \right)$$

Example : ***Max : 200 g, e : 0.2 g, Min : 4 g, class 3***

Determining the test loads and mpe

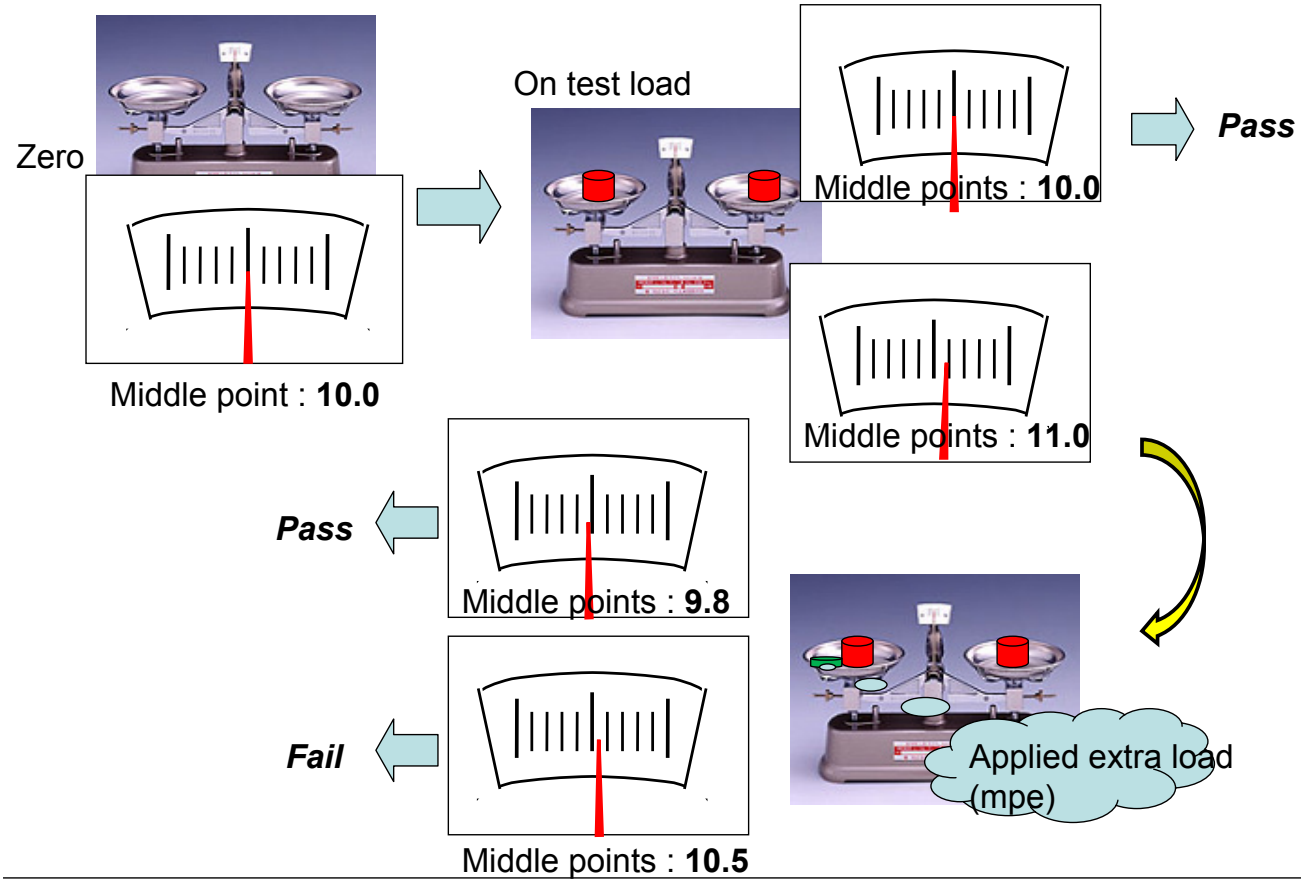
Test load : Zero,
1 Min,
2 ??(mpe changes 1),
3 ??(mpe changes 2),
4 ??(any load),
5 Max

Test load : 0 g,
1 4 g,
2 100 g (mpe changes 1),
3 --- g (mpe changes 2),
4 --- g ,
5 200 g

Test load : 0 g,
1 4 g,
2 50 g
3 100 g
4 150 g
5 200 g

mpe ?

Test load : 0 g, 0.1 g
1 4 g, 0.1 g
2 50 g 0.1 g
3 100 g 0.2 g
4 150 g 0.2 g
5 200 g 0.2 g

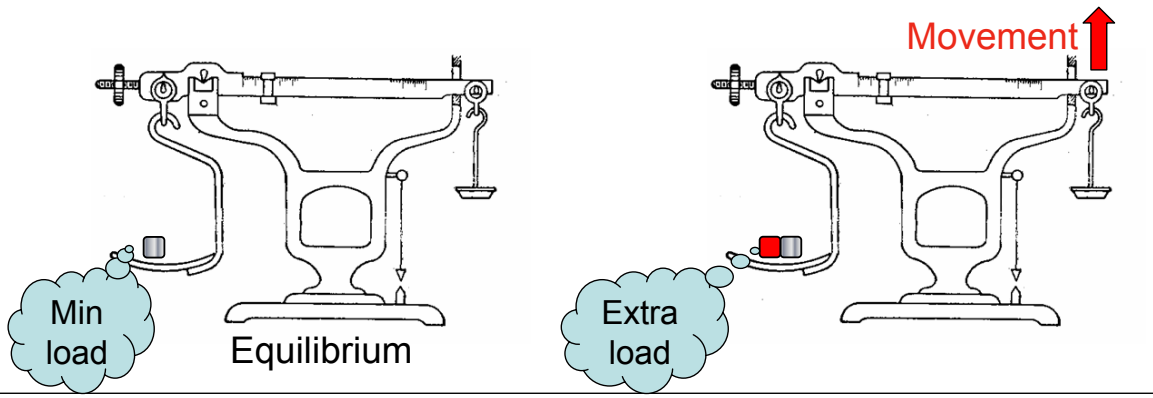


Discrimination test

Non self indicating instrument

An extra load equivalent to 0.4 times the absolute values of the maximum permissible error for the applied load when gently placed on or withdrawn from the instrument at equilibrium shall produce a visible movement of the indicating element.

This test shall be performed with three different loads. Min, 1/2Max, Max

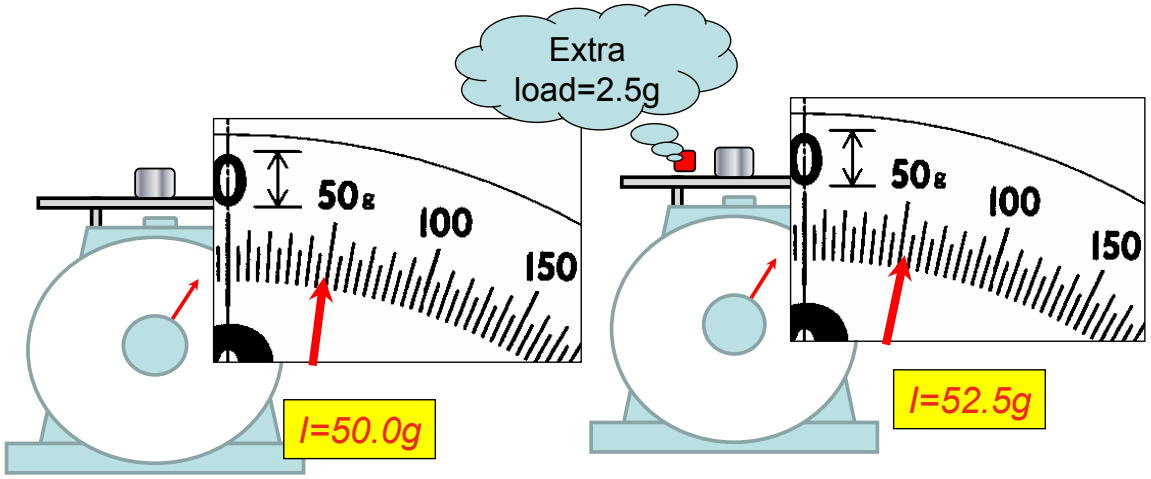


self or semi self indicating instrument

Analogue indication

An extra load equivalent to the absolute value of the maximum permissible error for the applied load when gently placed on or withdrawn from the instrument at equilibrium shall cause a permanent displacement of the indicating element corresponding to not less than 0.7 times extra load.

This test shall be performed with three different loads. Min, 1/2Max, Max



Analogue indication

Load	Indication I1	Extra load = mpe	Indication I2	I2-I1
50	50	2.5	52.5	2.5
1000	1000	5	1002.5	2.5
2000	2000	7.5	2005.0	5.0

Check if I2-I1 ≧0.7 mpe

Pass or Failed ?

Non self indicating instruments

Load	Indication	Extra load = 0.4 mpe	Movement

Mark visible movement by “+”

Pass or Failed ?

Sensitivity

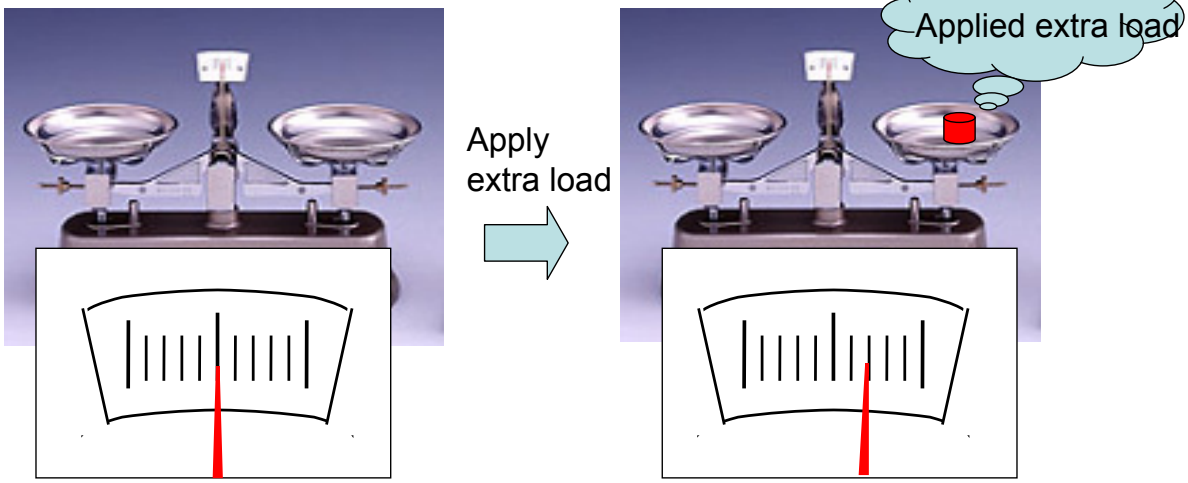
Only applied on non self indicating instrument

An extra load equivalent to the absolute value of the MPE for the applied load, shall be placed on the instrument at equilibrium and shall cause a permanent displacement of the indicating element of at least:

- 1 mm for an instrument of class 1 or 2;
- 2 mm for an instrument of class 3 or 4 with Max ≤30 kg;
- 5mm for an instrument of class 3 or 4 with Max >30 kg.

The test shall be performed with a minimum of two difference loads (e.g. zero and Max)

Test load : zero



Middle points of reading

Reading 1 : 10.0

Middle points of reading

Reading 2 : 12.0

Linear distance between reading 1 and reading 2

Repeatability

The difference between the results several weighings of the same load shall not be greater than the absolute value of the maximum permissible error of the instruments

Two series of weighings shall be performed ,one with a load of about 50% and one with a load close to 100% of Max. Normally no more than 3 weighings on class 3 and 4 or 6 weighings on classes 1 and 2 are necessary.

Repeatability Test

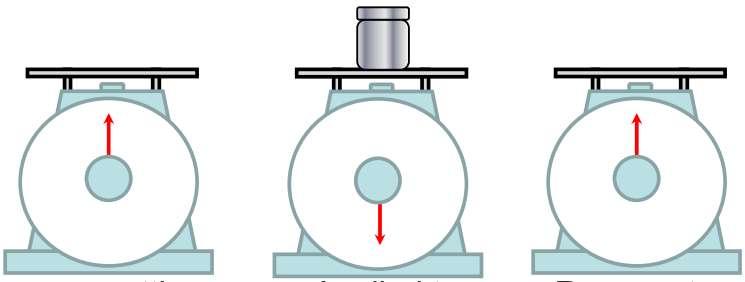
Analogue indication

Example : ***Max : 2 kg, e : 5 g, Min : 50 g, class 4***

Test load :

1 kg mpe : 5 g

2kg mpe : 7.5 g



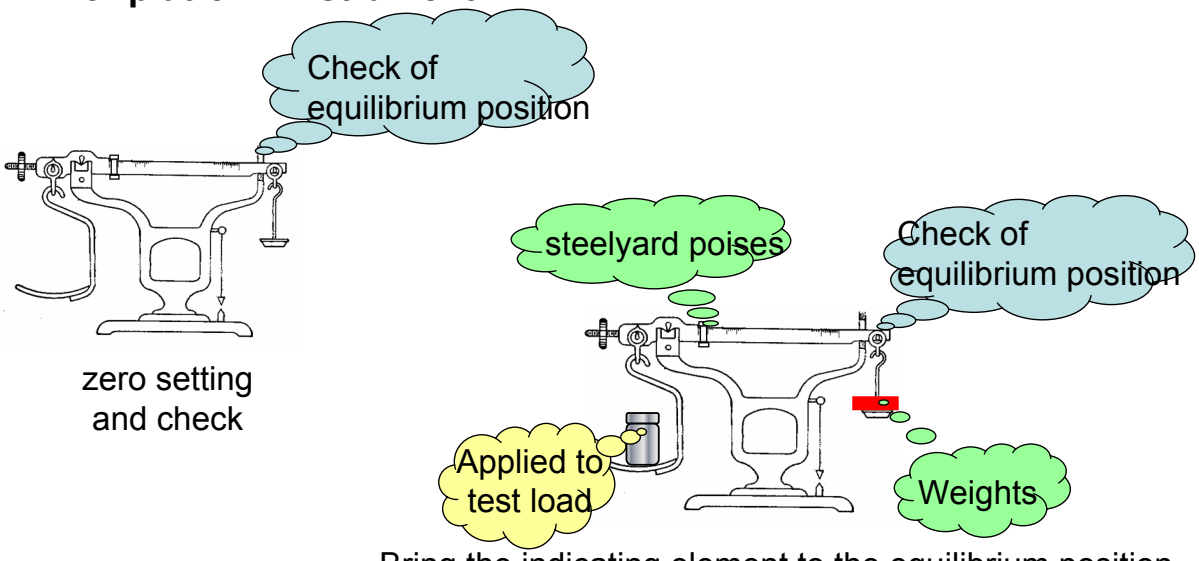
zero setting and check | Applied to test load | Remove to test load

No	Load	Indication	Load	Indication
1	1000	995.0	2000	1999.0
2	1000	999.5	2000	1995.0
3	1000	1000.5	2000	2000.0
	Max-Min	***5.5***	Max-Min	***5.0***

Pass or Failed ?

Non self indicating instrument

For platform instrument



zero setting and check

Bring the indicating element to the equilibrium position using the proportional weights and/or steelyard poises and note the indication.

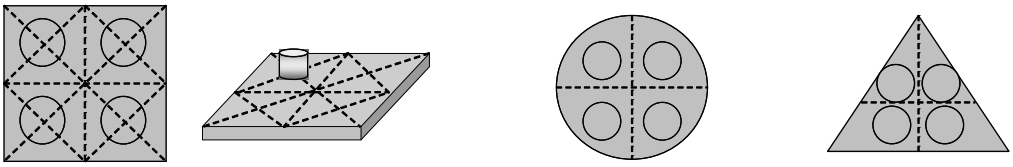
Eccentricity

Requirement 3.6.2

The Indications for different positions of a load shall meet the maximum permissible errors, when the is tested according to following.

➢ Instrument with a load receptor having ***n*** points of support,with ***n*** ≦ ***4***

Test load : (Max + Additive tare effect) /3



○ Load positions

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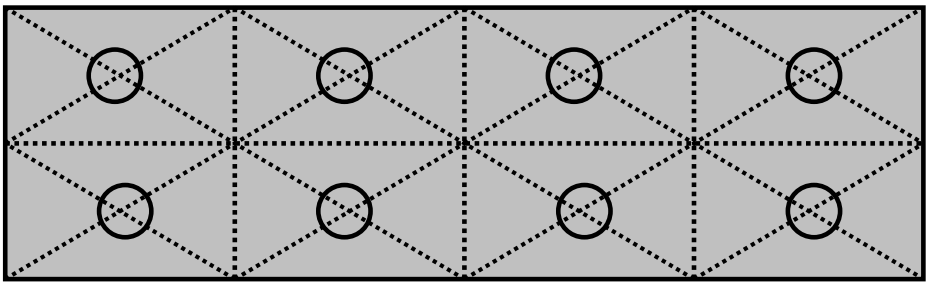
➢ Instrument with a load receptor having ***n*** points of support,with ***n*** > ***4***

Test load : (Max + Additive tare effect)/(n-1)



○ Load positions

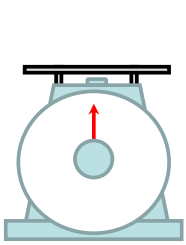
Eccentricity

Analogue indication

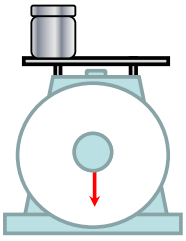
Example : Max : 30kg, e : 100 g, Min :1 kg, Class 4

n points of support, with ***n*** ≦ ***4***

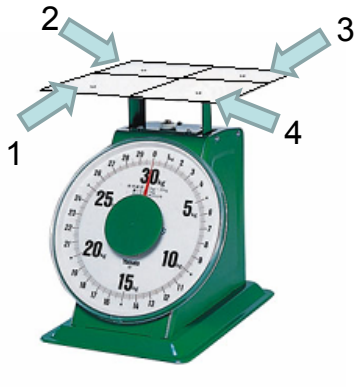
Test load : 10 kg



zero setting and check



Test load applied to No.1



Pass or Failed ?

Location	L	I	E	Ec	mpe
1	0	10	+10		
1	10000	9990	-10	-20	100
2	0	0	0		
2	10000	9900	-100	-100	100
3	0	10	+10		
3	10000	10010	+10	0	100
4	0	0	0		
4	10000	9950	-50	-50	100

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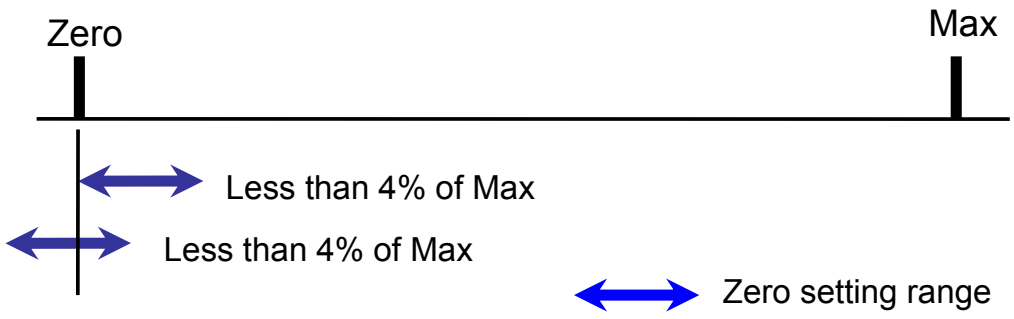
Zero-setting requirements

- The effect does not alter Max
- The accuracy is 0.25 e or 0.5 d on a auxiliary indicating device
- The range is 4 % of Max for zero-setting

Maximum effect



Zero setting accuracy

After zero setting the effect of zero deviation on the result of the weighing shall not be more than 0.25e; however, on an instrument with auxiliary indicating devices this effect shall be not more than 0.5d

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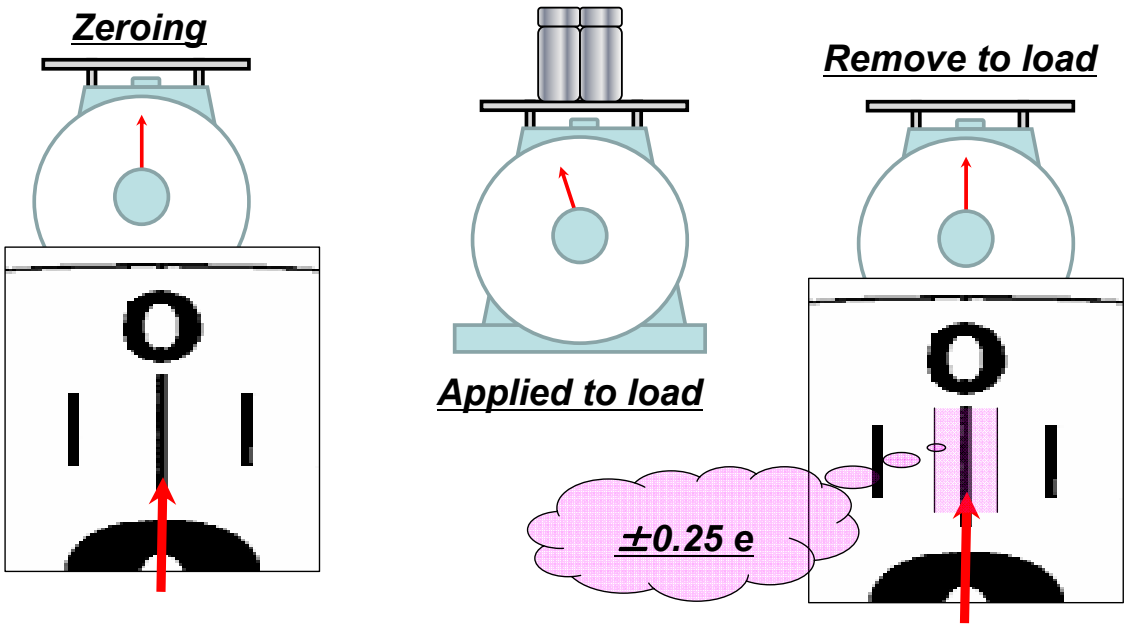
Analogue indication



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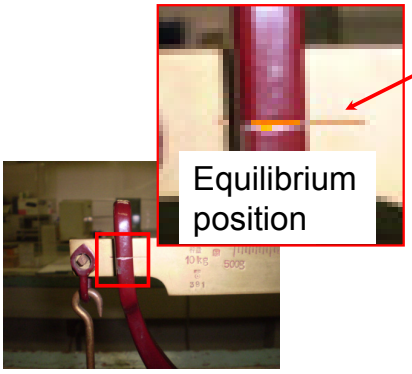
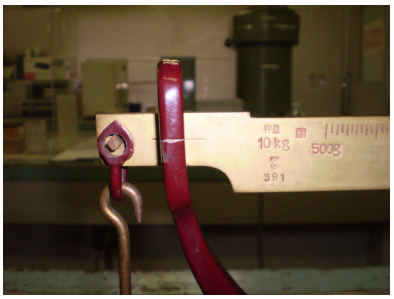
Non self indicating instrument



Zeroing

Applied to load

Check of equilibrium position after remove to load



If it has not returned to its equilibrium position,

- 0.25e on the appropriate load receptor or,
- 0.25e moves poise.

Indicator has moved through the equilibrium point the instrument	***Pass***
Indicator has not moved through the equilibrium point the instrument	***Fail***

Tare device

Device for setting the indication to zero when a load is on the load receptor:
Without altering the weighing range for net loads (additive tare device), or
Reducing the weighing range for net loads (subtractive tare device).
It may function as;

A non automatic device (load balanced by an operator),

A semi automatic device (load balanced automatically following a single manual command),

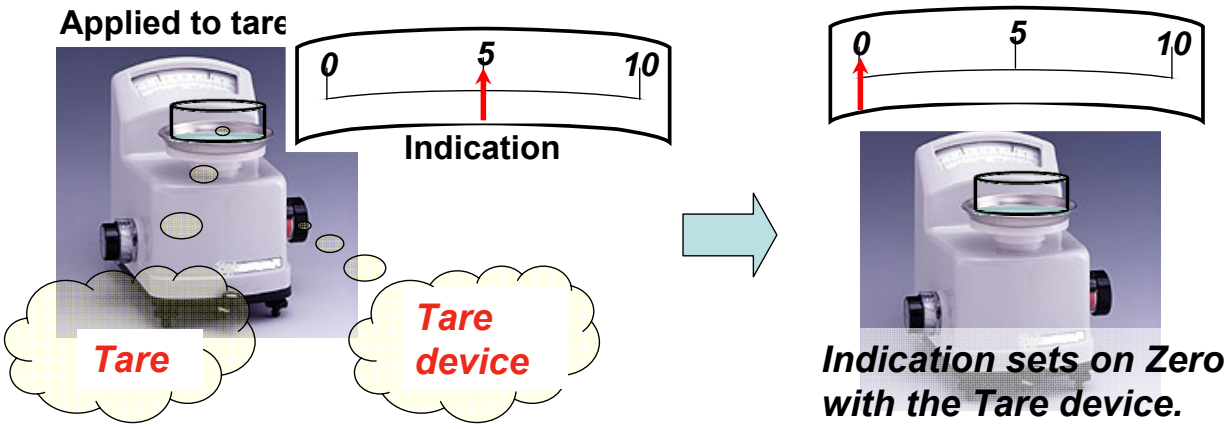
An automatic device (load balanced automatically without the intervention of an operator).

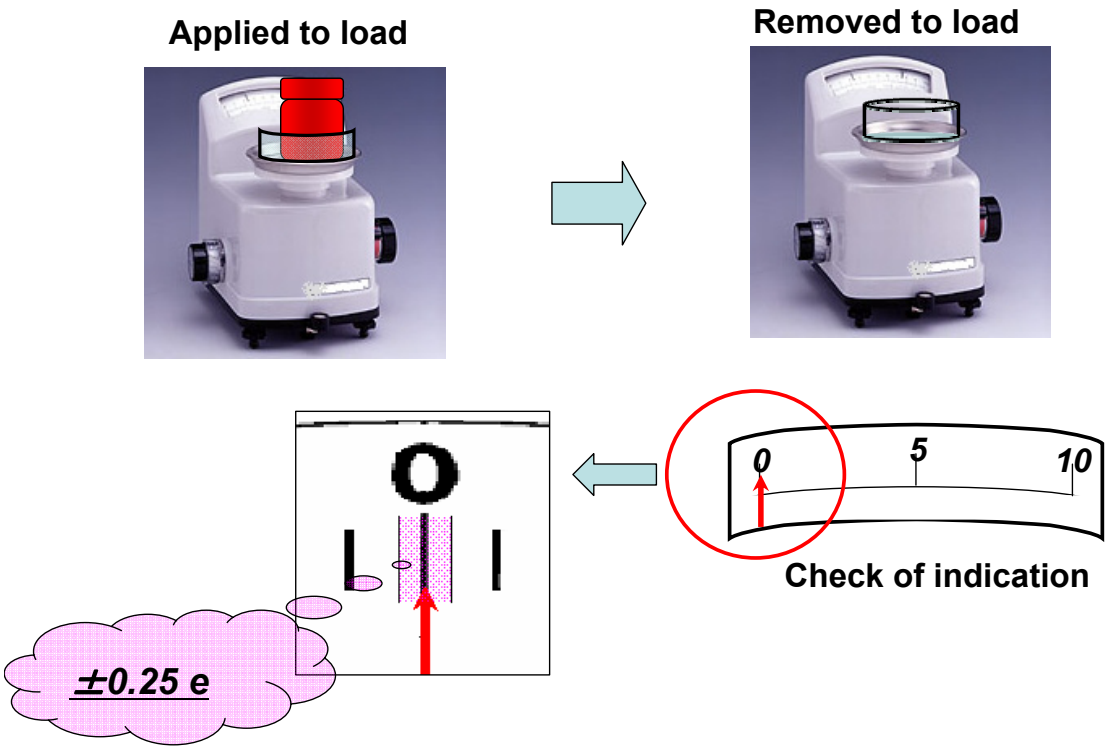
Tare setting accuracy

A tare device shall permit setting the indication to zero with an accuracy better than:

• ±0.25e for electronic instruments and any instrument with analogue indication;

Semi self indicating instrument





Metrological controls in Japan

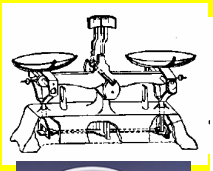
For non automatic weighing instruments

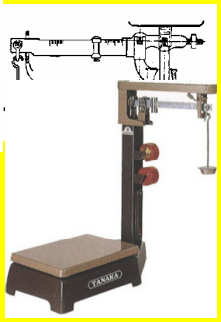
Information

Metrological controls in Japan

Non automatic weighing instruments

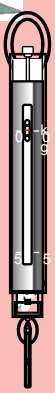
Mechanical type





No type approval

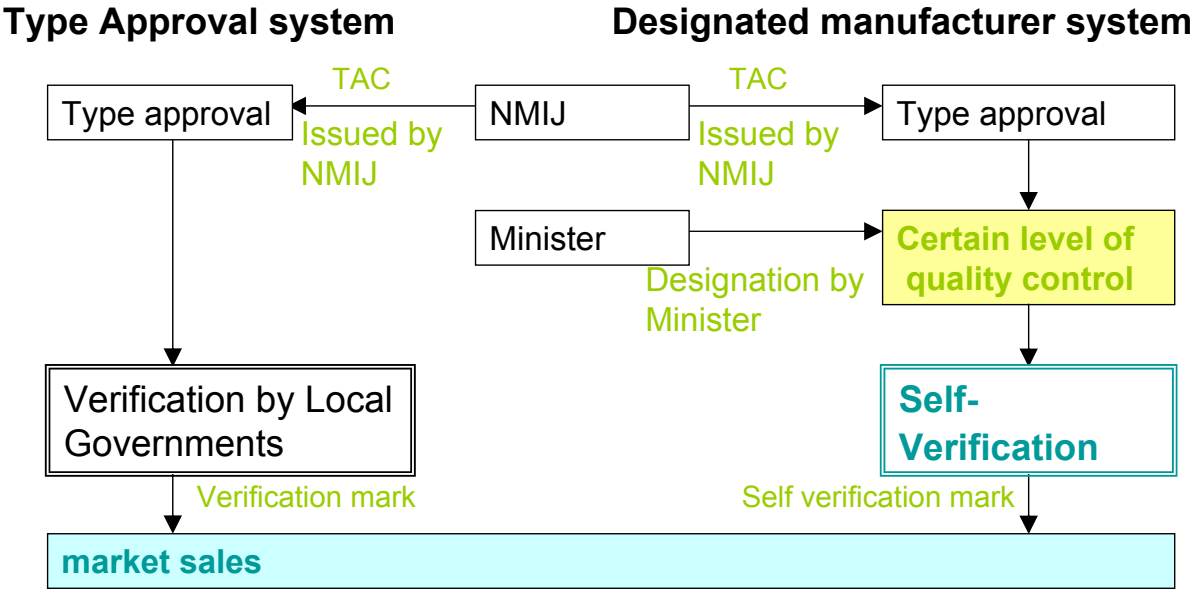
Electronically and spring type



Type approval objects

AIST

Metrological controls in Japan



Metrological controls in Japan

Initial Verification (Local Governments)

Re-verification
Local Governments (47)

- Taxi meters (1 year)
- Water meter(8 years)
- Hot water meters(8 years)
- Fuel-dispenser (7 years)
- Heatmeters(8 years)
- Illuminometers (2 years)
- Sound level meters (5 years)

, etc.

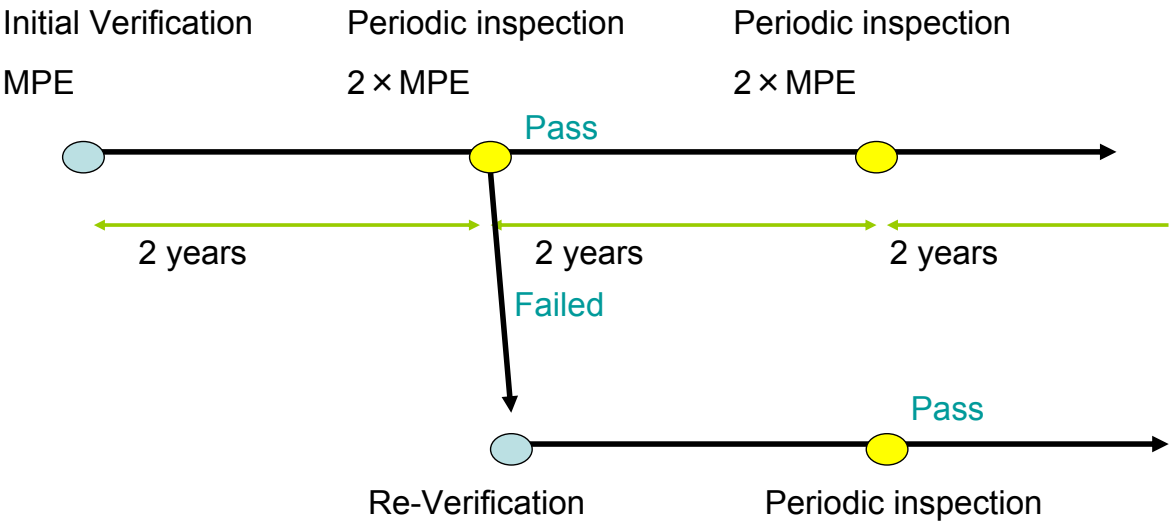
Periodic inspection
Local Governments (47)
& Special Cities (119)

- ***Weighting instrument (Once in two years)***
- Leather-area measuring machines (once a year)

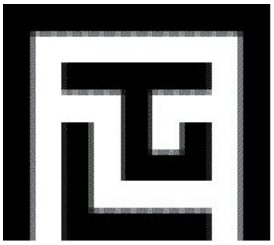
Initial only

- Hydrometers
- Glass clinical thermometer
- Aneroid sphygmomanometers

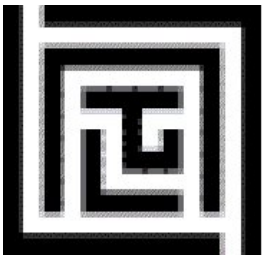
Non-automatic weighting instruments



Legal controls marks in Japan



Verification mark



Self-Verification mark

Periodic inspection mark

Number of verification and periodic inspection in Tokyo

2005.04 – 2006.03

		Verification	Inservice
Electronic		**225**	**8660**
Mechanical	(Spring)	**10,711**	**11,410**
	(Other)	**167**	**2703**
Total		**11,317**	**22,773**

Verification equipment for hanging scale in Tokyo

Verification of 500 pieces day is applied for as for hanging scale when it is a lot of.