

Mass Selection and Testing

Test Masses come in a wide range of classes, sizes, materials and accuracies. The combination of specifications will determine which masses suit your purpose, whether or not they meet your quality assurance processes, and will also affect the price greatly.

This guide is intended to explain the various elements to enable informed purchasing decisions. Wedderburn metrology specialists are available to help you navigate your choices.

CHOOSING THE RIGHT MASS

When choosing masses, you need to consider the following aspects.

- Accuracy (class) of mass
- Size of mass. Masses come in sizes that are multiples of 1, 2 and 5. This means that if you want a 1200 g test piece, then you would need to purchase a 1kg (1,000 g) and a 200 g mass.
- Material the mass is constructed from. This is particularly important if they will be used in a "food safe" area.
- Budget
- Calibration frequency

Wedderburn specialists can advise you on the correct masses to purchase based on your specific requirements.

MASS TESTING

Just like scales it is important to have masses tested on a regular basis to ensure that the mass is stable and still fit for purpose.

Wedderburn generally recommend a calibration frequency of 12 months for general use mass pieces.

We have qualified technicians located throughout New Zealand to perform mass calibration tests and provide supporting traceable documentation.

Topics Discussed:

Choosing the Right Mass

Mass Testing

Mass Material

What Affects Mass Accuracy

Correct Use of Test Masses

Metrology Bodies

OIML Mass Classes

Mass Class Tolerances



Specifications may change without notice

▲ **Labelling Equipment.**

Weighing Scales. Packaging Equipment. Labelling Equipment. Labels. Food Equipment. POS Solutions. Maintenance & Repairs.

MASS MATERIAL

Masses can be constructed using the various materials including; stainless steel, brass and cast iron. We've outlined benefits and potential downsides of each.

Stainless Steel

Stainless Steel is used for higher accuracy masses

Benefits;

- will not rust or corrode
- not susceptible to magnetism
- very stable

Downsides;

- expensive
- generally not adjustable

Brass

Brass is used for medium accuracy test weights.

Benefits;

- rust resistant
- not susceptible to magnetism
- adjustable (generally in masses larger than 50g)
- relatively cost effective

Downsides;

- may tarnish and go green due to oxidisation which will change the value of the mass,

Cast Iron

Cast Iron is used for larger masses and where lower accuracy is acceptable (legal).

Benefits;

- Cheap

Downsides;

- will rust
- can be magnetised

WHAT AFFECTS MASS ACCURACY?

Masses accuracy can be affected by the following;

- Impact damage. Paint and pieces falling of the mass due to rough handling
- Corrosion and rusting. Both will cause the value to change.
- Magnetism. A magnetic mass can affect the scale it is placed on.
- Temperature. Condensation can form on masses making them heavier

CORRECT USE OF TEST MASSES

It is important to know how to use your test masses correctly and how to interpret the results.

Here's how to check your scale.

- Level the scale, make sure that the bubble is in the middle of the level indicator
- Choose a mass (or masses) that will be close to the bulk of the work.
- Place the mass on scale and see that the displayed value is the same as the mass size.
- Remove the mass and repeat this above step 3 times.
- Move the mass (as long as the value chosen is less than one third scale capacity) around the corners of the platter without moving too close to the extreme outside of the platform. Please place the mass in the oval as shown in fig 1.

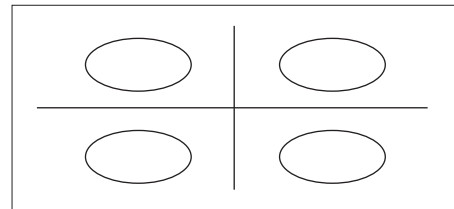


Fig. 1

What do if the scale indicator is not the same as the mass?

- Check the scale is level
- Check that the scale reads zero (0.00) before adding mass
- Check for damage on the mass changing it value
- Check to see that the area around the scale platter is clear from debris
- Remove the platter and clean under the platter

If the problem still persists, please contact your local Wedderburn technical service team.

METROLOGY BODIES

Metrology is defined as "the science of weights and measures or of measurement" and "a system of weights and measures".

In New Zealand, the weighing industry is guided by recommendations made by OIML (International Organisation of Legal Metrology).

These recommendations include how scales function, the shape and size of masses and construction of Load cells among other things.

- Mass recommendation are based on OIML R111-1.
- Scale recommendations are based on OIML R76.

OIML WEIGHT CLASSES

The following details are as published in OIML's International Recommendation OIML R 111

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 weights 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 instrumentation 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 III.

Classes M₁₋₂ and M₂₋₃

Weights from 50 kg to 5000 kg of lower accuracy intended for use with weighing instruments of medium accuracy Class III.



Specifications may change without notice

OIML MASS TOLERANCES

Masses have a “tolerance” that they should fall within applicable to their accuracy and the size of the tolerance will depend on the class of the mass.

The following Mass Tolerances are as published in OIML's International Recommendation OIML R 111.

Table 1. Maximum permissible errors for weights ($\pm \delta m$ in mg)

Nominal value*	Class E ₁	Class E ₂	Class F ₁	Class F ₂	Class M ₁	Class M ₁₋₂	Class M ₂	Class M ₂₋₃	Class M ₃
5 000 kg			25 000	80 000	250 000	500 000	800 000	1 600 000	2 500 000
2 000 kg			10 000	30 000	100 000	200 000	300 000	600 000	1 000 000
1 000 kg		1 600	5 000	16 000	50 000	100 000	160 000	300 000	500 000
500 kg		800	2 500	8 000	25 000	50 000	80 000	160 000	250 000
200 kg		300	1 000	3 000	10 000	20 000	30 000	60 000	100 000
100 kg		160	500	1 600	5 000	10 000	16 000	30 000	50 000
50 kg	25	80	250	800	2 500	5 000	8 000	16 000	25 000
20 kg	10	30	100	300	1 000		3 000		10 000
10 kg	5.0	16	50	160	500		1 600		5 000
5 kg	2.5	8.0	25	80	250		800		2 500
2 kg	1.0	3.0	10	30	100		300		1 000
1 kg	0.5	1.6	5.0	16	50		160		500
500 g	0.25	0.8	2.5	8.0	25		80		250
200 g	0.10	0.3	1.0	3.0	10		30		100
100 g	0.05	0.16	0.5	1.6	5.0		16		50
50 g	0.03	0.10	0.3	1.0	3.0		10		30
20 g	0.025	0.08	0.25	0.8	2.5		8.0		25
10 g	0.020	0.06	0.20	0.6	2.0		6.0		20
5 g	0.016	0.05	0.16	0.5	1.6		5.0		16
2 g	0.012	0.04	0.12	0.4	1.2		4.0		12
1 g	0.010	0.03	0.10	0.3	1.0		3.0		10
500 mg	0.008	0.025	0.08	0.25	0.8		2.5		
200 mg	0.006	0.020	0.06	0.20	0.6		2.0		
100 mg	0.005	0.016	0.05	0.16	0.5		1.6		
50 mg	0.004	0.012	0.04	0.12	0.4				
20 mg	0.003	0.010	0.03	0.10	0.3				
10 mg	0.003	0.008	0.025	0.08	0.25				
5 mg	0.003	0.006	0.020	0.06	0.20				
2 mg	0.003	0.006	0.020	0.06	0.20				
1 mg	0.003	0.006	0.020	0.06	0.20				

*The nominal weight values in Table 1 specify the smallest and largest weight permitted in any class of R 111 and the maximum permissible errors and denominations shall not be extrapolated to higher or lower values. For example, the smallest nominal value for a weight in class M₂ is 100 mg while the largest is 5 000 kg. A 50 mg weight would not be accepted as an R 111 class M₂ weight and instead should meet class M₁ maximum permissible errors and other requirements (e.g. shape or markings) for that class of weight. Otherwise the weight cannot be described as complying with R111.

References:

www.oiml.org/en/files/pdf_r/r111-1-e04.pdf/view

Specifications may change without notice