

Correct Weight Handling 12 Practical Tips

How you handle, clean and store test weights can make a sizeable difference in the ongoing accuracy of your weighing processes.

Considerable weighing errors can arise if you use a balance tested with mishandled reference weights. The percentage mass variation becomes particularly critical when using small weights or working with tight tolerances.

This paper describes actions you can take to ensure your reference weights maintain accuracy long-term. This accuracy will help you avoid weighing errors and costs associated with rework, waste disposal, and product recall.



Correct weight handling with carbon-tipped tweezers.

Actions that keep weights clean and accurate

Introduction

Weights are the most important equipment used for calibration and testing of scales and balances. Weights external to the balance are used for scheduled periodic routine testing of the balance. This requires manually handling a set of test weights suitable for the balance being tested.

Anytime external weights are used, handling and storage becomes critical. A mere brush of the hand can negatively affect both the mass of the test weight and routine testing results (see Figure 1). This in turn results in a false rejection of the balance or incorrectly formulated products which may pose a health risk, necessitating costly rework or recall efforts.

Our list of suggestions follows. First, we present how weights should be handled, then move on to review actions that should not be taken if you want to maintain the integrity and accuracy of weights, regardless of size or material.



Use original packaging to store weights whenever possible.

1. Store weights in original packaging

Did your weights come in an appropriate carrying case? Use it. It will keep your weights from gathering dust, and padded resting places for weights of different sizes will help prevent mix-ups. Per OIML R 111-1:2004, using a specialized storage case is most important for weights under 500 g. Larger weights can be stored in clean spaces with suitable covering. If weights are out of their case or stored under a bell jar, they should rest on sheets of clean, acid-free tissue (rather than on the base of the jar itself).

2. Store weights near the balance

Storing weights near the balance where they will be used helps to ensure that both the balance and weights are similarly acclimatized. If you must bring the weights from a storage area to the balance, allow sufficient time for them to come to a similar state. Acclimatization will require more time if weights are larger and have been in an area with dissimilar characteristics, such as carried outside on a cold winter day. For recommended thermal stabilization times, please see OIML R 111-1: 2004 (E) Annex B.4.3 or ASTM E617-E Table 10.

3. Handle with care

This includes everything from wearing clean nylon or leather gloves when touching weights to using special tweezers with coated tips to lift them from their resting places. Beware of objects that can scratch the surface of the weight, and take particular care not to slide the weight across a balance's metal weighing pan to avoid microabrasions.

4. Clean according to OIML/ASTM recommendations

Under ideal circumstances, precision or mass calibration weights should never need cleaning. However, in practice this is not always the case. Whether you can clean a weight yourself or not depends on the weight's size and process criticality. In general, remove dust with a specially-designed brush, soft microfiber cloth, or rubber bellows.

5. Use specialized handles for bigger weights

Using specialized handles for lifting does more than protect the weight's surface finish. It also provides a more ergonomic lifting experience to protect the health of the operator.

6. Inspect for damage prior to use

Particularly if you share the weight set among various shifts or lab personnel, always check the surface for impurity, corrosion, or foreign substances before use. Issues to watch for include dust, fingerprints, or surface marks. If necessary, a magnifying glass or microscope can be used as an assistive aid.

Actions to be avoided to protect test weights

7. Do not touch weights with bare hands

This is especially critical for weights with tighter tolerances and smaller nominal weights. Skin acids disrupt a weight's surface. Experience shows that fingerprints and the foreign matter they deposit can affect mass by up to +50 µg (Figure 1). Non-magnetic, non-abrasive tweezers or synthetic or leather gloves are generally recommended for handling, though weights of less tight tolerances can also be handled using clean cotton gloves.

8. Do not forget periodic recalibration

Even when weights are handled with care, they experience wear. Adhering to recalibration schedules stipulated by ISO 9001 helps keep processes accurate. Calibration results are documented in calibration certificates with details of conventional mass correction, uncertainty and traceability information according to ISO/IEC 17025.

9. Do not use a weight with dust or water on its surface

This can be especially problematic if weights have been stored outside their storage container or have been brought from one area to another where temperature and humidity differ. Allow weights to acclimatize and/or follow cleaning recommendations mentioned under point 4.

10. Do not use a weight when in doubt

Inspect it first using appropriate devices (gloves, tweezers, handles, magnification aid). If marks are visible, decide whether the marring will affect accuracy. Under metro-

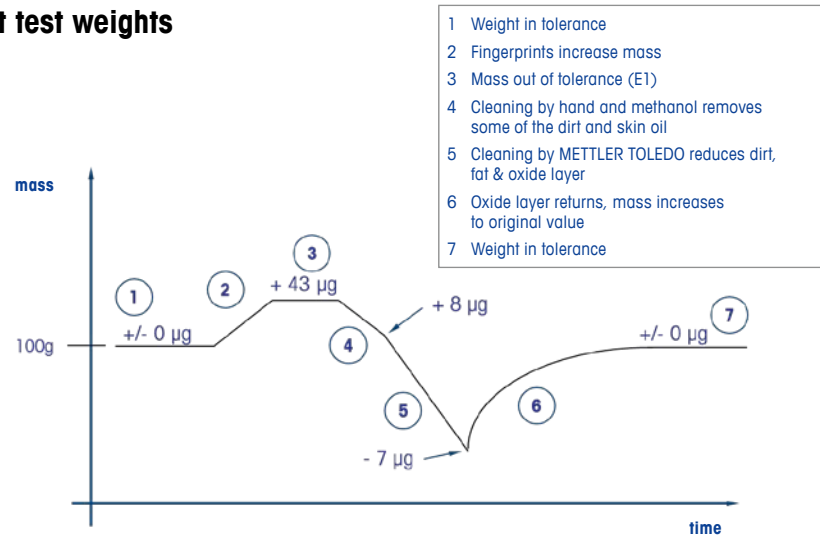


Figure 1: In extreme cases, fingerprints can permanently affect mass if weights are not cleaned properly.

logical aspects, traces of marring are irrelevant when the requirements of OIML R 111-1: (2004), section 11 "Surface Conditions" are met. (Though when in doubt, always recalibrate the weight in an accredited calibration laboratory.)

11. Do not clean with abrasive or caustic chemicals

Caustic or abrasive substances can damage the outer surface or "skin" of the weight. This can decrease weight mass by removing the oxidized layer or increase mass by causing additional oxidation or rust. Either way, accuracy is negatively impacted.

12. Do not underestimate static

Electrostatic charges can influence results. Limit friction between the weight and other surfaces such as cleaning tissues. After cleaning or drying, be sure to allow the weight to rest to allow static to dissipate. All METTLER TOLEDO balances are grounded to eliminate static influences. Conductive carbon-tipped tweezers also help eliminate static charges.



High-quality, FDA-suitable foam inserts do not produce residue, even after years of use.

Weight storage and transport

Test weights are best kept in original packaging designed for the purpose. When transported, weights are carried in specially-built boxes. METTLER TOLEDO offers a full range of storage and transportation boxes which contain appropriate weight compartments.



METTLER TOLEDO is currently using wood, aluminum and plastic for storage and carrying cases. For certain cases, aluminum is replacing plastic because it is more robust.

Effective weight handling

METTLER TOLEDO offers a full line of appropriate handling and storage devices. This includes a range of ergonomic tweezers to manage even microgram weights. Ceramic-tipped tweezers allow handling of weights with diameters as small as 0.05 mm.



Conductive carbon-tipped tweezers help eliminate static charges.

Accredited mass laboratories

Accurately calibrated weights are at the base of accurate weighing results. METTLER TOLEDO accredited mass laboratories clean, calibrate, and adjust weights, and then document the results of our calibration efforts in a calibration certificate. The certificate covers



the basic reporting of conventional mass correction and documents uncertainty and traceability information in accordance with ISO/IEC 17025 requirements. All METTLER TOLEDO accredited mass laboratories meet or exceed process guidelines stipulated by ISO/IEC 17025, FDA, GMP regulations.

References

International Recommendation OIML R111-1, OIML, 2004. Downloaded by permission.

"ASTM E617 – 13" American Society for Testing and Materials, 2013. Downloaded by permission.

Cleaning, Handling and Storage of Weights, Good Practice Guide, www.npl.co.uk

Calibration: What is it?, METTLER TOLEDO, 30260955B; 02/2017

SOP for Periodic Repeatability Tests (Routine Tests), METTLER TOLEDO, 11793057; 06/2009

Standard procedures of the METTLER TOLEDO Calibration Laboratory, Greifensee, Switzerland

e-learning "Balance Routine Testing", METTLER TOLEDO 2015, ► www.mt.com/lab-elearning

www.mt.com/weights

For more information

METTLER TOLEDO Group

Local contact: www.mt.com/contacts

Subject to technical changes

© 09/2019 METTLER TOLEDO. All rights reserved

30304785C

Group MarCom 2779 MB/AG