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REFERER



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TEST WEIGHTS

A SHORT INTRODUCTION TO THE BASICS



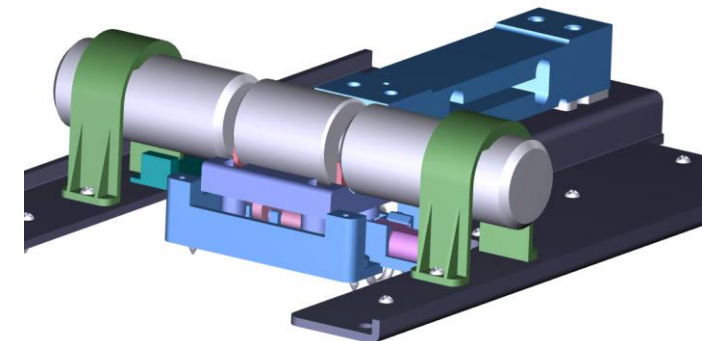
AREAS OF APPLICATION

- **Formerly:**
 - Weights were part of the scales and necessary for weighing.
 - This purpose has now almost completely disappeared.



AREAS OF APPLICATION (Today)

- **Adjustment**
 - Precise adjustment of the scales is a prerequisite for accurate measurement results.
 - **Important:** Balances without an internal calibration weight should always be calibrated at the place of installation!
- **Calibration**
 - Provides information on accuracy, linearity and behavior when a scale is loaded off-center.
 - **Important:** Scales should be checked regularly.
- **Other purposes**
 - Newton weights.
 - Internal calibration weight in scales.



OIML R111

What is the OIML R111?



Organisation Internationale de
Métrieologie Légale
International Organization of
Legal Metrology

- The OIML guideline R111 is an international recommendation for test weights.
- All relevant properties are specified, for example material, surface finish, markings, structure, shape, etc.
- In the OIML, representatives from almost 100 countries work on standardised construction and testing regulations for all measuring instruments. In the OIML certification system, the certificates issued by the member states certify that a particular type of measuring instrument complies with the OIML recommendations. This means that a type tested and approved in one country can be approved in another without having to repeat the test. (Extract from PTB)

OIML R111 – Accuracy Classes

Klasse	
E1	<ul style="list-style-type: none"> • Traceability to national mass standard (traceability to original kilogram) • Calibration certificate is required
E2	<ul style="list-style-type: none"> • For balances of accuracy class I • Calibration certificate is required
F1	<ul style="list-style-type: none"> • For balances of accuracy classes I and II
F2	<ul style="list-style-type: none"> • For commercial transactions with scales of accuracy class II (e.g. precious metals and precious stones)
M1	<ul style="list-style-type: none"> • For balances of accuracy class III
M2	<ul style="list-style-type: none"> • For balances of accuracy class III (general commercial transactions)
M3	<ul style="list-style-type: none"> • For balances of accuracy class III and accuracy class IIII

Nennwert OIML R111:2004 Fehlergrenzen = zulässige Toleranzen „Tol ± mg“

↓	E1	E2	F1	F2	M1	M2	M3
1 mg	± 0,003 mg	± 0,006 mg	± 0,020 mg	± 0,06 mg	± 0,20 mg	-	-
2 mg	± 0,003 mg	± 0,006 mg	± 0,020 mg	± 0,06 mg	± 0,20 mg	-	-
5 mg	± 0,003 mg	± 0,006 mg	± 0,020 mg	± 0,06 mg	± 0,20 mg	-	-
10 mg	± 0,003 mg	± 0,008 mg	± 0,025 mg	± 0,08 mg	± 0,25 mg	-	-
20 mg	± 0,003 mg	± 0,010 mg	± 0,03 mg	± 0,10 mg	± 0,3 mg	-	-
50 mg	± 0,004 mg	± 0,012 mg	± 0,04 mg	± 0,12 mg	± 0,4 mg	-	-
100 mg	± 0,005 mg	± 0,016 mg	± 0,05 mg	± 0,16 mg	± 0,5 mg	± 1,6 mg	-
200 mg	± 0,006 mg	± 0,020 mg	± 0,06 mg	± 0,20 mg	± 0,6 mg	± 2,0 mg	-
500 mg	± 0,008 mg	± 0,025 mg	± 0,08 mg	± 0,25 mg	± 0,8 mg	± 2,5 mg	-
1 g	± 0,010 mg	± 0,03 mg	± 0,10 mg	± 0,3 mg	± 1,0 mg	± 3,0 mg	± 10 mg
2 g	± 0,012 mg	± 0,04 mg	± 0,12 mg	± 0,4 mg	± 1,2 mg	± 4,0 mg	± 12 mg
5 g	± 0,016 mg	± 0,05 mg	± 0,16 mg	± 0,5 mg	± 1,6 mg	± 5,0 mg	± 16 mg
10 g	± 0,020 mg	± 0,06 mg	± 0,20 mg	± 0,6 mg	± 2,0 mg	± 6,0 mg	± 20 mg
20 g	± 0,025 mg	± 0,08 mg	± 0,25 mg	± 0,8 mg	± 2,5 mg	± 8,0 mg	± 25 mg
50 g	± 0,03 mg	± 0,10 mg	± 0,3 mg	± 1,0 mg	± 3,0 mg	± 10 mg	± 30 mg
100 g	± 0,05 mg	± 0,16 mg	± 0,5 mg	± 1,6 mg	± 5,0 mg	± 16 mg	± 50 mg
200 g	± 0,10 mg	± 0,3 mg	± 1,0 mg	± 3,0 mg	± 10 mg	± 30 mg	± 100 mg
500 g	± 0,25 mg	± 0,8 mg	± 2,5 mg	± 8,0 mg	± 25 mg	± 80 mg	± 250 mg
1 kg	± 0,5 mg	± 1,6 mg	± 5,0 mg	± 16 mg	± 50 mg	± 160 mg	± 500 mg
2 kg	± 1,0 mg	± 3,0 mg	± 10 mg	± 30 mg	± 100 mg	± 300 mg	± 1 000 mg
5 kg	± 2,5 mg	± 8,0 mg	± 25 mg	± 80 mg	± 250 mg	± 800 mg	± 2 500 mg
10 kg	± 5,0 mg	± 16 mg	± 50 mg	± 160 mg	± 500 mg	± 1 600 mg	± 5 000 mg
20 kg	± 10 mg	± 30 mg	± 100 mg	± 300 mg	± 1 000 mg	± 3 000 mg	± 10 g
50 kg	± 25 mg	± 80 mg	± 250 mg	± 800 mg	± 2 500 mg	± 8 000 mg	± 25 g
100 kg	-	± 160 mg	± 500 mg	± 1 600 mg	± 5 000 mg	± 16 g	± 50 g
200 kg	-	± 300 mg	± 1 000 mg	± 3 000 mg	± 10 g	± 30 g	± 100 g
500 kg	-	± 800 mg	± 2 500 mg	± 8 000 mg	± 25 g	± 80 g	± 250 g
1 000 kg	-	± 1 600 mg	± 5 000 mg	± 16 g	± 50 g	± 160 g	± 500 g
2 000 kg	-	-	± 10 g	± 30 g	± 100 g	± 300 g	± 1 000 g
5 000 kg	-	-	± 25 g	± 80 g	± 250 g	± 800 g	± 2 500 g

Standard Marking

- **E1 / E2**
 - No marking
- **F1**
 - Nominal value; without unit
- **F2**
 - Nominal value; without unit
 - “F” (stands for F2)
- **M1**
 - Nominal value; with unit
 - “M” or “M1”

Custom Marking

- The weights can be marked to avoid confusion with different sets.
- Short ID or the last digits of SN can be used as marking.

Restrictions

- The size of the weights
- Existing (standard) markings
- There are some restriction from the OIML, because the marking changes the surface.

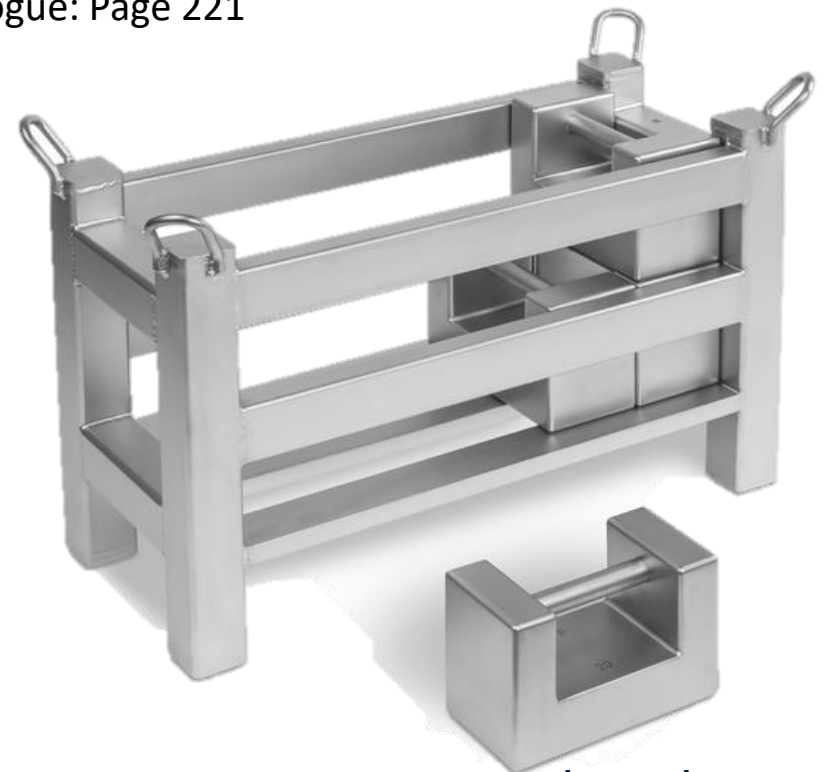
Construction types

- **Check Weights**
 - With handle
 - Stackable
 - Stainless steel
- **Weight Baskets for Check Weights**
 - For testing floor and crane scales
 - Calibration possible
 - Catalogue: Page 221



Construction types

- **Block Weights**
 - With handle
 - Stackable
 - Stainless steel or Cast Iron
- **Weight Baskets for Block Weights**
 - For testing floor and crane scales
 - Calibration possible
 - Catalogue: Page 221



Construction types

Wire Weights

- 1 mg / 10 mg / 100 mg = **Triangle**
- 2 mg / 20 mg / 200 mg = **Square**
- 5 mg / 50 mg / 500 mg = **Pentagon**



Sheet Weights

- 1 mg / 10 mg / 100 mg = **Triangle**
- 2 mg / 20 mg / 200 mg = **Square**
- 5 mg / 50 mg / 500 mg = **Pentagon**



Construction types – Knob Form Shapes



Test weight	→ Knob shape with lifting knob, polished stainless steel	Compact shape with carrying grip, polished stainless steel	Knob shape with lifting knob, polished stainless steel	ECO shape, polished stainless steel	Knob shape with lifting knob, finely turned stainless steel
Features	↓				
Conforms to OIML:R 111	yes	yes	yes	yes	yes
Available classes	E1, E2	E2	F1	F1	F2, M1
Upper surface	polished	polished	polished	polished	finely turned
Material	Stainless steel	Stainless steel	Stainless steel	Stainless steel	Stainless steel
Adjusting cavity	no	no	yes	yes, from 50 g, readjustment can only be carried out by KERN	yes, from 20 g
Marking (Milligram weights, generally none)	none	none	Nominal value, etched	Nominal value, etched	F2: Class + nominal value, etched; M1: Class + nominal value, adopted

Construction types

Hook Weights

- With hook for attaching
- Available as Newton weight



Newton Weights

- **Newton weights must be adjusted to the place of use.**
- The **gravitational constant** (and height) must be specified for processing
- The gravitational constant can be determined via the address, but the information is less accurate. (maximum class M1 possible)

Construction types

- **Slotted weights**
- With hook for attaching
- Available as a Newton weight
- Support bar can be fitted with several individual weights

Type A



Type B



Construction types - New slot weights from 2024

Serie 347-xx7



- Improved design available from 2024.
- Enables higher loads. (up to 180 kg)
- Individual weights from 5 g to 10 kg
- Recessed grip for safe carrying.
- Weights from 100 g hold onto each other thanks to guide on underside.
- Also available as a Newton weight on request.

Custom Weights

- Please feel free to contact us!



Gewichtskette
2 x 2 kg und 1 x 1 kg
Die Gewichte werden mit
einer Liniereinheit auf die
Waage aufgesetzt.

Weight chain 2 x 2 kg and
1 x 1 kg – the weights are
set onto the scale by a
linear unit.



Scheibengewichte 10 x 50 kg
mit Trägerstange

Disc weights 10 x 50 kg with
support bar



500 kg Zylindergewicht

500 kg cylinder weight

Ungerade Nennwerte z. B. 25 g, 30 g, 40 g

Odd nominal values, e.g. 25 g, 30 g, 40 g

How to determine the correct test weight/adjustment weight?

1. Nominal value:

If the weight is used to calibrate the balance, it should correspond to at least 80 % of the largest weighing range. (Observe the scale manufacturer's specifications)

2. Accuracy

The accuracy of the test weight must correspond approximately to the readability [d] of the scale.

3. Note:

A single weight is preferable to several weights.

Tip:

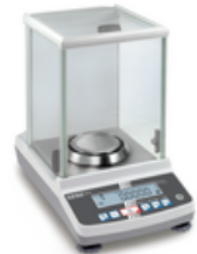
The recommended calibration weight is specified in the operating instructions for the scale. You can also find the correct weight in our web store under "Accessories" or use our test weight calculator in the shopping cart.

Test Weight Calculator

- When purchasing scales, the appropriate test weight can be selected in the shopping basket
- The accuracy can be selected using the slider (e.g. 0.00016 % of Max)

KERN ABJ 220-4NM in den Warenkorb legen:

Bitte gewünschte Stückzahl(en) angeben!



Modell	Artikelnummer	Preis	Stückzahl	Gesamtpreis
Analysewaage Analysewaage ABJ 220-4NM, Wägebereich 220 g, Ablesbarkeit 0,0001 g	ABJ 220-4NM	€ 1.500,00	<input type="text" value="1"/>	€ 1.500,00
Installation und Prüfung ⓘ				
Gewünschtes Genauigkeitsniveau: <input type="range" value="0,00016"/>		0,00016 % von Max	Postleitzahl des Verwendungsorts: <input type="text"/>	
<input checked="" type="checkbox"/> Günstiges individuelles Gewicht für Prüfung & Justierung erreichte Genauigkeit: 0,00016 % ⓘ				
E2 200 g Prüfgewicht Kompaktform, Edelstahl poliert (OIML)	316-08	€ 69,00	<input type="text" value="1"/>	€ 69,00
Kunststoff-Gewichtsetui, 200 g für E1, E2, Knopf/Kompakt	317-080-400	€ 7,70	<input type="text" value="1"/>	€ 7,70
E2 200 g DAkkS Kalibrierschein für konventionellen Wägewert	962-338	€ 41,00	<input type="text" value="0"/>	€ 0,00
Garantierte Plus-Abweichung (> +1/3 OIML) Einzelgewicht 200 g, Klasse E2	921-338	€ 23,00	<input type="text" value="0"/>	€ 0,00
<input type="checkbox"/> KERN Safety Set mit DAkkS-Kalibrierung ⓘ		€ 338,00		€ 338,00
<input type="checkbox"/> Gewicht für Prüfung der Mindestwaage gemäß USP <41> ⓘ		€ 51,80		€ 51,80

Handling of test weights

Handling

- Only handle test weights with suitable means.
- Protect test weights from high humidity, vapors, dust and dirt
- To avoid abrasion damage, do not slide the test weights over the contact surfaces (e.g. weighing plate).
- Weights must be acclimatized before use.
- Avoid contact with abrasive or corrosive chemicals
- Keep away from electromagnetic fields (magnetism!)

Cleaning

- Cleaning is possible with a lint-free microfiber cloth.
- Cleaning with distilled water or alcohol is also possible, but the weights should then not be used for 24 hours.

Calibration

- Weights should be checked regularly.

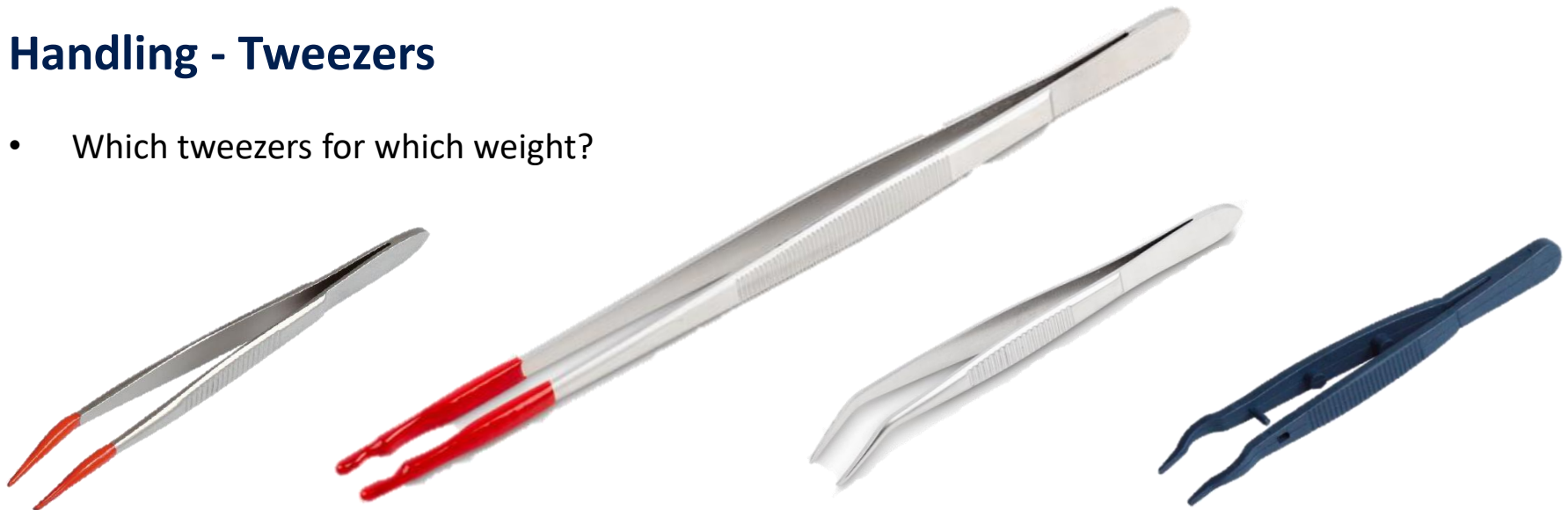
Storage

- Our KERN weight cases / cases at a glance
- Storage in a suitable container protects against surface changes (e.g. dust, corrosion).



Handling - Tweezers

- Which tweezers for which weight?



Klasse	Gewicht	Art.-Nr.	Länge	Ausführung
E1 – F1	1 mg – 200 g	315-243	105 mm	1 Edelstahl mit silikonbeschichteten Spitzen
E1 – F1	500 g – 2 kg	315-245	250 mm	2 Edelstahl mit silikonbeschichteten Spitzen
F2 – M3	1 mg – 200 g	335-240	100 mm	3 Edelstahl
E1 – M3	1 mg – 200 g	315-242	100 mm	4 Kunststoff

Handling - Gloves

- Helps to protect the test weights from finger grease, moisture etc. during daily use.
- Gloves are not necessarily required for M weights.
- **Important:** Protect gloves from dirt!
- **Cotton:** Suitable for test weights up to 2 kg
- **Leather:** Ideal for test weights from 2 kg
- **Rubber/nylon:** Ideal for all test weights



Artikel 317-280



Artikel 317-281



Artikel 317-290

Handling – Weight Handles

- Handling with weight handles or forks
- Quick use of the weights without having to put on or take off gloves.

Gewichtsgriff

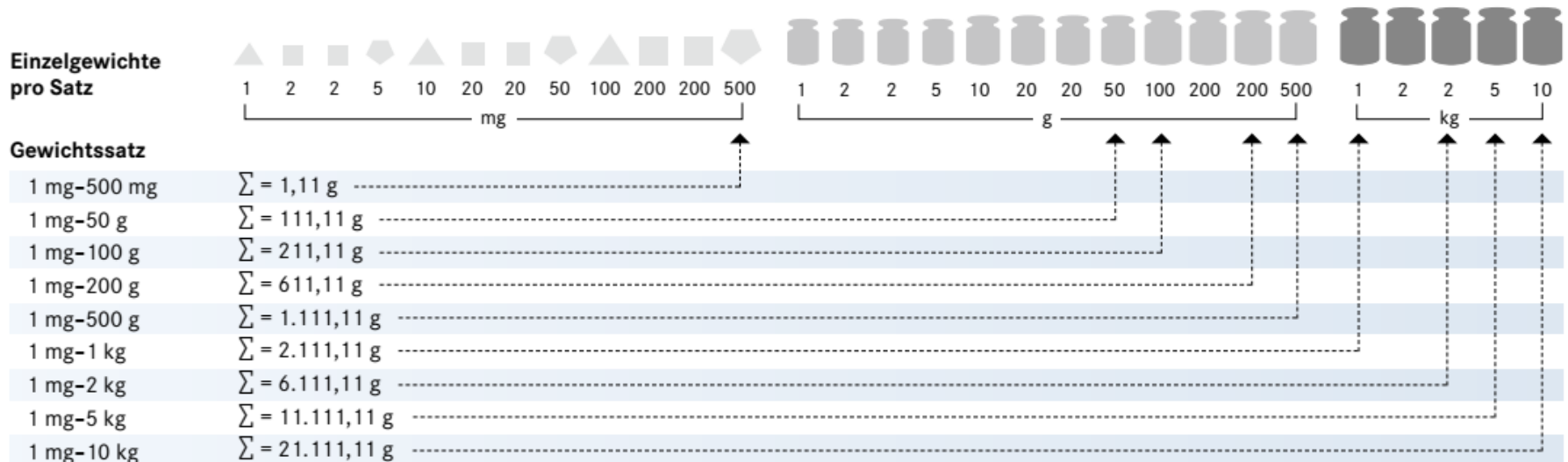
kunststoffummantelt

Für Klasse	Für Knopfgewichte	KERN
E1 - M3	2 kg	315-273
E1 - M3	5 kg	315-274
E1 - M3	10 kg	315-275
E1 - M3	20 kg	315-276



Denomination in weight sets

- Weight sets can be composed in 2 ways.
 - Double denominations of 1 (e.g. 1 g, 10 g, 100 g)
 - Double nominal values of 2 (e.g. 2 g, 20 g, 200 g)
- At KERN, the denominations of 2 are always double:





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TO FURTHER SUCCESSFUL COOPERATION





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