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KERN®

TEST WEIGHTS

2015

KERN Pictograms

Internal adjusting:
Quick setting up of the balance's accuracy with internal adjusting weight (motordriven).

Adjusting program CAL:
For quick setting up of the balance's accuracy. External adjusting weight required.

Memory:
Balance memory capacity, e.g. for article data, weighing data, tare weights, PLU etc.

Data interface RS-232:
To connect the balance to a printer, PC or network.

RS-485 data interface:
To connect the balance to a printer, PC or other peripherals. High tolerance against electromagnetic disturbance.

USB data interface:
To connect the balance to a printer, PC or other peripherals.

Bluetooth data interface:
To transfer data from the balance to a printer, PC or other peripherals.

WLAN data interface:
To transfer data from the balance to a printer, PC or other peripherals.

Control outputs (optocoupler, digital I/O):
To connect relays, signal lamps, valves, etc.

Interface for second balance:
For direct connection of a second balance.

Network interface:
For connecting the scale to an Ethernet network. With KERN products you can use a universal RS-232/LAN converter.

GLP/ISO log:
The balance displays the weight, date and time, regardless of a printer connection.

GLP/ISO log:
With weight, date and time. Only with KERN printers, see "Accessories"

Piece counting:
Reference quantities selectable. Display can be switched from piece to weight.

Recipe level A:
Separate memory for the weight of the tare container and the recipe ingredients (net total).

Recipe level B:
Internal memory for complete recipes with name and target value of the recipe ingredients. User guidance through display.

Recipe level C:
Internal memory for complete recipes with name and target value of the recipe ingredients. User guidance through display. Additional convenient functions, such as barcode and back calculation functions.

Totalising level A:
The weights of similar items can be added together and the total can be printed out.

Totalising level C:
Internal memory for complete recipes with name and target value of the recipe ingredients. User guidance through display. Additional convenient functions, such as barcode and back calculation.

Percentage determination:
Determining the deviation in % from the target value (100 %).

Weighing units:
Can be switched to e.g. nonmetric units at the touch of a key. See balance model. Please refer to KERN's website for more details.

Weighing with tolerance range:
Upper and lower limiting values can be programmed individually for e.g. dosing, sorting and portioning.

Vibration-free weighing:
(Animal weighing program)
When the weighing conditions are unstable, a stable weight is calculated as an average value.

Protection against dust and water splashes IPxx:
The type of protection is shown in the pictogram. For details see the glossary.

ATEX explosion protection:
Suitable for use in hazardous industrial environments, in which there is explosion danger. The ATEX marking is specified for each device.

Stainless steel:
The balance is protected against corrosion.

Suspended weighing:
Load support with hook on the underside of the balance.

Battery operation:
Ready for battery operation. The battery type is specified for each device.

Rechargeable battery pack:
Rechargeable set.

Mains adapter:
230V/50Hz in standard version for EU. On request GB, AUS or USA version available.

Power supply:
Integrated in balance. 230V/50Hz standard EU. More standards e.g. GB, AUS or USA on request.

Strain gauges:
Electrical resistor on an elastic deforming body.

Tuning fork principle:
A resonating body is electromagnetically excited, causing it to oscillate.

Electromagnetic force compensation:
Coil inside a permanent magnet. For the most accurate weighings.

Single cell technology:
Advanced version of the force compensation principle with the highest level of precision.

Verification possible:
The time required for verification is specified in the pictogram.

DAkkS calibration possible:
The time required for DAkkS calibration is shown in days in the pictogram.

Package shipment:
The time required for internal shipping preparations is shown in days in the pictogram.

Pallet shipment:
The time required for internal shipping preparations is shown in days in the pictogram.

Warranty:
The warranty period is shown in the pictogram.

Selection of the appropriate test weight for your balance

Correctly selected test weights with DAkkS calibration certificate are the pre-requisite for ensuring that your balances are not only correctly adjusted, but also correctly calibrated. Scheduled testing of your balances with such test weights helps to guarantee your quality requirements and to maintain your quality targets.

Here's how you find the right test weight for your balance:
A balance can never be more accurate than the test weight used to adjust it, it all depends on its tolerance.
Accuracy of the test weight: Should correspond to the readout [d] of the balance, or rather be better.

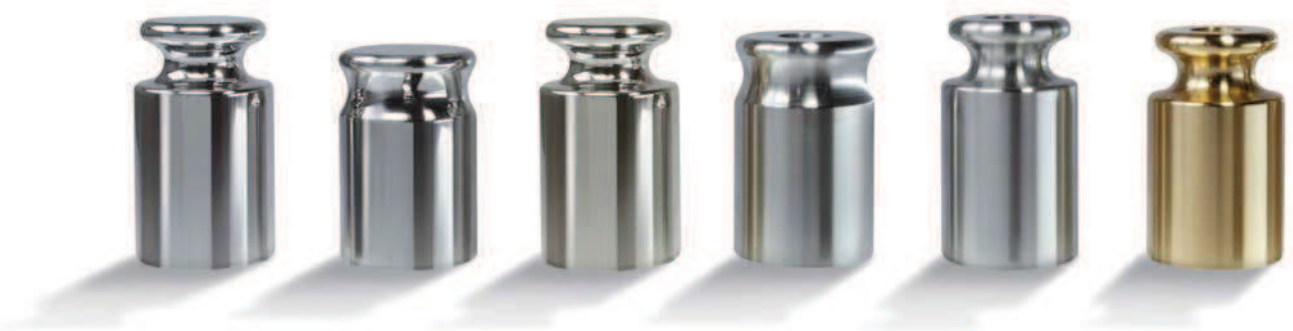
Nominal weight value: This is shown in adjust mode "CAL" in the balance display. Given a choice, the heaviest weight is the most suitable for accurate measurement.
Once accuracy and nominal weight value are specified, the suitable test weight is selected according to the tolerances "Tol" of the individual accuracy classes E2 – M3, see column "Tol ± mg" at the respective weight and table at page 167.

Example:
Balance with weighing range [Max] 2000 g = 2 kg
and readout [d] = 0,01 g = 10 mg

- The accuracy of the required test weight is determined by readout [d] with approx. ± 10 mg.
- Displayed weight size on "CAL" mode: 1000 g or 2000 g. The required test weight has a 2 kg weight size.
- Suitable test weights with ± 10 mg tolerance and 2 kg weight size, can be found in accuracy class F1. KERN-No 327-72, see page 172.

Exception, analytical balances (readout [d] ≤ 0,1 mg):
E1 test weights are recommended. Depending on the safety requirements, E2 test weights with a DAkkS calibration certificate will also be sufficient.

From brass to stainless steel - the right test weight for every situation



Test weight → / Features ↓	Cylindrical shape with lifting knob, polished stainless steel	Compact shape with carrying grip, polished stainless steel	Cylindrical shape with lifting knob, polished stainless steel or nickelplated and polished brass	Compact shape with carrying grip, finely turned stainless steel	Cylindrical shape with lifting knob, finely turned stainless steel	Cylindrical shape with lifting knob, finely turned brass
conforms to OIML R111	yes	yes	yes	no	yes	yes
Available classes	E1, E2	E2, F1	F1	adjusted to F1 error limit class	F2, M1	M1, M2, M3
Upper surface	polished	polished	polished	finely turned	finely turned	finely turned
Material	Stainless steel	Stainless steel	Stainless steel or nickel-plated brass	Stainless steel	Stainless steel	Brass
Adjusting cavity	no	no	yes	yes, from 20 g	yes, from 20 g	yes, from 20 g
Verification possible	yes	yes	yes	nein	yes	yes, except M2
Checking equipment for verification purposes	approved	approved	approved	not approved	approved	approved
Ideal as checking equipment in QM systems (e.g. ISO 9000 ff)	yes	yes	yes	yes	yes	yes
Benefits	• High-quality test weight for analytical and precision balances • Highly-refined surface • Ideal shape of the top for good grip	• Affordable test weight for analytical and precision balances • Highly-refined surface	• Ideal, high-quality test weight for precision balances • Ideal shape of the top for good grip	• Affordable test weight for in-house checking of precision balances	• Ideal test weight for commercial and industrial scales • Ideal shape of the top for good grip	• Affordable test weight for commercial and industrial scales • Ideal shape of the top for good grip

OIML norm R111-2004 for weights

The key points from the OIML norm R111-2004
OIML (Organisation Internationale de Metrologie Legale) has established the exact metrological requirements for weights in verified applications in approx. 100 states all over the world. The OIML recommendation R111 (2004 Edition) for weights relates to sizes 1 mg – 50 kg. Statements are made on the accuracy, materials, geometric shape, marking and storage of the weights.

Error limits for weights of classes E1 to M3
The error limit classes are in fixed hierarchical levels in the proportion of 1:3, where E1 is the most accurate and M3 is the least accurate weight class. When testing weights with other weights, the correct test class is the next highest class.

Error limit classes (= tolerances)
The values given in the table below (tolerances ± ... mg) are the respective permitted fabrication tolerances. They are to be equal to the ➔ ***measuring uncertainty*** of the weight, if no ➔ ***DAkkS calibration certificate*** is available.

Conventional mass
The problem is the air buoyancy, which makes the weight appear lighter. In order to avoid this "distortion" in daily use, all weights are adjusted to the unit specifications as given in R111, i.e. it is accepted that: material density of the weights is 8000 kg / m^3, air density is 1.2 kg / m^3 and measuring temperature is 20 °C.

KERN cylindrical test weights
Comply with OIML R111-2004 in all respects, without exception.

➔ *See the glossary, page 191 – 192*

Nominal value	OIML R111-2004 Maximum permissible errors for weights = permissible tolerances "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

Composition table, valid for all KERN weight sets from 1 mg