HÄFNER

THE PERFECT WEIGHT





made in Germany

WEIGHTS FOR THE BEST



WEIGHTS AND WEIGHT SETS 2016



Registrier-Nr. 059993 QM08
DIN EN ISO 9001:2008

DIN EN ISO / IEC 17025:2005

DAkkS Deutsche Akkreditierungsstelle D-K-15192-01-00

DKD

HÄFNER
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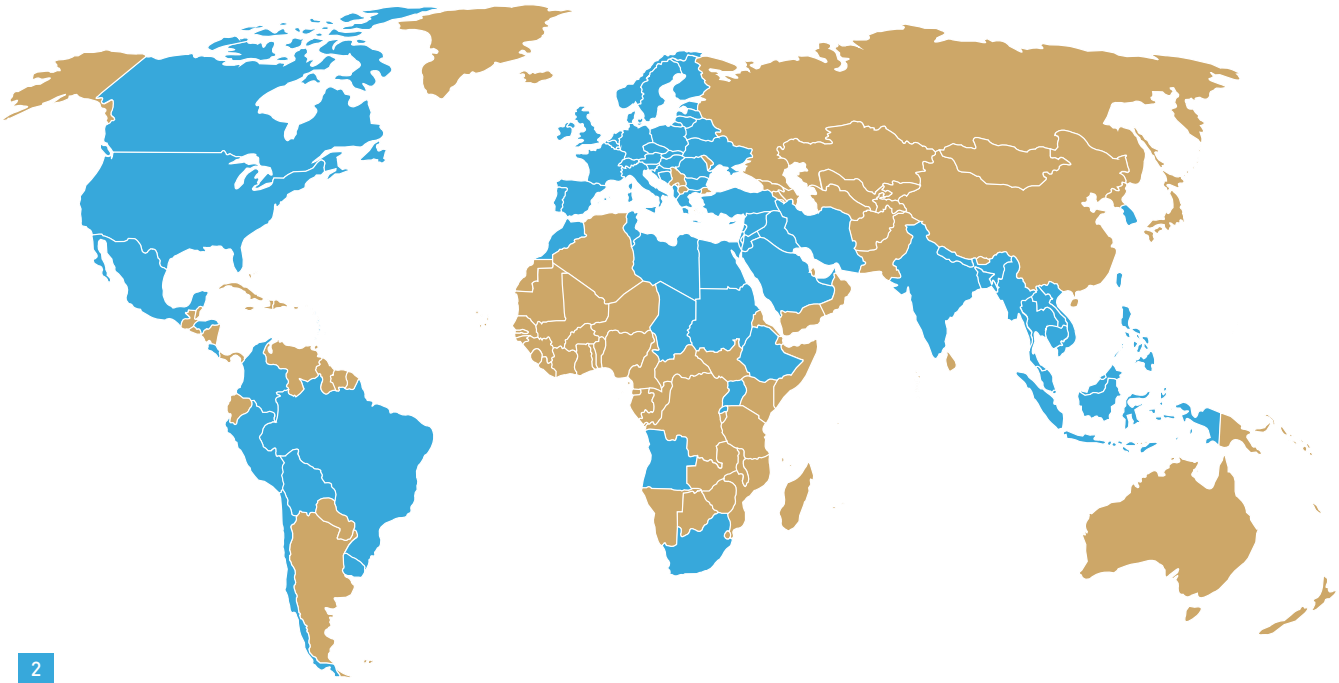
WE SUPPLY RELIABLE AND HIGH QUALITY WEIGHTS **WORLDWIDE.**

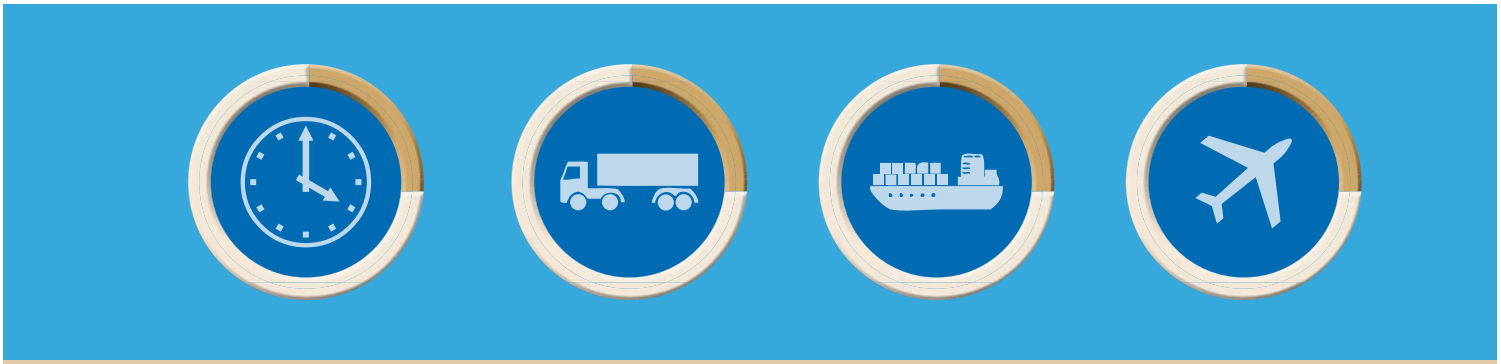
OUR PRODUCTS

Our weights range from milligrams to tons, all made under one roof. In addition to meeting everyday customer needs, HÄFNER sets great store in accommodating special wishes:

made in Germany

+ very small weights (down to to 0.1 mg)
+ very large weights (up to 5000 kg)
+ Special forms such as load weights or bent-wire milligram weights
+ Accessories such as bell jars or forks
+ Special markings (e.g. barcodes and signs)
+ Boxes and cases according to customer demands





HÄFNER - SPECIALIST FOR WEIGHTS AND WEIGHT SETS

EVER SINCE OUR COMPANY WAS FOUNDED IN 1933 IN OBERROT, A SMALL TOWN IN THE SWABIAN REGION OF GERMANY, WE HAVE BEEN MANUFACTURING WEIGHTS FOR A WIDE RANGE OF APPLICATIONS.

These weights range from milligrams to tons, all made under one roof. We are certified to EN ISO 9001:2008 and are known worldwide for our high reliability and quality.

With the advent of electronic weighing devices, the role of weights has changed. Originally used as weighing instruments in conjunction with scales, weights are now used as adjusting, calibration and test equipment for balances and force measuring devices. The demands on weights are constantly rising with the continuosly increasing accuracy and resolution of electronic load cells.

We recognised this trend early on and responded to the challenge. Rationalisation and the utilisation of advanced technology form the basis for our leading position in modern weights manufacturing.

Furthermore, our calibration laboratory MASSCAL is accredited by the German Accreditation Body (DAkkS) and is a member of the German Calibration Service (DKD).





WHEN **PERFORMANCE** COUNTS

OUR QUALITY EXPECTATIONS

Over many decades and in the history of our family-owned business, perfection and the name HÄFNER have become inseparable.

Worldwide trust and recognition by national metrology institutes (NMIs) such as PTB, NPL etc., as well as accredited calibration laboratories, state offices for verification, scale and balance manufacturers, companies for repair and maintenance, distributors for laboratory equipment, companies in all industrial sectors and not least our competitors, testify to our exceptional performance and our success.

Customer wishes and requirements for perfect weights can only be fulfilled by an ongoing development process that creates the necessary conditions and means for improvement.

We strive to repay your trust in HÄFNER with our quality and performance. **Challange us!**

QUALITY MANAGEMENT

HÄFNER utilises a quality management system and is certified to EN ISO 9001:2008 by DQS (registration number 059 993).

We are always up-to-date in science and technology thanks to our active participation in the technical committee of the German Calibration Service (DKD) and close cooperation with the German National Metrology Institute PTB.

OUR WEIGHTS ARE **SO GOOD** THAT OUR STAFF ARE **PROUD OF EVERY ONE OF THEM.**

PERFECT WEIGHTS

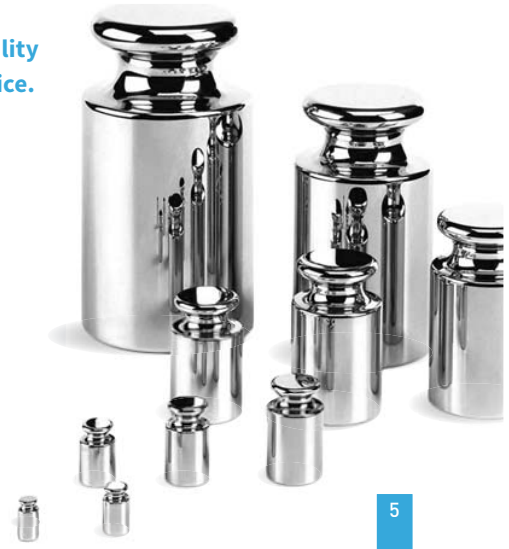
At HÄFNER every blank is formed from special materials. Advanced casting technology and extremely precise CNC machine tools are key parts of the production process.

Consistently high precision of all HÄFNER blanks is ensured by our exceptional expertise and advanced surface processing technology. What happens afterward is pure craftsmanship.
With considerable experience and sensitivity, our employees machine each weight to the specified value. Every step in the process is checked using extremely accurate scales with calibrated standard weights, and ambient conditions are monitored continuously. HÄFNER marks the weights using special corrosion-proof laser technology to ensure that the weights retain their values. This allows weight standards in classes E2, E1 and E0 to be identified reliably without confusion.

Another key factor for manufacturing perfect weights is our special HE210 steel, which was developed to meet the requirements of class E0.

As a result, for many years national metrology institutes have been able to rely on their primary weight standards (class E0) and secondary mass standards (class E1) from HÄFNER.
Before delivery, each HÄFNER weight is again cleaned and checked, and if requested by the customer a calibration certificate (e.g. a DAkkS calibration certificate) is prepared to document quality and traceability to the national kilogram prototype.
HÄFNER perfection is only possible with staff who are experts at their trade.

Service and reliability at an attractive price.



HÄFNER
THE PERFECT WEIGHT



PROCESS SECURITY AND RELIABILITY

QUALITY MANAGEMENT

Assuring the quality of your products is an important part of your business success, which is why an accredited quality management system is indispensable in the world of measuring and weighing.

Quality management standards and guidelines, such as the ISO 9001 family, VDA 6.1, ISO 10012, ISO/TS 16649, ISO 17025 and the GLP/GMP regulations, help ensure reproducible measurement results by means of reliable and suitable measuring and test equipment, which includes scales and standard weights (calibration and test weights).

Documented monitoring of measuring and test equipment is therefore a key obligation and provides essential evidence of compliance with product liability and due diligence regulations.

As a worldwide leader in the manufacture of weights, HÄFNER supports you in planning test processes and test equipment with:

- expertise and experience;
- advice and competence;
- extremely high precision and quality;
- flexibility;
- special production according to individual customer requirements;
- service and reliability at an attractive price.

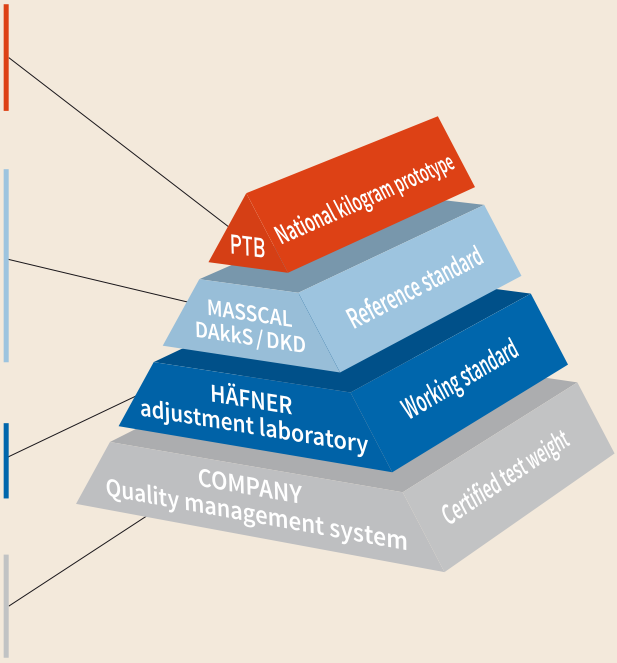
TRACEABILITY TO THE NATIONAL WEIGHT STANDARD

In Germany the Physikalisch Technische Bundesanstalt (PTB) is the National Metrology Institute (NMI) and provides access to the physical SI mass standards.

Our MASSCAL calibration laboratory is accredited as a DAkkS calibration laboratory (registration number D-K-15192-01-00) by the PTB. The internationally valid DAkkS calibration certificates meet the requirements for test equipment monitoring and serve as evidence for traceability to the national weight standard.

HÄFNER works with a quality management system and is certified to EN ISO 9001:2008 by DQS (registration number 059 993).

In the world of measuring and weighing, a certified quality management system is essential as a basis for ensuring the quality of your products.

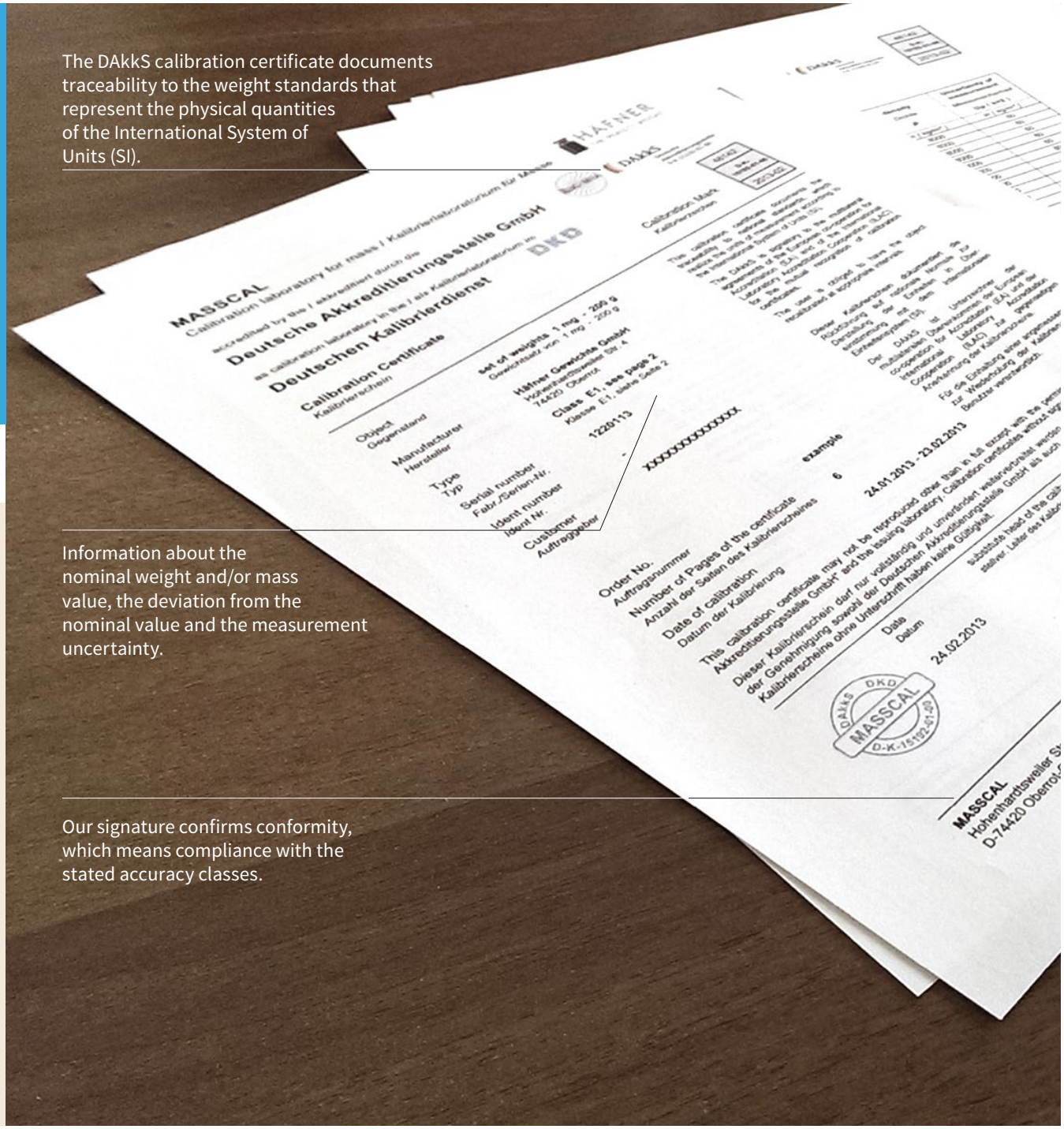


MASCAL ADJUSTMENT AND CALIBRATION LABORATORY

HÄFNER has a spacious adjustment and calibration laboratory dubbed MASSCAL, which meets the highest metrological requirements. We invest considerable sums to keep our measuring devices at the state of the art.

MASSCAL conforms to the EN ISO/IEC 17025 international standard and is accredited within the scope of the German Accreditation Body (DAkkS) (Reg, Nr. D-K-15192-01-00) of the German national metrology institute PTB, which means that our calibration certificates are recognised internationally.

DAkkS Deutsche Akkreditierungsstelle



The DAkkS calibration certificate documents traceability to the weight standards that represent the physical quantities of the International System of Units (SI).

Information about the nominal weight and/or mass value, the deviation from the nominal value and the measurement uncertainty.

Our signature confirms conformity, which means compliance with the stated accuracy classes.

HOW TO DETERMINE THE NECESSARY TEST WEIGHTS

MAXIMUM TOLERANCE FOR WEIGHTS ACCORDING TO OIML R111:2004

Nominal value	E1	E2	F1	F2	M1	M1-2	M2	M2-3	M3
	+/- mg	+/- mg	+/- mg	+/- mg	+/- mg	+/- mg	+/- mg	+/- mg	+/- mg
1 mg	0,003	0,006	0,020	0,06	0,20				
2 mg	0,003	0,006	0,020	0,06	0,20				
5 mg	0,003	0,006	0,020	0,06	0,20				
10 mg	0,003	0,008	0,025	0,08	0,25				
20 mg	0,003	0,010	0,03	0,10	0,3				
50 mg	0,004	0,012	0,04	0,12	0,4				
100 mg	0,005	0,016	0,05	0,16	0,5		1,6		
200 mg	0,006	0,020	0,06	0,20	0,6		2,0		
500 mg	0,008	0,025	0,08	0,25	0,8		2,5		
1 g	0,010	0,030	0,10	0,3	1,0		3,0		10
2 g	0,012	0,040	0,12	0,4	1,2		4,0		12
5 g	0,016	0,050	0,16	0,5	1,6		5,0		16
10 g	0,020	0,060	0,20	0,6	2,0		6,0		20
20 g	0,025	0,080	0,25	0,8	2,5		8,0		25
50 g	0,030	0,10	0,3	1,0	3,0		10		30
100 g	0,05	0,16	0,5	1,6	5		16		50
200 g	0,10	0,30	1,0	3,0	10		30		100
500 g	0,25	0,80	2,5	8,0	25		80		250
1 kg	0,5	1,6	5	16	50		160		500
2 kg	1,0	3,0	10	30	100		300		1.000
5 kg	2,5	8,0	25	80	250		800		2.500
10 kg	5	16	50	160	500		1.600		5.000
20 kg	10	30	100	300	1.000		3.000		10.000
50 kg	25	80	250	800	2.500	5.000	8.000	16.000	25.000
		+/- g	+/- g	+/- g	+/- g	+/- g	+/- g	+/- g	+/- g
100 kg		0,16	0,5	1,6	5	10	16	30	50
200 kg		0,30	1,0	3,0	10	20	30	60	100
500 kg		0,80	2,5	8,0	25	50	80	160	250
1.000 kg		1,6	5	16	50	100	160	300	500
2.000 kg			10	30	100	200	300	600	1.000
5.000 kg			25	80	250	500	800	1.600	2.500

DEFAULT DENSITIES FOR WEIGHT MATERIALS

Ident.	Material	Density at 68°F	Density uncertainty U(k=2)
		kg/m³	kg/m³
GG	Cast iron	7200	400
ST	Steel	7800	200
AL	Aluminium	2700	120
NS	German silver ickel silver	8600	170
MS	Brass finely turned	8400	100
MSN	Brass nickel plated	8400	100
MSM	Brass miralloy	8400	100
VA	Stainless steel	7900	140
HF12	austenit stainless steel	7950	80
HE210	Special stainless steel	8000	30

LIMITS OF MAGNETIC CHARACTERISTICS

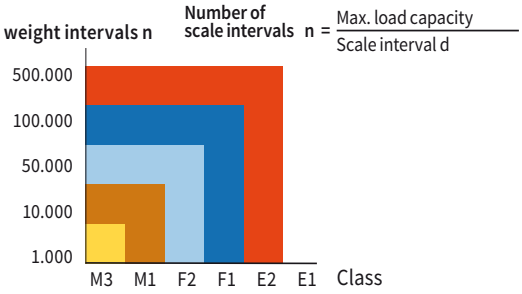
Class	Magnetization	Magnetic susceptibility X		
	µoM (µT)	m ≤ 1 g	2 g ≤m ≤ 10 g	m ≤ 20 g
E1	< 2,5	< 0,25	< 0,06	< 0,02
E2	< 8	< 0,9	< 0,18	< 0,07
F1	< 25	< 10	< 0,7	< 0,2
F2	< 80	-	< 4	< 0,8
M1	< 250	-	-	-
M1-2	< 500	-	-	-
M2	< 800	-	-	-
M2-3	< 1600	-	-	-
M3	< 2500	-	-	-

EXAMPLE

A balance has a maximum rated capacity of 1,000 g and a scale division d of 10 mg. The user manual specifies an external calibration weight with a nominal value of 1 kg. According to step A.1, the number of scale intervals that the balance can measure is 100,000.

According to step A.2, the required tolerance with a nominal weight of 1 kg is between 5 and 10 mg. Tolerance class F1 meets this requirement (±5 mg).

The following test loads are determined in step B.2: 250 g, 500 g, 750 g and 1 kg. According to OIML R111 the following four test weights in the class F1 are determined: 50 g, 200 g, 500 g and 1 kg.



Accuracy of the balance (scale)	Resolution of the balance: quotient of max. range / readability	Required tolerance class of the weights
IV Ordinary accuracy scale	≤ 1.000 d	Klasse M3
III Medium accuracy scale	≤ 10.000 d	Klasse M1
II Precision balance	≤ 30.000 d	Klasse F2
	≤ 100.000 d	Klasse F1
I Analytical balance	ab 100.000 d	Klasse E2

A.

DETERMINE THE RIGHT TOLERANCE CLASS FOR THE TEST WEIGHTS

1. Determine the number of intervals n by dividing the maximum weight by the scale division d (smallest reading digit) of the weighing range (measuring range).

$$\text{Number of steps } n = \frac{\text{Max. load capacity}}{\text{Scale interval d}}$$

2. Determine the tolerance class of the test weights from the required tolerance.

Weighing range (measuring range)	Tolerance of the test weight, depending on the safety requirement
n = 100.000	0,5 d and 1 d
100.000 < n < 500.000	Between 1 d and 2 d
n > 500.000	less than 3 d

For this, choose a nominal value equal or close to the maximum value of the weighing range (measuring range). This nominal value should always be greater than 80% of the maximum rated capacity.

You can round up or down by a small amount. In case of doubt you should always choose the next smaller tolerance.

B.

DETERMINE THE REQUIRED NOMINAL VALUES (WEIGHTS)

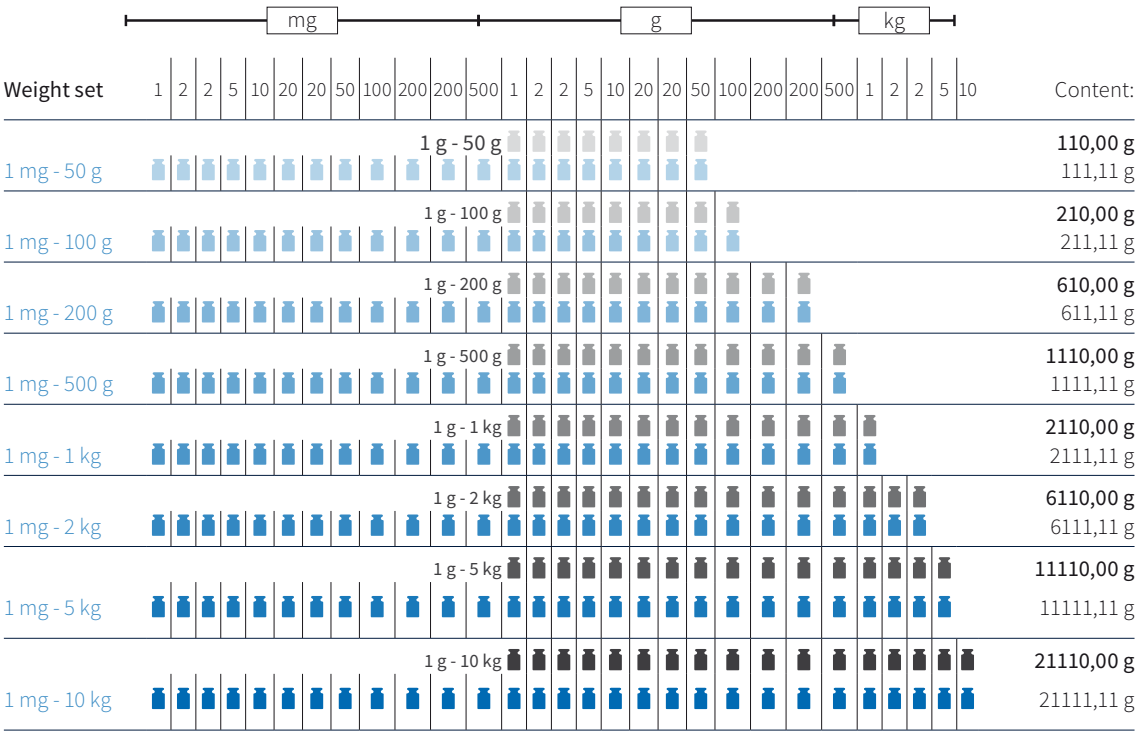
1. Cursory testing
   You can make most of the test measurements for the weighing range with just one test weight (nominal value). The nominal value of the external calibration weight is often used for this purpose (consult the user guide or operating software of your balance). This nominal value should always be greater than 80% of the maximum rated capacity.

2. Complete testing
   Use this method to check the weighing range (measuring range) against the maximum potential requirements. The following four test loads are required: 25%, 50%, 75% and 100% (or at least 80%) of the maximum rated capacity.

   The test weight for 100% (or at least 80%) of the maximum rated capacity should consist of just one weight, rather than a combination of several test weights.

If you have any questions, we would be pleased to advise you on choosing suitable test weights for your measuring or test task. We support you in the specification of test plans and give you recommendations about appropriate documentation and interpretation of your test results.

Composition of the standard weight sets



ADVICES FOR RELIABLE MEASURING RESULTS

Reliable, constant weighing and measuring results require compliance with the following rules:

1. Balances and measuring systems must be monitored and maintained competently. The metrological properties must be familiar.

2. Balances and measuring systems must be adjusted regularly – depending on frequency of use – with adjustment and test weights and must also be calibrated according to an acknowledged test method.

3. The adjustment and test weights you use must be tracable back to national normal weights, this is, they must be calibrated regularly.

4. The test and calibration results must be documented together with their uncertainty of measurement (e.g. by a protocol of the test for scales and a DAkkS calibration certificate for weights.)

5. Test and calibration results must be evaluated. The test and calibration periods for scales and weights must be determined and be controlled with a test plan.

6. Test protocols or calibration certificates must be kept for a sufficient long time.

Increase your competitiveness. The confidence of your customers is important.