

KERN test service

DAkkS calibration and verification service for balances, test weights, force measurement and more



Deutsche
Akkreditierungsstelle
D-K-19408-01-00

DAkkS calibration in accordance
with DIN EN ISO/IEC 17025:2005 for balances, weights,
force, volumes of solid bodies, densities of solid bodies

PROFESSIONAL
MEASURING



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Your contact person at the KERN DAkkS calibration laboratory



Team leader testing service distribution
DE (PC 0, 1, 2, 3, 4), AT, CH,
Asia, Eastern Europe, CIS
Waldemar Fleitling
Tel. +49 [0] 7433 9933-163
Fax +49 [0] 7433 9933-29163
fleitling@kern-sohn.com



Testing service distribution
DE (PC 5, 6, 7), GB, IE,
PT, IT, ES, SE, FI, NO
Sandra Ehinger
Tel. +49 [0] 7433 9933-162
Fax +49 [0] 7433 9933-29162
sandra.ehinger@kern-sohn.com



Testing service distribution
DE (PLZ 8, 9), FR, DK, BeNeLux, Africa,
TR, GR, South and North America, Oceania
Athina Ioakimidou
Tel. +49 [0] 7433 9933-123
Fax +49 [0] 7433 9933-29123
athina.ioakimidou@kern-sohn.com

QM certification and accreditation by KERN as a basis for the highest level of quality.

- DIN EN ISO 9001
- DIN EN ISO/IEC 17025
- DIN EN ISO 13485
- Medical: 93/42/EWG
- NAWI: 2014/31/EU
- Verification point



The heart of calibration and verification

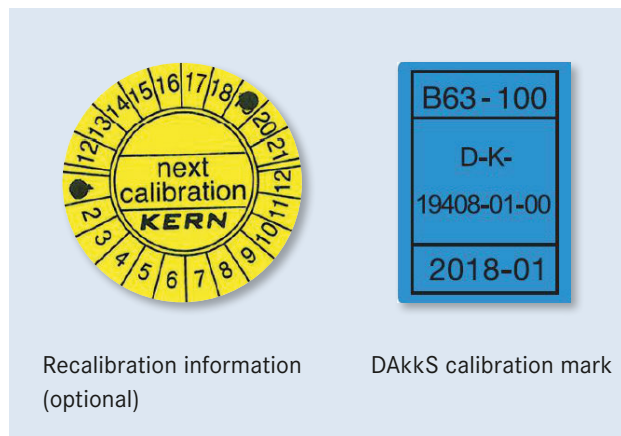
The principle

Every electronic measuring device will only give correct results if it is checked regularly, i.e. calibrated correctly and adjusted when required. An electronic balance, test weight or another measuring device is only a reliable measuring and checking tool if it is calibrated and this calibration is documented as part of a quality procedure.

DAkkS calibration (DAkkS = German calibration service) documents traceability to the national standard and this then meets the standard requirements of QM systems. DAkkS calibrations are valid internationally.

Calibration of measuring devices

Measuring “correctly” is of elementary significance, as it is not unusual for inaccurate or “wrong” measurements to have expensive economic consequences. Calibration or establishing the accuracy of checking equipment is carried out by accredited laboratories throughout the world in accordance with the DIN EN ISO/IEC 17025 standard. On an international level, the EA (European Co-operation for Accreditation) and ILAC (International Laboratory Accreditation Cooperation) monitor the upholding of the highest quality standards. In Germany this is carried out by DAkkS (German accreditation point).



What does calibration mean?

Determining and documenting the deviation from true, actual measure value of the value displayed by a measuring device or of the value given by checking equipment.

More interesting facts at: www.kern-lab.com

When should you carry out DAkkS calibration?

DAkkS calibration is always necessary, when checking equipment is to be used in a QM process (e.g. in accordance with ISO 9000ff, TS 16949, VDA, FDA, GLP, GMP, ...). The operator controls the use of checking equipment and periodic recalibration time intervals themselves. DAkkS calibration certificates are recognised internationally.

Deutsche Akkreditierungsstelle (DAkkS)

The German accreditation body (DAkkS) is the successor to the German calibration service (DKD) in terms of accreditation systems. On the basis of EC regulation no. 765/2008, the accreditation point of the German calibration service (DKD) was transferred to the German accreditation point (DAkkS) with effect from 17.12.2009. From a metrological viewpoint there is no difference between the DAkkS calibration and the previous DKD calibration.

Who needs a DAkkS calibration certificate?

In the context of standard requirements for monitoring checking equipment, every company with a Quality Management system is obliged to test and document its measuring equipment at regular intervals. A DAkkS calibration certificate fulfils this obligation.

The KERN calibration laboratory (D-K-19408-01-00)



KERN has a highly-automated DAkkS laboratory with accreditation to DIN EN ISO/IEC 17025 in the field of balances, test weights and force measurement. By using the most modern calibration technology with high-end calibration robots in fully air-conditioned laboratories, the measurement uncertainty and process times are reduced to a minimum, and also the quality of the calibration is increased. As an accredited and certified calibration service provider with decades of experience, we offer you an extensive range of services, which will leave no demand unfulfilled. The accreditation applies to the extent specified in the appendix to the certificate D-K-19408-01-00.

Calibration or verification

DAkkS calibration is possible for every balance in perfect condition. DAkkS calibration is a private service for ensuring high quality requirements according to DIN EN ISO 9000ff and other standards, e.g. in production and research. Verifying is only possible for balances with EC type approval marked with a green **M**.

All you need to know about calibration



DAkkS calibration

(area not regulated by law)

Why?

DAkkS calibration is always necessary when checking equipment (balance or test weight) is to be used in a QM process (e.g. to ISO 9000ff, GS 9000, TS 16949, VDA 6.1, FDA, GLP, GMP, ...)

What?

Any checking equipment in proper condition can be DAkkS calibrated.

How?

Determination of accuracy throughout the world by a laboratory which is accredited to DIN EN ISO/IEC 17025. Traceability to internationally recognised standards. The DAkkS calibration certificate confirms both the metrological characteristics of the checking equipment and the general requirements for the ► *monitoring of checking equipment* (eg. ISO 9000ff).

Where?

Internationally recognised. This is monitored by EA (European co-operation for Accreditation) and ILAC (International Laboratory Accreditation Cooperation), and in Germany, for example the DAkkS (Deutsche AkkreditierungsStelle GmbH) – German accreditation point.

When?

The operator controls the use of checking equipment and periodic recalibration time intervals themselves.

Verification

(area regulated by law)

Why?

Applications with mandatory verification of balances and test weights include commercial trade when the price of a commodity is determined by weighing, the manufacture of pharmaceuticals in pharmacies, the production of pre-packaged goods in medical applications.

What?

You can only verify balances which have official buildtype approval and test weights which conform to ► *OIML* standards.

How?

Testing to verification permissible error limits (for details on tolerances see page 14) to protect the consumer. When introducing balances and weights onto the market, they are subject to EU directives. The subsequent monitoring of the market is regulated at a national level, in Germany through the MessEG (Weights and Measures Act) and MessEV (Verification ordinance).

Where?

EC Declaration of Conformity with CE marking is valid as “Initial verification” throughout Europe. Reverification and national declarations of conformity are only recognised on a national level.

When?

The legislative body governs the use of balances and test weights as well as time intervals for re-verification. National specifications apply here.

KERN test services at a glance

Calibration of balances inhouse (at KERN)

With the shortest calibration time in the KERN calibration laboratory of maximum 4 working days after receipt of order, this gives you almost uninterrupted use of your balances within your production process.

Calibration of balances on site (at the customer)

As an option, you can have your balances calibrated on your premises. This on-site testing service is metrologically recommended, as the balance is in its field of use and can be calibrated without any possible transportation problems. Minimized downtime and personal contact with our expert are the major benefits of this service. We would be pleased to give you more information and agree a date with you.

Calibration of weights

Here too, with its short process times, KERN is unbeatable. The most modern calibration robots calibrate your test weights with only the slightest ► *measuring uncertainty*, according to international directives of OIML R111 and thereby ensuring a reliable weighing result. Recommended recalibration period 1 year. On-site calibration of your weights according to OIML classes M1 – M3 (10 kg – 50 kg) can also offer you an affordable alternative. We would be pleased to come to your premises and calibrate your test weights with our mobile **MACOS calibration system**.

Volume determination

When calibrating every new weight in OIML class E1 you must also establish its volume. This is necessary for the correction of air buoyancy. Accredited volume determination in our laboratories is an integral part of our high-end demands.

Reconditioning of weights

KERN gets your weights back up to standard, **regardless of the manufacturer**. Whether it is adjustment, marking, sand blasting or lacquering. The aim here is compliance and long-term stability. Special arrangements on request.

Magnetic characteristics

By measuring sensitivity/and magnetisation KERN gains reliable evidence regarding the magnetic characteristics of your test weights. “Magnetic” weights can distort the weighing result when you are using the balance.

DAkkS calibration certificates for force-measurement

Through the force-measurement accreditation from KERN (in Newtons), DAkkS calibration of your force-measuring devices means that we can meet the highest requirements. With test stands and measuring procedures designed for this purpose, our specialists can calibrate your checking equipment to the latest test methodology in our laboratory.

Factory calibration

The testing of measuring devices for accuracy in accordance with a recognised, but not accredited, process – this is the difference when compared with DAkkS calibration.

Digital calibration certificate

Of course you will also receive the issued DAkkS and ISO* calibration certificates from us in digital form. Ideal for your own archives or as an “Express solution” by e-mail, when you need it even quicker.

Reverification service for balances and test weights (in Germany)

Reverification in Germany is only possible through the verification authorities. In conjunction with these KERN offers reverification of balances and test weights.

Database supported management of checking equipment

Information on your checking equipment which has been calibrated by us is stored in our database. In this way it is possible to make trend calculations. You therefore get an overview of long-term stability and trend behaviour of your checking equipment.

Reminder service

The continuous recalibration of your checking equipment is an integral part of the reliable management of checking equipment. You can depend on KERN to support you, and KERN will remind you in good time when the next recalibration is due. **This service is free of charge to you!**

Collection and delivery service

Why not let us transport your checking equipment correctly. We will collect your checking equipment from you and then deliver it quickly and safely.

The balance

Calibration of balances

Any balance will only give correct results if it is checked regularly, i.e. calibrated correctly and adjusted when required. A balance is only a reliable measuring and checking tool if it is calibrated and this calibration is documented. The issued DAkkS calibration certificates are proof of the metrological traceability to national and international standards, as required by the DIN EN ISO 9000 and DIN EN ISO/IEC 17025 standards, amongst others. KERN recommends a recalibration period of one year. The standard does not give a defined recalibration period. KERN recommends that, with intensive (daily) use, you recalibrate your balance every 6 months and with normal (weekly) use, every 12 months.



Since 2014, KERN has been operating a crane scale testing facility

THE ADVANTAGES OF USING THE KERN IN-HOUSE CALIBRATION:



- + Short calibration time: Test time in the laboratory is only four working days
- + Competence: Calibration laboratory, which complies with the highest standards in the area of metrology
- + Management of the recalibration calendar for your individual measuring instrument is possible
- + Cross-brand service: Measuring devices from any manufacturer can be calibrated independently
- + Repair: Any necessary repairs can be carried out immediately, if you wish



a) Calibration at the KERN factory (you send your balance to us)

Recommended for new devices and for balances which can be affordably transported, as then there is no need for us to travel to carry out the calibration on-site. Repairs can be carried out at the same time, quickly and in full.

The process would be as follows:

- Day 1: Send your balance to the KERN calibration laboratory in Balingen.
- Day 2 to 3: Evaluation and calibration of your balance by our specialists.
- Day 4: After positive validation, your balance is returned.

Recalibration

• Typical industrial recalibration times

may be recommended as follows:

- daily use of the measuring instrument (once or several times): Recalibration period of 6 months
- weekly use of the measuring instrument (or less often): Recalibration period of 12 months

• **Recalibration prices:** The prices for initial calibrations and recalibrations are identical. Costs for cleaning, function testing and any necessary adjustment or for the production of special holders to carry out the calibration will be calculated separately.



Exact measurements on-site

E.g.: Pallet scale set up with 2 x 500 kg

b) KERN on-site calibration (we visit you)

In Germany, KERN has a close-knit network of KERN DAkkS calibration laboratory employees, who can carry out on-site calibration of balances up to 50 tonnes.

This on-site testing service is metrologically recommended, as your balance is in its field of use and can be calibrated without any possible transportation problems.

Lower downtime and personal contact with our expert are the major benefits of this service.

This KERN calibration service is also independent of the brand. Preparatory maintenance work by agreement. Prices for on-site calibration on request.

You tell us when you would like us to come, giving us details of the balances to be tested. Our on-site DAkkS calibration team will then get in touch with you immediately and will discuss the process with you at your premises – it's straight forward and professional.



THE ADVANTAGES OF USING THE KERN ON-SITE CALIBRATION:



- + Calibration on-site at your premises in the field of use
- + No risk of damage during transportation
- + Low downtime
- + Cross-brand servicing, basic inspection and adjustment by a specialist
- + You tell us when you would like us to come
- + Device training for qualified users



DAkkS calibration certificate for balances

1. "Official" document

The DAkkS calibration laboratory KERN (D-K-19408-01-00) is accredited through the accreditation point of the Deutsche Akkreditierungsstelle GmbH. The DAkkS calibration certificate is recognised internationally and is available in several languages.

2. Item to be calibrated

The calibration item as well as the type or model with serial number is documented. This means that there is no confusion and guarantees the assignment of the DAkkS calibration certificate to a specific balance.

3. Traceability

The reference standards of the accredited laboratory are monitored in strictly defined cycles and periodically brought into line with national and thereby international standards. This is carefully documented and given on the DAkkS calibration certificate. In this way the basic fundamental traceability to the national standard is ensured.

4. Applicant

On the very first page of the DAkkS calibration certificate you will clearly see the applicant or owner of the calibrated checking equipment.

5. Metrological part

As well as other tests, three metrological tests are carried out during DAkkS calibration. These are to test repeatability, accuracy and eccentric loading. This defines the features of the balance.

6. Measurement uncertainty of a balance

This is determined individually for each balance according to a precisely given test method and is documented in the calibration certificate. It depends on various factors, both internal and external to the balance.

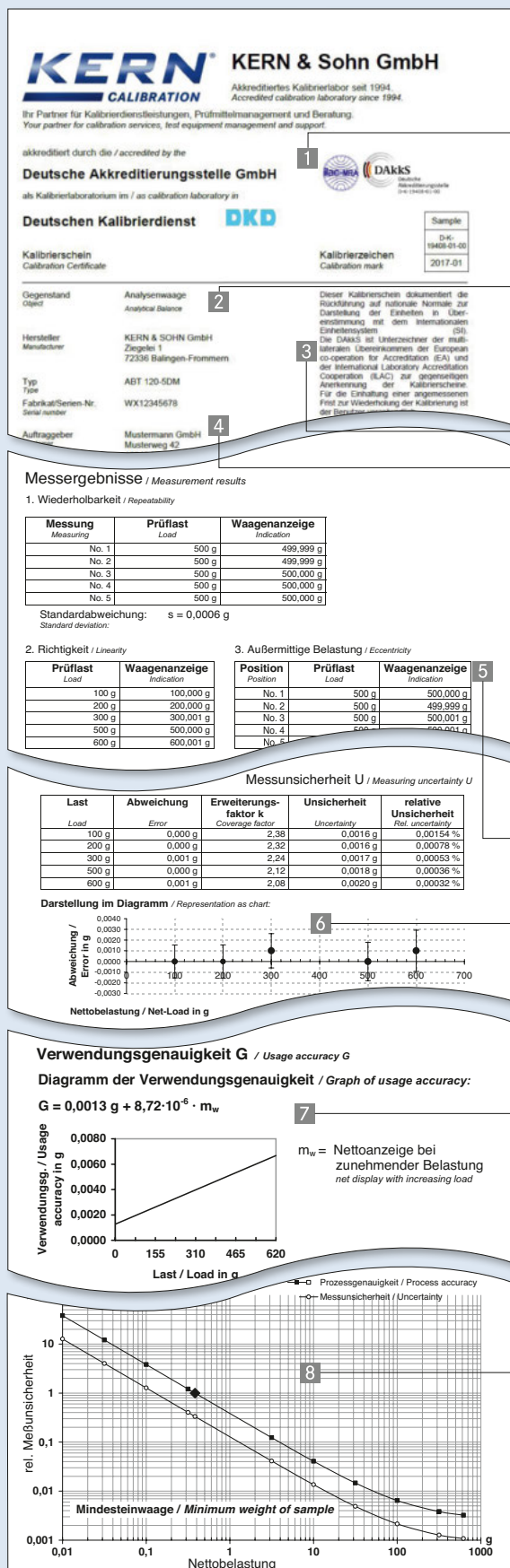
7. Usage accuracy

Usage accuracy gives the uncertainty when the operator uses the measuring equipment on site. This value, which is established by a mathematical equation is influenced by changes in temperature, type of use and other factors.

8. Minimum weight of sample

(optional; see page 9 Art.No. 969-103)

The smaller the sample weight, the larger the relative measuring uncertainty. For those responsible for weighing processes, it is important to determine the deviations which occur when establishing values of the smallest loads. Determining the minimum sample weight declares in this way, clearly the various requirements on the weighing accuracy in relation to the sample weight.



DAkkS calibration certificate for balances (extract)

Minimum weight of sample (in use)

What is the lightest item you can weigh on your balance, while still achieving accurate and reliable weighing results? What exactly is the limit?

The KERN minimum sample weight protocol accounts for the established minimum sample weight of your balance and its location of installation and use with the relative ► **measuring uncertainty**. With various safety coefficients and required weighing accuracy (process accuracy), depending on standard or quality-related requirements on the balance being used.

The higher the selected safety coefficient, the higher the safety when using the balance in a particular process. Typical perturbations when using the balance e.g. small fluctuations in temperature are taken into account. In easily predictable conditions in a professional environment of use, KERN recommends a safety coefficient of 3. For critical processes, a correspondingly higher factor should be selected. The minimum sample weight protocol contains a diagram as well as a table, from which you can ascertain the minimum sample weight for your balance, depending on the process.

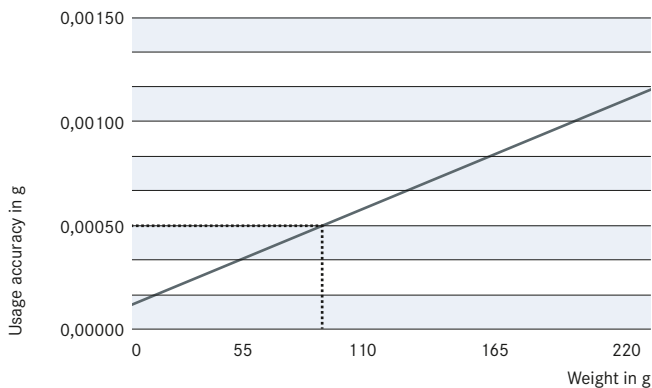
Safety coefficients and required process accuracy for the minimum sample weight:

Usage accuracy

As the calibration of a balance is a snapshot, there must be a statement relating to how the measuring instrument behaves in operation in the location of use, or to what extent the measuring uncertainty may change. This is because with daily use, the measuring uncertainty of a balance increases due to various influences. These influences must be recorded and rated ...

... and this is how:

By accepting that the same environmental conditions (e.g. draughts, vibrations, ...) as they were at the point of calibration are present at the location of the balance and estimated room temperature fluctuations of X Kelvin (°C) with a temperature coefficient assigned in the balance (in ppm/K), the result is a particular accuracy of use. You can establish this accuracy of use in accordance with EURAMET/cg-18.



Example:
Balance with 220 g.
At 82.5 g the usage accuracy
is 0.0005 g.

≅ 0.000606 %

Required process accuracy	Safety coefficient			
	1	3	5	10
0,1 %	0,0985 g	0,2983 g	0,5021 g	1,0297 g
0,2 %	0,0491 g	0,1480 g	0,2480 g	0,5021 g
0,5 %	0,0196 g	0,0590 g	0,0985 g	0,1979 g
1,0 %	0,0098 g	0,0294 g	0,0491 g	0,0985 g
2,0 %	0,0049 g	0,0147 g	0,0245 g	0,0491 g
5,0 %	0,0020 g	0,0059 g	0,0098 g	0,0196 g
10,0 %	0,0010 g	0,0029 g	0,0049 g	0,0098 g

Adjustment at the location of installation

Why?

Adjustment at the location of installation is necessary, as the measuring results of balances depend on the local gravitational force (gravitational acceleration) and therefore depend on the location of use. KERN can carry this out just before shipping at the factor, individually to suit the location of installation.

What are the advantages of carrying out adjustment at the location of installation?

- The balance gives reliable measurement results at the location of installation.
- No time-consuming on-site adjustment necessary.
- You do not need a Service Engineer or any additional weights.
- The balance is ready for immediate use.

Pricing table for adjustment at the location of installation

Area	KERN	Price
[Max] ≤ 5 kg	961-247	36,-
[Max] > 5 – 50 kg	961-247	44,-
[Max] > 50 – 350 kg	961-249	52,-
[Max] > 350 – 1500 kg	961-250	83,-
[Max] > 1500 – 2900 kg	961-251	110,-
[Max] > 2900 – 6000 kg	961-252	220,-
[Max] > 6000 – 12000 kg	961-253	250,-

For adjustment to the location of installation you need the value for gravitational acceleration at the location of installation, which KERN can calculate using the point of use. The procedure is suitable for balances with a resolution of <60,000 d. For higher resolutions we recommend a balance with an internal adjusting weight or adjustment with a calibrated adjusting weight at the location of installation.

Certificate of conformity

With a certificate of conformity you get a statement about whether the balance meets your defined requirements.

In conjunction with a DAkkS calibration certificate it serves as documented proof that the balance fulfils the required process demands. When doing this the process owner for the balance can select from different temperature specifications – depending on its individual requirements:

Conformity evaluation on the basis of the:	KERN		Price
Usage accuracy*	relative	969-511	on request
	absolute	969-512	
Calibration results*	relative	969-513	on request
	absolute	969-514	
Measurements as manufacturer or customer specification	other manuf.	969-515	on request
	cust. spec.	969-516	
	KERN device	969-517	

relative = % / absolute = g

*as supplement to the DAkkS certificate
(Details see www.kern-lab.com)

Example for absolute customer tolerance (Item no. 969-511):

No.	Tare	Load	Display	Deviation	Uncertainty	Customer tol.	Conformity ¹⁾
1	0 g	500 g	500,00 g	0,00 g	± 0,013 g	± 0,05 g	☑
2	0 g	1000 g	1000,00 g	0,00 g	± 0,015 g	± 0,05 g	☑
3	0 g	1500 g	1500,01 g	0,01 g	± 0,017 g	± 0,05 g	☑
4	0 g	2000 g	2000,01 g	0,01 g	± 0,020 g	± 0,10 g	☑
5	0 g	3000 g	3000,02 g	0,02 g	± 0,022 g	± 0,10 g	☑

¹⁾ Evaluation criteria: |[Deviation]| + [extended measuring uncertainty] ≤ [tolerance]

Factory calibration temperature of moisture analysers

In order to guarantee the comparability of the results of moisture analyses it is crucial that the heating chamber and therefore the sample are maintained at the correct temperature. Over time, for example, deposits or dirt can contaminate the heating chamber of the moisture analyser and this can distort the measuring results. It is therefore necessary to carry out regular temperature calibration.

KERN	Description	Price
964-305	Temperature calibration moisture analyser	140,-

Note: A calibration certificate is not a DAkkS calibration certificate, it is a factory calibration certificate.

Calibration is limited to the following models:
DAB 100-3, DBS 60-3, DLB 160-3A (depending on S/N),
DLT 100-3N (depending on S/N), MLS 50-3D, MLS 50-3C, MLB 50-3

Example for temperature calibration:

Test point	Display temperature kit	Calibration offset	Deviation	ext. measuring uncertainty	Tolerance	Conformity
100 °C ¹⁾	100,3 °C	- 0,2 °C	+ 0,1 °C	± 2,0 °C	± 5 °C	☑
160 °C ²⁾	159,8 °C	+ 0,3 °C	+ 0,1 °C	± 2,0 °C	± 5 °C	☑

¹⁾ Other test points are selectable ²⁾ Equals approx. 80 % max

Calibration and verification prices for electronic balances

DAkkS initial calibration and recalibration of balances at the KERN factory

Checking equipment	KERN	Price € excl. of VAT ex works
Weighing range		
Analytical balances		
[Max] ≤ 5 kg	963-101	138,-
[Max] > 5 kg	963-102	176,-
Precision balances/Industrial scales		
[Max] ≤ 5 kg	963-127	72,-
[Max] > 5 kg – 50 kg	963-128	88,-
[Max] > 50 kg – 350 kg	963-129	105,-
[Max] > 350 kg – 1500 kg	963-130	165,-
[Max] > 1500 kg – 2900 kg ¹⁾	963-131	220,-
[Max] > 2900 kg – 6000 kg ¹⁾	963-132	440,-
[Max] > 6000 kg – 12000 kg ¹⁾	963-133	500,-
Hanging scales/Crane scales		
[Max] ≤ 5 kg	963-127H	72,-
[Max] > 5 kg – 50 kg	963-128H	88,-
[Max] > 50 kg – 350 kg	963-129H	105,-
[Max] > 350 kg – 1500 kg	963-130H	165,-
[Max] > 1500 kg – 2900 kg	963-131H	250,-
[Max] > 2900 kg – 6000 kg	963-132H	500,-
[Max] > 6000 kg – 12000 kg ^{2) 3)}	963-133H	700,-
Additional services		
Preparation for recalibration (cleaning, adjustment, function test)	969-003R	20,-
Minimum weight of sample (for details see page 9 or internet)	969-103	10,-
DAkkS Express service with delivery time 48 hours (only on initial purchase, details see p. 15)	962-116	50,- / scale
Express shipping: Express supplement for guaranteed delivery on the next working day (if ready for shipment before 12:00 noon)	in GER only	40,- / parcel

¹⁾ Floor scales & axle load scales only (Price per weighing panel). Please ask for further details. ²⁾ On request ³⁾ Processing time 4 working days

⁴⁾ Processing time 15 working days

 Calibration prices for on-site calibration on request

Verification prices for electronic balances

Checking equipment	Initial verification	Price € excl. of VAT ex works	Subsequent verification	Price € excl. of VAT ex works
	KERN		KERN	
Electronic balances, class I, [Max] ≤ 5 kg ¹⁾	965-201	110,-	950-101R	180,-
Electronic balances, class I, [Max] > 5 kg ¹⁾	965-202	110,-	950-102R	230,-
Electronic balances, class II, [Max] ≤ 5 kg ¹⁾	965-216	66,-	950-116R	90,-
Electronic balances, class II, [Max] > 5 kg – 50 kg ¹⁾	965-217	77,-	950-117R	110,-
Electronic balances, class II, [Max] > 50 kg – 350 kg ¹⁾	965-218	110,-	950-118R	170,-
Electronic balances, class III-IV, [Max] ≤ 5 kg ¹⁾	965-227	55,-	950-127R	86,-
Electronic balances, class III-IV, [Max] > 5 kg – 50 kg ¹⁾	965-228	70,-	950-128R	86,-
Electronic balances, class III-IV, [Max] > 50 kg – 350 kg ¹⁾	965-229	93,-	950-129R	138,-
Electronic balances, class III-IV, [Max] > 350 kg – 1500 kg ¹⁾	965-230	132,-	950-130R	200,-
Electronic balances, class III-IV, [Max] > 1500 kg – 2900 kg ¹⁾	965-231	150,-	950-131R	280,-
Electronic balances, class III-IV, [Max] > 2900 kg – 6000 kg ¹⁾	965-232	200,-	950-132R	430,-
Preparation for recalibration (cleaning, adjustment, function test)	–	–	969-006R	20,-

Initial verification only when purchasing a balance from KERN, valid throughout Europe, reverification (only in Germany)

Verification prices for electronic crane scales

Checking equipment	Ersteichung	Price € excl. of VAT ex works	Subsequent verification	Price € excl. of VAT ex works
	KERN		KERN	
Electronic crane scales, class III-IV, [Max] > 50 kg – 350 kg ¹⁾	950-129H	150,-	950-129HR	150,-
Electronic crane scales, class III-IV, [Max] > 350 kg – 1500 kg ¹⁾	950-130H	200,-	950-130HR	250,-
Electronic crane scales, class III-IV, [Max] > 1500 kg – 2900 kg ¹⁾	950-131H	270,-	950-131HR	360,-
Electronic crane scales, class III-IV, [Max] > 2900 kg – 6000 kg ¹⁾	950-132H	500,-	950-132HR	550,-
Electronic crane scales, class III-IV, [Max] > 6000 kg – 12000 kg ¹⁾	950-133H	700,-	950-133HR	870,-
Electronic crane scales, class III-IV, [Max] > 12000 kg – 31000 kg ²⁾	–	–	950-134HR	1060,-
Electronic crane scales, class III-IV, [Max] > 31000 kg – 50000 kg ²⁾	–	–	950-135HR	1060,-
Preparation for recalibration (cleaning, adjustment, function test)	–	–	969-006R	20,-

¹⁾ Processing time 4 working days, ²⁾ processing time 15 working days

Equipment qualification

Documented quality of your balances in the log book

Consistently high product quality requires the use of measuring and test equipment that provides comprehensible, consistent and reproducible results. Hence, quality management systems require that measuring and test equipment produces a detailed traceable description and documentation of calibration results and conformity statements. Work not documented is work not done.

Equipment qualification is documentary evidence that a equipment is suitable for the intended purpose and is working faultlessly. A balance log book is used to record all activities and results required for the qualification and monitoring of balances during routine operation. This includes the installation and commissioning of the balances, routine tests, maintenance as well as the recording of special events (failures, repairs, change of location).

The structure of the balance log book is based on the qualification process of the balance. The requirements for the qualification system such as DIN EN ISO 9001, DIN EN ISO/IEC 17025, GLP/GMP, VDA must be taken into account. The log book supports the user in his/her daily work with the balance and is meant to serve as necessary evidence during inspections and audits. The responsibility for maintaining the log book and its appropriate use is to be borne by the user.

Our proposal: Count on our support!

KERN offers this qualification concept throughout. Our validation services are carried out on the spot by technicians of our calibration laboratory and comprise among other things: installation, measurement test inclusive DAkkS calibration certificate as well as records in your qualification log book.

We give you advice about the options of device qualification, as required and will be happy to set up an appointment for qualification at the place of installation. We offer individual calibration and maintenance agreements for the periodically required requalification.

Important elements of equipment qualification:



Installation qualification (IQ)

All steps to be taken for the installation and commissioning of the equipment are described in detail in the installation qualification. These include among others:

- checking for completeness of delivery and assurance that the delivered equipment meets the required specifications
- a description of the ambient conditions at the place of installation
- proper installation and assurance that the equipment is ready for operation after installation
- documentation of equipment configuration and equipment settings
- Recording and installation of connected peripherals units



Function qualification (OQ)

The operational qualification describes the metrological test performed for the balance at the place of installation. In the course of this all parameters that define the efficiency of a measurement will be checked. Functional qualification is carried out with the help of a standard operating procedure (SOP) and recorded in a calibration certificate. The OQ must be carried out by trained staff with the help of qualified aids (such as certified weights that are traceable to an approved standard). Briefing / training of users must be assured and recorded in the OQ.



Performance qualification (PQ)

The PQ represents documented evidence that the balance or weighing system functions in the selected application as intended. This will be assured by a qualification test of the equipment under real conditions with respect to its surroundings and the problem definition (such as traceable data transmission). If the balance or weighing system is "merely" to be used for weighing it will not be necessary to carry out a PQ as the ability to function has already been proven during the metrological test (OQ).



Maintenance qualification (MQ)

The periodical maintenance, cleaning work and complete metrological test of the balance/weighing system is documented in the MQ by a trained authorised engineer. The results are documented on a DAkkS calibration certificate. Maintenance is carried out with the help of a maintenance schedule.

Further information can be found at www.kern-lab.com



If you are interested in a qualification or training for equipment qualification, please feel free to contact us at +49[0]7433 9933-196.

The test weight

Calibration of test weights

In order to have calibrated measuring devices you must have calibrated checking equipment. For balances, for example, the test equipment is calibrated test weights.

Depending on frequency of use, test weights must be recalibrated at regular intervals. This is the only way to guarantee that you maintain the requirements for checking equipment so that it functions reliably.

Recalibration times depend on the frequency of use, the conditions of use and your safety requirements.

The standard does not give a defined recalibration period. We recommend that, with intensive use, you recalibrate your test weights every 6 months and with normal use (daily), every 12 months (weekly).

KERN calibrates test weights

- In all OIML error limit classes E1 – M3 and in sizes 1 mg – 2500 kg
- Test weights with free nominal value (any weight value)
- Carried out in Newton
- Independent of design (special designs)
- **Independent of the brand**



The advantages of using KERN in-house calibration (you send your test weights to us)

- Excellent price to performance ratio
- Quick handling time
 - DAkkS standard: 4 working days
 - DAkkS Express Service: from 48 hours (details on request)
- **Calibration service independent of the brand**
- KERN also reconditions old customer weights (e.g. cleaning or readjustment)
- KERN DAkkS calibration certificates are valid internationally
- We would be pleased to monitor your recalibration times
- On request, collection and delivery service by our courier service
- The most modern calibration methods with robot operated comparators allow the most accurate calibration results and rapid process times



The advantages of using KERN on-site calibration (we visit you)

We would be pleased to visit you within Germany and calibrate your test weights to OIML error limits M1 – M3, 10 kg – 2500 kg with our mobile MACOS calibration system. Minimized downtime of your checking equipment and direct contact with our expert are the major benefits of this service. Prices on request.



Selection of the appropriate test weight

Quality of the test weight

A balance can never be more accurate than the test weight which is used to adjust it. It depends on its tolerances.

Accuracy of the test weight

Must approximately correspond to the readout [d] of the balance, or should if anything, be better.

Weight size

This is often shown in the adjust mode “CAL” in the balance display. Given a choice, the largest displayed weight is the best one to use for accurate measurement. The weight of your test weight should ideally be larger than 80 % of the maximum weighing range of the balance. If accuracy and weight size (nominal value) are fixed, the appropriate test weight is selected according to

the tolerances of the individual accuracy classes (error limit classes) E1 to M3 (see page 14).

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 the readout [d] with approx. ± 10 mg.
- Displayed weight size in mode “CAL”: 1000 g or 2000 g. The required test weight therefore has the weight size 2 kg.
- Appropriate test weight with tolerance ± 10 mg and weight size 2 kg is found in error limit class F1.

Exception analytical balances (readout [d] ≤ 0.1 mg):

E1 test weights are recommended. Depending on the safety requirement, E2 test weights with a DAkkS calibration certificate will also be sufficient.

For more information about our test weights, see page 18.

OIML norm R 111 for weights

The key points from the OIML norm R 111

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 R 111 for weights relates to sizes 1 mg – 5000 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 $\pm \dots$ 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 R 111, e.g. it is accepted that: material density of the weights is 8000 kg/m³, air density is 1.2 kg/m³ and measuring temperature is 20 °C.

KERN cylindrical test weights

Comply with OIML R 111 in all respects, without exception.

Nominal value ↓	OIML R 111:2004 Maximum permissible errors for weights = permissible tolerances „Tol $\pm$ mg“						
	E1	E2	F1	F2	M1	M2	M3
1 mg	$\pm 0,003$ mg	$\pm 0,006$ mg	$\pm 0,020$ mg	$\pm 0,06$ mg	$\pm 0,20$ mg	-	-
2 mg	$\pm 0,003$ mg	$\pm 0,006$ mg	$\pm 0,020$ mg	$\pm 0,06$ mg	$\pm 0,20$ mg	-	-
5 mg	$\pm 0,003$ mg	$\pm 0,006$ mg	$\pm 0,020$ mg	$\pm 0,06$ mg	$\pm 0,20$ mg	-	-
10 mg	$\pm 0,003$ mg	$\pm 0,008$ mg	$\pm 0,025$ mg	$\pm 0,08$ mg	$\pm 0,25$ mg	-	-
20 mg	$\pm 0,003$ mg	$\pm 0,010$ mg	$\pm 0,03$ mg	$\pm 0,10$ mg	$\pm 0,3$ mg	-	-
50 mg	$\pm 0,004$ mg	$\pm 0,012$ mg	$\pm 0,04$ mg	$\pm 0,12$ mg	$\pm 0,4$ mg	-	-
100 mg	$\pm 0,005$ mg	$\pm 0,016$ mg	$\pm 0,05$ mg	$\pm 0,16$ mg	$\pm 0,5$ mg	$\pm 1,6$ mg	-
200 mg	$\pm 0,006$ mg	$\pm 0,020$ mg	$\pm 0,06$ mg	$\pm 0,20$ mg	$\pm 0,6$ mg	$\pm 2,0$ mg	-
500 mg	$\pm 0,008$ mg	$\pm 0,025$ mg	$\pm 0,08$ mg	$\pm 0,25$ mg	$\pm 0,8$ mg	$\pm 2,5$ mg	-
1 g	$\pm 0,010$ mg	$\pm 0,03$ mg	$\pm 0,10$ mg	$\pm 0,3$ mg	$\pm 1,0$ mg	$\pm 3,0$ mg	± 10 mg
2 g	$\pm 0,012$ mg	$\pm 0,04$ mg	$\pm 0,12$ mg	$\pm 0,4$ mg	$\pm 1,2$ mg	$\pm 4,0$ mg	± 12 mg
5 g	$\pm 0,016$ mg	$\pm 0,05$ mg	$\pm 0,16$ mg	$\pm 0,5$ mg	$\pm 1,6$ mg	$\pm 5,0$ mg	± 16 mg
10 g	$\pm 0,020$ mg	$\pm 0,06$ mg	$\pm 0,20$ mg	$\pm 0,6$ mg	$\pm 2,0$ mg	$\pm 6,0$ mg	± 20 mg
20 g	$\pm 0,025$ mg	$\pm 0,08$ mg	$\pm 0,25$ mg	$\pm 0,8$ mg	$\pm 2,5$ mg	$\pm 8,0$ mg	± 25 mg
50 g	$\pm 0,03$ mg	$\pm 0,10$ mg	$\pm 0,3$ mg	$\pm 1,0$ mg	$\pm 3,0$ mg	± 10 mg	± 30 mg
100 g	$\pm 0,05$ mg	$\pm 0,16$ mg	$\pm 0,5$ mg	$\pm 1,6$ mg	$\pm 5,0$ mg	± 16 mg	± 50 mg
200 g	$\pm 0,10$ mg	$\pm 0,3$ mg	$\pm 1,0$ mg	$\pm 3,0$ mg	± 10 mg	± 30 mg	± 100 mg
500 g	$\pm 0,25$ mg	$\pm 0,8$ mg	$\pm 2,5$ mg	$\pm 8,0$ mg	± 25 mg	± 80 mg	± 250 mg
1 kg	$\pm 0,5$ mg	$\pm 1,6$ mg	$\pm 5,0$ mg	± 16 mg	± 50 mg	± 160 mg	± 500 mg
2 kg	$\pm 1,0$ mg	$\pm 3,0$ mg	± 10 mg	± 30 mg	± 100 mg	± 300 mg	± 1000 mg
5 kg	$\pm 2,5$ mg	$\pm 8,0$ mg	± 25 mg	± 80 mg	± 250 mg	± 800 mg	± 2500 mg
10 kg	$\pm 5,0$ mg	± 16 mg	± 50 mg	± 160 mg	± 500 mg	± 1600 mg	± 5000 mg
20 kg	± 10 mg	± 30 mg	± 100 mg	± 300 mg	± 1000 mg	± 3000 mg	± 10 g
50 kg	± 25 mg	± 80 mg	± 250 mg	± 800 mg	± 2500 mg	± 8000 mg	± 25 g
100 kg	-	± 160 mg	± 500 mg	± 1600 mg	± 5000 mg	± 16 g	± 50 g
200 kg	-	± 300 mg	± 1000 mg	± 3000 mg	± 10 g	± 30 g	± 100 g
500 kg	-	± 800 mg	± 2500 mg	± 8000 mg	± 25 g	± 80 g	± 250 g
1000 kg	-	± 1600 mg	± 5000 mg	± 16 g	± 50 g	± 160 g	± 500 g
2000 kg	-	-	± 10 g	± 30 g	± 100 g	± 300 g	± 1000 g
5000 kg	-	-	± 25 g	± 80 g	± 250 g	± 800 g	± 2500 g

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

Individual weights per set	1	2	2	5	10	20	20	50	100	200	200	500	1	2	2	5	10	20	20	50	100	200	200	500	1	2	2	5	10																		
Weight set	mg	mg	mg	mg	mg	mg	mg	mg	mg	mg	mg	mg	g	g	g	g	g	g	g	g	g	g	g	g	g	kg	kg	kg	kg	kg																	
1 mg – 500 mg	Total weight												1,11 g																																		
1 mg – 50 g																							111,11 g																								
1 mg – 100 g																							211,11 g																								
1 mg – 200 g																							611,11 g																								
1 mg – 500 g																							1.111,11 g																								
1 mg – 1 kg																							2.111,11 g																								
1 mg – 2 kg																							6.111,11 g																								
1 mg – 5 kg																							11.111,11 g																								
1 mg – 10 kg																							21.111,11 g																								

DAkkS calibration certificate for test weights

1. "Official" document

The DAkkS calibration laboratory KERN (D-K-19408-01-00) is accredited through the accreditation point of the Deutsche Akkreditierungsstelle GmbH. The DAkkS calibration certificate is recognised internationally and is available in several languages.

2. Item to be calibrated

The calibration item with nominal value and OIML tolerance class if applicable, as well as the serial number is documented. In this way the assignment of the issued DAkkS calibration certificate to the weight or set of weights is completely guaranteed.

3. Traceability

The reference standards of the accredited laboratory are monitored in strictly defined cycles and periodically brought into line with national and thereby international standards. This is carefully documented and given on the DAkkS calibration certificate. In this way the basic fundamental traceability to the national standard is ensured.

4. Applicant

On the very first page of the DAkkS calibration certificate you will clearly see the applicant or owner of the calibrated checking equipment.

5. Environmental conditions

The environmental conditions during calibration are given here, such as the current temperature, the relative humidity and the air pressure at that point in time.

6. Metrological part

In this part of the calibration certificate information is given on the environmental conditions during calibration. Material, shape and density of the weight is given. The conventional weight value including the relevant measurement uncertainty is shown, as well as the OIML error limits and the OIML class.

7. ► Conventional mass

Using the substitution weighing method (comparative measurement with a test weight) you can determine the exact value of the weight to be calibrated. The conventional mass gives the deviation of the given value from the nominal value of the test item.

8. Measuring uncertainty

When obtaining any technical measurement, there is a particular uncertainty when trying to determine an exact value. This so-called measuring uncertainty should objectify measuring results, by establishing to what degree the measurement is expected to deviate from the true value. Determining and declaring the measuring uncertainty is of great significance, because the smaller this is, the more accurate the obtained weight.

KERN & Sohn GmbH
KERN CALIBRATION
Akkreditiertes Kalibrierlabor seit 1994.
Accredited calibration laboratory since 1994.

Ihr Partner für Kalibrierdienstleistungen, Prüfmittelmanagement und Beratung.
Your partner for calibration services, test equipment management and support.

akkreditiert durch die / accredited by the
Deutsche Akkreditierungsstelle GmbH
als Kalibrierlaboratorium im / as calibration laboratory in the
Deutschen Kalibrierdienst DKD

Kalibrierschein
Calibration certificate

Kalibrierteilen
Calibration mark

Sample
D-K-19408-01-00
2014-05

Gegenstand
Object
Gewichtssatz, 1 mg - 1 kg
Klasse E2
Set of weights, 1 mg - 1 kg
Class E2

Hersteller
Manufacturer
KERN & Sohn GmbH
Ziegelei 1
D-72336 Balingen
Germany
313-052

Typ
Type
F123456789

Fabrikat-/Serien-Nr.
Serial number
G123456789

Auftraggeber
Customer
Mustermann GmbH

2014-123456789

Kalibrierverfahren:
Calibration method
Die Kalibrierung erfolgte durch Vergleich mit den Bezugsnormale des Kalibrierlaboratoriums nach der Substitutionsmethode mit Auftriebskorrektur.
The calibration ensued through comparison with the reference standards of the calibration laboratory using the substitution method with air buoyancy correction.

Umgebungsbedingungen:
Ambient conditions
Die Kalibrierung wurde bei folgenden Umgebungsbedingungen ausgeführt:
The calibration was carried out under the following ambient conditions:

	von from	bis to	Unsicherheit uncertainty
Temperatur (°C) temperature	22,9	24,1	0,1
rel. Luftfeuchte (%) relative humidity	48,5	53,4	2,0
Luftdruck (hPa) air pressure	942,5	948,5	0,3

Referenzgewichte:
Standard weights
G1-123-D-K-19408-01-00-2014-05

Material / angenommene Dichte:
Material / assumed density:

Nennwert nominal value	Dichte density	Unsicherheit uncertainty	Material material	Form shape
1 mg - 500 mg	7950 kg/m³	140 kg/m³	Edelstahl Stainless steel	Draht Wire
1 g - 1 kg	8000 kg/m³	100 kg/m³	Edelstahl Stainless steel	Knopf Cylindrical form

Messergebnisse:
Measurement results:

Nennwert nominal value	Kennzeichnung marking	konventioneller Wägewert conventional mass	Unsicherheit k=2 uncertainty	Fehlergrenze max. perm. error	Klasse* class*
1 mg		1 mg + 0,0010 mg	0,0020 mg	± 0,0060 mg	E2 ✓
2 mg		2 mg + 0,0005 mg	0,0020 mg	± 0,0060 mg	E2 ✓
2 mg	*	2 mg + 0,0016 mg	0,0020 mg	± 0,0060 mg	E2 ✓
5 mg		5 mg + 0,0010 mg	0,0020 mg	± 0,0060 mg	E2 ✓
10 mg		10 mg + 0,0009 mg	0,0020 mg	± 0,0080 mg	E2 ✓
20 mg		20 mg - 0,001 mg	0,003 mg	± 0,010 mg	E2 ✓
20 mg	*	20 mg + 0,001 mg	0,003 mg	± 0,010 mg	E2 ✓
50 mg		50 mg + 0,001 mg	0,004 mg	± 0,012 mg	E2 ✓
100 mg		100 mg + 0,001 mg	0,005 mg	± 0,016 mg	E2 ✓
200 mg		200 mg + 0,002 mg	0,006 mg	± 0,020 mg	E2 ✓
200 mg	*	200 mg + 0,003 mg	0,006 mg	± 0,020 mg	E2 ✓
500 mg		500 mg + 0,005 mg	0,008 mg	± 0,025 mg	E2 ✓
1 g		1 g + 0,002 mg	0,010 mg	± 0,030 mg	E2 ✓
2 g		2 g + 0,002 mg	0,013 mg	± 0,040 mg	E2 ✓
2 g	*	2 g + 0,002 mg	0,013 mg	± 0,040 mg	E2 ✓
5 g		5 g + 0,010 mg	0,016 mg	± 0,050 mg	E2 ✓
10 g		10 g - 0,007 mg	0,020 mg	± 0,060 mg	E2 ✓
20 g		20 g + 0,005 mg	0,026 mg	± 0,080 mg	E2 ✓
20 g	*	20 g + 0,015 mg	0,026 mg	± 0,080 mg	E2 ✓
50 g		50 g + 0,02 mg	0,03 mg	± 0,10 mg	E2 ✓
100 g		100 g + 0,01 mg	0,05 mg	± 0,16 mg	E2 ✓
200 g		200 g + 0,05 mg	0,10 mg	± 0,30 mg	E2 ✓
200 g	*	200 g - 0,10 mg	0,10 mg	± 0,30 mg	E2 ✓
500 g		500 g + 0,10 mg	0,26 mg	± 0,80 mg	E2 ✓
1 kg		1 kg + 0,1 mg	0,5 mg	± 1,6 mg	E2 ✓

DAkkS calibration certificate for test weights (extract)

Please see www.kern-lab.com for more details on our calibration service and other useful information

Recalibration price of test weights (DAkkS calibration)

Class acc. OIML R 111:2004	→	E1 with volume determination (for new weights only)		E1 without volume determination		E2		F1 / F2 * F2 only		M1 / M2 / M3	
Nominal value	↓	KERN	Price € excl. of VAT ex works	KERN	Price € excl. of VAT ex works	KERN	Price € excl. of VAT ex works	KERN	Price € excl. of VAT ex works	KERN	Price € excl. of VAT ex works
1 mg		-	-	962-251R	52,-	962-351R	26,-	962-451R	18,-	962-651R	15,-
2 mg		-	-	962-252R	52,-	962-352R	26,-	962-452R	18,-	962-652R	15,-
5 mg		-	-	962-253R	52,-	962-353R	26,-	962-453R	18,-	962-653R	15,-
10 mg		-	-	962-254R	52,-	962-354R	26,-	962-454R	18,-	962-654R	15,-
20 mg		-	-	962-255R	52,-	962-355R	26,-	962-455R	18,-	962-655R	15,-
50 mg		-	-	962-256R	52,-	962-356R	26,-	962-456R	18,-	962-656R	15,-
100 mg		-	-	962-257R	52,-	962-357R	26,-	962-457R	18,-	962-657R	15,-
200 mg		-	-	962-258R	52,-	962-358R	26,-	962-458R	18,-	962-658R	15,-
500 mg		-	-	962-259R	52,-	962-359R	26,-	962-459R	18,-	962-659R	15,-
1 g	963-231	193,-	962-231R	52,-	962-331R	26,-	962-431R	18,-	962-631R	15,-	
2 g	963-232	193,-	962-232R	52,-	962-332R	26,-	962-432R	18,-	962-632R	15,-	
5 g	963-233	193,-	962-233R	52,-	962-333R	26,-	962-433R	18,-	962-633R	15,-	
10 g	963-234	193,-	962-234R	52,-	962-334R	26,-	962-434R	18,-	962-634R	15,-	
20 g	963-235	193,-	962-235R	52,-	962-335R	26,-	962-435R	18,-	962-635R	15,-	
50 g	963-236	193,-	962-236R	52,-	962-336R	26,-	962-436R	18,-	962-636R	15,-	
100 g	963-237	193,-	962-237R	52,-	962-337R	33,-	962-437R	20,-	962-637R	16,-	
200 g	963-238	193,-	962-238R	52,-	962-338R	33,-	962-438R	20,-	962-638R	16,-	
500 g	963-239	193,-	962-239R	52,-	962-339R	33,-	962-439R	20,-	962-639R	16,-	
1 kg	963-241	193,-	962-241R	52,-	962-341R	33,-	962-441R	20,-	962-641R	16,-	
2 kg	963-242	465,-	962-242R	64,-	962-342R	41,-	962-442R	25,-	962-642R	17,-	
5 kg	963-243	465,-	962-243R	64,-	962-343R	41,-	962-443R	25,-	962-643R	17,-	
10 kg	963-244	465,-	962-244R	64,-	962-344R	41,-	962-444R	25,-	962-644R	17,-	
20 kg	963-245	1160,-	962-245R	590,-	962-345R	52,-	962-445R	28,-	962-645R	22,-	
50 kg	963-246	1360,-	962-246R	660,-	962-346R	64,-	962-446R	39,-	962-646R	24,-	
100 kg	-	-	-	-	-	-	962-591R*	116,-	962-691R	63,-	
200 kg	-	-	-	-	-	-	962-592R*	116,-	962-692R	63,-	
500 kg	-	-	-	-	-	-	962-593R*	116,-	962-693R	63,-	
1000 kg	-	-	-	-	-	-	-	-	962-694R	136,-	
2000 kg	-	-	-	-	-	-	-	-	962-695R	250,-	
1 mg – 500 mg	-	-	962-250R	350,-	962-350R	190,-	962-450R	100,-	962-650R	63,-	
1 mg – 50 g	963-201	1070,-	962-201R	560,-	962-301R	315,-	962-401R	167,-	962-601R	106,-	
1 mg – 100 g	963-202	1170,-	962-202R	580,-	962-302R	340,-	962-402R	178,-	962-602R	112,-	
1 mg – 200 g	963-203	1350,-	962-203R	630,-	962-303R	385,-	962-403R	199,-	962-603R	125,-	
1 mg – 500 g	963-204	1440,-	962-204R	660,-	962-304R	410,-	962-404R	210,-	962-604R	131,-	
1 mg – 1 kg	963-205	1530,-	962-205R	700,-	962-305R	435,-	962-405R	220,-	962-605R	137,-	
1 mg – 2 kg	963-206	2000,-	962-206R	750,-	962-306R	495,-	962-406R	250,-	962-606R	152,-	
1 mg – 5 kg	963-207	2450,-	962-207R	770,-	962-307R	530,-	962-407R	265,-	962-607R	160,-	
1 mg – 10 kg	963-208	2900,-	962-208R	800,-	962-308R	560,-	962-408R	285,-	962-608R	167,-	
1 g – 50 g	963-215	770,-	962-215R	245,-	962-315R	127,-	962-415R	67,-	962-615R	42,-	
1 g – 100 g	963-216	860,-	962-216R	270,-	962-316R	150,-	962-416R	77,-	962-616R	49,-	
1 g – 200 g	963-217	1040,-	962-217R	320,-	962-317R	196,-	962-417R	98,-	962-617R	61,-	
1 g – 500 g	963-218	1130,-	962-218R	350,-	962-318R	220,-	962-418R	109,-	962-618R	68,-	
1 g – 1 kg	963-219	1230,-	962-219R	375,-	962-319R	245,-	962-419R	119,-	962-619R	74,-	
1 g – 2 kg	963-220	1780,-	962-220R	425,-	962-320R	305,-	962-420R	151,-	962-620R	89,-	
1 g – 5 kg	963-221	2230,-	962-221R	450,-	962-321R	340,-	962-421R	166,-	962-621R	96,-	
1 g – 10 kg	963-222	2690,-	962-222R	485,-	962-322R	370,-	962-422R	182,-	962-622R	104,-	

Additional costs for preparation, overhaul and adjustment before the calibration	KERN	Price € excl. of VAT ex works
Preparation of weights (e.g. cleaning, etc.)		
Single weight	969-001R	3,-
Weight set	969-002R	16,-
Subsequent services are carried out after confirmation		
Continued overhaul of weights (e.g. wet-cleaning, markings, repair, special packaging, adjustment E1, E2 ...)	969-005R	T & M basis
Adjustment, per weight only available for weights with adjustment chamber (F1-M3)	969-010R	12,-
Second calibration after adjustment or substitution, per weight		
Class E1	969-210R	40,-
Class E1 incl. volume determination	969-211R	80,-
Class E2	969-310R	14,-
Class F1/F2	969-410R	14,-
Class M1-M3	969-610R	14,-
Testing of magnetic properties according to OIML R111-2004, per weight	972-000	12,-
Calibration of NON-OIML test weights, additional price per weight	-	8,-

KERN DAkkS delivery times	
DAkkS standard service Class E2-M3	4 working days
DAkkS standard service Class E1, 1 mg - 500 mg, and recalibration 1 g - 10 kg with a known volume	10 working days
Class E1, 1 g - 2 kg, incl. volume determination (new weights)	15 working days

	DAkkS Express service in 48 hours except for class E1
• Urgent order is received at KERN by 12:00 noon at the latest • Ready for shipping at KERN within two working days, at 12:00 noon • Return by standard parcel service or express shipping (Costs and processing time on request) • Additional cost for DAkkS Express Service, for each • KERN test weight KERN 962-115 € 20,- • For Express shipping (details on request)	

Verification prices for test weights

Class acc. OIML R 111	→	E2 with verification certificate		F1 / F2 with verification certificate		M1 with verification certificate	
Nominal value	↓	KERN	Price € excl. of VAT ex works	KERN	Price € excl. of VAT ex works	KERN	Price € excl. of VAT ex works
1 mg		952-351	40,-	952-451	35,-	952-651	24,-
2 mg		952-352	40,-	952-452	35,-	952-652	24,-
5 mg		952-353	40,-	952-453	35,-	952-653	24,-
10 mg		952-354	40,-	952-454	35,-	952-654	24,-
20 mg		952-355	40,-	952-455	35,-	952-655	24,-
50 mg		952-356	40,-	952-456	35,-	952-656	24,-
100 mg		952-357	40,-	952-457	35,-	952-657	24,-
200 mg		952-358	40,-	952-458	35,-	952-658	24,-
500 mg		952-359	40,-	952-459	35,-	952-659	24,-
1 g		952-331	40,-	952-431	35,-	952-631	24,-
2 g		952-332	40,-	952-432	35,-	952-632	24,-
5 g		952-333	40,-	952-433	35,-	952-633	24,-
10 g		952-334	40,-	952-434	35,-	952-634	24,-
20 g		952-335	40,-	952-435	35,-	952-635	24,-
50 g		952-336	40,-	952-436	35,-	952-636	24,-
100 g		952-337	45,-	952-437	35,-	952-637	24,-
200 g		952-338	45,-	952-438	36,-	952-638	24,-
500 g		952-339	45,-	952-439	36,-	952-639	24,-
1 kg		952-341	45,-	952-441	36,-	952-641	24,-
2 kg		952-342	51,-	952-442	40,-	952-642	25,-
5 kg		952-343	51,-	952-443	40,-	952-643	25,-
10 kg		952-344	51,-	952-444	40,-	952-644	32,-
20 kg		952-345	59,-	952-445	42,-	952-645	36,-
50 kg		952-346	67,-	952-446	50,-	952-646	37,-
1 mg – 500 mg		952-350	200,-	952-450	105,-	952-650	66,-
1 mg – 50 g		952-301	330,-	952-401	175,-	952-601	111,-
1 mg – 100 g		952-302	360,-	952-402	187,-	952-602	117,-
1 mg – 200 g		952-303	405,-	952-403	210,-	952-603	131,-
1 mg – 500 g		952-304	430,-	952-404	220,-	952-604	137,-
1 mg – 1 kg		952-305	455,-	952-405	230,-	952-605	144,-
1 mg – 2 kg		952-306	520,-	952-406	260,-	952-606	159,-
1 mg – 5 kg		952-307	560,-	952-407	280,-	952-607	168,-
1 mg – 10 kg		952-308	590,-	952-408	300,-	952-608	175,-
1 g – 50 g		952-315	133,-	952-415	76,-	952-615	50,-
1 g – 100 g		952-316	157,-	952-416	81,-	952-616	54,-
1 g – 200 g		952-317	205,-	952-417	103,-	952-617	64,-
1 g – 500 g		952-318	235,-	952-418	114,-	952-618	71,-
1 g – 1 kg		952-319	255,-	952-419	125,-	952-619	78,-
1 g – 2 kg		952-220	320,-	952-420	158,-	952-620	93,-
1 g – 5 kg		952-321	355,-	952-421	174,-	952-621	101,-
1 g – 10 kg		952-322	390,-	952-422	191,-	952-622	109,-

KERN verification delivery time	
Standard verification service Class E2 – M1	6 working days

Additional costs for preparation, overhaul and adjustment before the verification	KERN	Price € excl. of VAT ex works
Preparation of weights (e.g. cleaning, etc.)		
Single weight	969-008R	3,-
Weight set	969-009R	16,-
Subsequent services are carried out after confirmation		
Continued overhaul of weights (e.g. wet-cleaning, markings, repair, special packaging, adjustment E2)	969-005R	nach Aufwand
Adjustment, per weight only available for weights with adjustment chamber (F-M1)	969-010R	12,-
Verification after adjustment or substitution, per weight		
Class E2	969-310R	14,-
Class F1/F2	969-410R	14,-
Class M1	969-610R	14,-

! Verification only valid in Germany



Accredited calibration with DAkkS calibration certificate for force gauges

From the transducer to the complete force gauge, we are happy to take care of traceable calibration of your test equipment for you. Our accreditation includes the calibration of tensile and compression force up to 5 kN according to the standards DIN EN ISO 376 and DKD-R 3-3, each with the Newton (N) display unit for a complete force gauge (situation B) or voltage ratio/transmission coefficient (mV/V, situation A).

Comparison of DIN EN ISO 376 and DKD-R 3-3		
	ISO 376	DKD-R 3-3
Standard	ISO standard (internationally standardized)	Standard of the DKD (Germany)
Measuring equipment	Force transducers and complete force gauge	Force transducers and complete force gauge
Area of application	Specifically force gauges for the testing of testing equipment	General force gauges
Number of power stages	8	5
Classification/Assessment	Classification in classes 00; 0,5; 1 and 2	None in standard
Test sequences	Fixed procedure	Sequences A, B, C, D possible Standard is sequence A, B, C and D are reduced sequences, relevant previous knowledge is necessary
Summary	Higher-quality calibration, as 8 force levels are calibrated	High-quality calibration, reduced sequences with less effort possible

The image shows a digital force gauge (SAUTER model 6) connected to two force transducers. The gauge has a digital display showing 0.00 and several buttons for operation. It is connected to a force transducer (A) and a force transducer (B) via cables. The force transducers are labeled A and B.

Situation B:
complete force gauge (N),
consisting of transducer,
amplifier and display

KERN®

CALIBRATION

KERN & Sohn GmbH

Akkreditiertes Kalibrierlabor seit 1994.
Accredited calibration laboratory since 1994.

Ihr Partner für Kalibrierdienstleistungen, Prüfmittelmanagement und Beratung.
Your partner for calibration services, test equipment management and support.

akkreditiert durch die / accredited by the

Deutsche Akkreditierungsstelle GmbH

als Kalibrierlaboratorium im / as calibration laboratory in the

Deutschen Kalibrierdienst DKD

Sample
DAK
19403-01-00
2017-05

Kalibrierschein
Calibration certificate

Kalibrierzeichen
Calibration mark

Gegenstand
Object

Kraftmessgerät
Force measurer

Max 500 N, d= 0,1 N

Hersteller
Manufacturer

Sauter GmbH
Ziegelse 1
72336 Balingen
Deutschland

Typ
Type

FH 500

Fabrikate/Serien-Nr.
Number number

ZHI1110671

Beschreiber
Mustermann Grottel

Dieser Kalibrierschein dokumentiert die Rückführung auf nationale Normale zur Darstellung der Einheiten in Übereinstimmung mit dem Internationalen Einheitensystem (SI).
The DAKKS is Unterzeichner der multilateralen Übereinkommen der European co-operation for Accreditation (EA) und der International Laboratory Accreditation Cooperation (ILAC) zur gegenseitigen Anerkennung der Kalibrierscheine.
Für die Einhaltung einer angemessenen Frist zur Wiederholung der Kalibrierung ist

Messwerte (Zugkraft) / Measurement results (tension force)

2017-05

Ausrichtung rotation	Ausgangsposition / initial position 0°		120°		240°	
Kraft force	R1	R2	R3	R4	R5	R6
0 N	0,0 N	0,0 N	0,0 N	0,0 N	0,0 N	0,0 N
100,0 N	-99,8 N	-99,8 N	-99,8 N	-99,8 N	-99,8 N	-99,8 N
200,0 N	-199,6 N	-199,6 N	-199,6 N	-199,6 N	-199,6 N	-199,6 N
300,0 N	-299,4 N	-299,4 N	-299,4 N	-299,4 N	-299,4 N	-299,4 N
400,0 N	-399,2 N	-399,2 N	-399,2 N	-399,2 N	-399,2 N	-399,2 N
500,0 N	-499,0 N	-499,0 N	-499,0 N	-499,0 N	-499,0 N	-499,0 N
0 N	0,0 N	0,0 N	0,0 N	0,0 N	0,0 N	0,0 N

Messergebnisse (Zugkraft) / Measured values (tension force)

Aus den oben aufgeführten Messwerten ergeben sich die folgenden Messergebnisse.
The following measurement results are calculated using the measured values above:
Rel. Kalibrierabweichung:
Rel. Nullpunktabweichungen:
0,000 % (R1), 0,000 % (R2), 0,000 % (R3&R4), 0,000 % (R5&R6)

Kraft force	arith. Mittelwert average	rel. Wiederhol- präzision b/ Wiederholbarkeit	rel. Vergleichs- präzision B reproducibility	rel. Umkehrspanne + hysteresis
100,0 N	-99,8 N	0,000 %	0,000 %	0,000 %
200,0 N	-199,6 N	0,000 %	0,000 %	0,000 %
300,0 N	-299,4 N	0,000 %	0,000 %	0,000 %
400,0 N	-399,2 N	0,000 %	0,000 %	0,000 %
500,0 N	-499,0 N	0,000 %	0,000 %	0,000 %

DAKKS calibration certificate for force gauges (extract)

Prices for DAkkS calibration of force gauges and force transducers

Situation A: Force transducer (voltage ratio, in mV/V)*1,2					
ISO 376 (8 stages)			DKD-R 3-3 (5 stages, sequence A)		
KERN	Measuring range	€	KERN	Measuring range	€
Tensile force:					
963-161IV (R)	≤ 500 N	181,-	963-161V (R)	≤ 500 N	168,-
963-162IV (R)	≤ 2 kN	214,-	963-162V (R)	≤ 2 kN	198,-
963-163IV (R)	≤ 5 kN	280,-	963-163V (R)	≤ 5 kN	258,-
Compression force:					
963-261IV (R)	≤ 500 N	181,-	963-261V (R)	≤ 500 N	168,-
963-262IV (R)	≤ 2 kN	214,-	963-262V (R)	≤ 2 kN	198,-
963-263IV (R)	≤ 5 kN	280,-	963-263V (R)	≤ 5 kN	258,-
Tensile & Compression force:					
963-361IV (R)	≤ 500 N	302,-	963-361V (R)	≤ 500 N	278,-
963-362IV (R)	≤ 2 kN	363,-	963-362V (R)	≤ 2 kN	333,-
963-363IV (R)	≤ 5 kN	478,-	963-363V (R)	≤ 5 kN	438,-

Situation B: Complete force gauge (in N)*2					
ISO 376 (8 stages)			DKD-R 3-3 (5 stages, sequence A)		
KERN	Measuring range	€	KERN	Measuring range	€
Tensile force:					
963-161I (R)	≤ 500 N	149,-	963-161 (R)	≤ 500 N	135,-
963-162I (R)	≤ 2 kN	182,-	963-162 (R)	≤ 2 kN	165,-
963-163I (R)	≤ 5 kN	248,-	963-163 (R)	≤ 5 kN	225,-
Compression force:					
963-261I (R)	≤ 500 N	149,-	963-261 (R)	≤ 500 N	135,-
963-262I (R)	≤ 2 kN	182,-	963-262 (R)	≤ 2 kN	165,-
963-263I (R)	≤ 5 kN	248,-	963-263 (R)	≤ 5 kN	225,-
Tensile & Compression force:					
963-361I (R)	≤ 500 N	270,-	963-361 (R)	≤ 500 N	245,-
963-362I (R)	≤ 2 kN	330,-	963-362 (R)	≤ 2 kN	300,-
963-363I (R)	≤ 5 kN	446,-	963-363 (R)	≤ 5 kN	405,-

(R): Recalibration

For each force gauge without interface or from other manufacturers we charge a surcharge of 10,- € for the additional effort.

*1 Compatibility with our amplifiers required

*2 Installation in our measuring equipment required



Factory calibration

for force

Situation A: Force transducer (voltage ratio, in mV/V)* ^{1,2}			Situation B: Complete force gauge (in N)** ²		
KERN	Measuring range	€	KERN	Measuring range	€
Tensile force:					
961-161V (R)	≤ 500 N	168,-	961-161 (R)	≤ 500 N	135,-
961-162V (R)	≤ 2 kN	198,-	961-162 (R)	≤ 2 kN	165,-
961-163V (R)	≤ 5 kN	258,-	961-163 (R)	≤ 5 kN	225,-
961-164V (R)	≤ 20 kN	328,-	961-164 (R)	≤ 20 kN	295,-
961-165V (R)	≤ 50 kN	328,-	961-165 (R)	≤ 50 kN	295,-
961-166V (R)	≤ 120 kN	358,-	961-166 (R)	≤ 120 kN	325,-
Compression force:					
961-261V (R)	≤ 500 N	168,-	961-261 (R)	≤ 500 N	135,-
961-262V (R)	≤ 2 kN	198,-	961-262 (R)	≤ 2 kN	165,-
961-263V (R)	≤ 5 kN	258,-	961-263 (R)	≤ 5 kN	225,-
961-264V (R)	≤ 20 kN	328,-	961-264 (R)	≤ 20 kN	295,-
961-265V (R)	≤ 50 kN	328,-	961-265 (R)	≤ 50 kN	295,-
961-266V (R)	≤ 120 kN	358,-	961-266 (R)	≤ 120 kN	325,-
Tensile & Compression force					
961-361V (R)	≤ 500 N	278,-	961-361 (R)	≤ 500 N	245,-
961-362V (R)	≤ 2 kN	333,-	961-362 (R)	≤ 2 kN	300,-
961-363V (R)	≤ 5 kN	438,-	961-363 (R)	≤ 5 kN	405,-
961-364V (R)	≤ 20 kN	473,-	961-364 (R)	≤ 20 kN	440,-
961-365V (R)	≤ 50 kN	473,-	961-365 (R)	≤ 50 kN	440,-
961-366V (R)	≤ 120 kN	520,-	961-366 (R)	≤ 120 kN	485,-

(R): Recalibration

For each force gauge without interface or from other manufacturers we charge a surcharge of 10,- € for the additional effort.

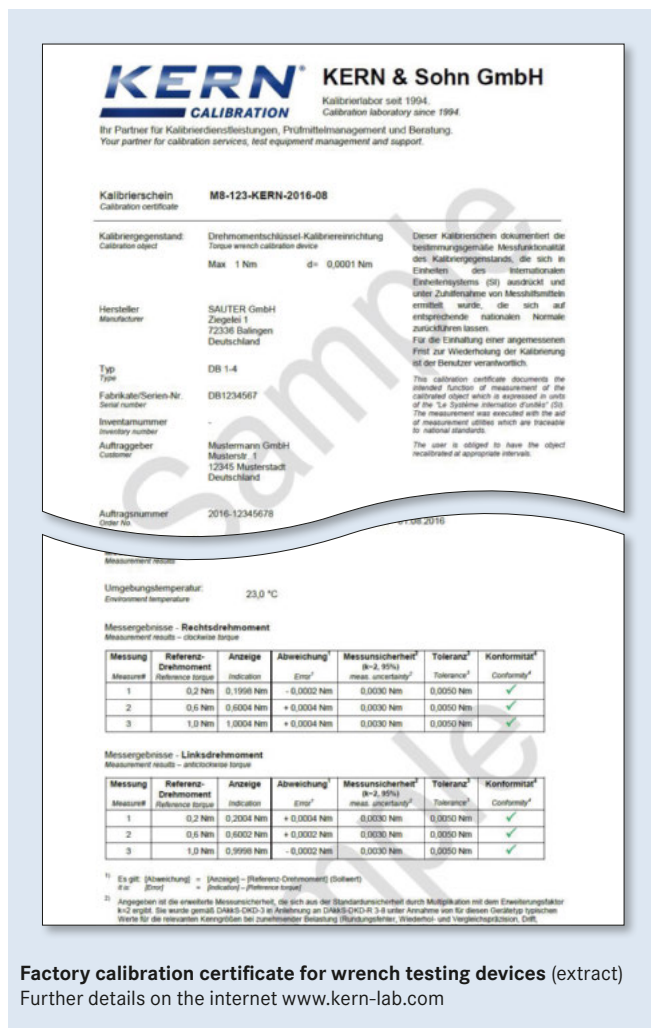
*¹ Compatibility with our amplifiers required

*² Installation in our measuring equipment required



Factory calibration

for other measuring instruments



Factory calibration certificates

As DAkkS calibration certificates cannot be offered for all measuring devices or measurement sizes, or where it is not customary, we then offer factory calibration certificates. These calibration certificates meet international standards and are particularly suitable as proof of exacting calibration in the monitoring of your checking equipment. Factory calibrations are available for many measuring devices, for example

- Mechanical balances (spring balances, etc.)
- Force-measuring devices up to 120 kN
- Measuring devices for layer thickness 0 µm - 2000 µm
- Hardness testing devices in accordance with Leeb tests
- Ultrasound material thickness testing devices 25 - 300 mm

We carry out calibrations whatever the brand. In order to avoid any unnecessary delays when processing your order, please send us the technical documents and accessories with the checking device. Calibration time 4 working days.

KERN	Measurand	Measuring range	Price € excl. of VAT ex works
Factory calibration			
961-167	Force (for hand grip dynamometer KERN MAP)	≤ 130 kg	120,-
961-110	Coating thickness	≤ 2000 µm F or N	120,-
961-112	Coating thickness	≤ 2000 µm FN	170,-
961-113	Wall thickness (ultra sound)	≤ 300 mm (in stainless steel)	120,-
961-114	Wall thickness (test blocks)	≤ 300 mm	150,-
961-170	Hardness Shore	For sets up to 7 plates	95,-
961-131	Hardness Leeb	400 - 800 HLD	120,-
961-132	Hardness Leeb	Test block (for Leeb durometer)	120,-
961-270	Hardness (UCI)	200 - 800 HV	260,-
961-150	Length	≤ 300 mm	120,-
961-190	Light	≤ 200000 lx	165,-
961-100	Weight (Mechanical balances/ Spring balances)	≤ 5 kg	72,-
961-101	Weight (Mechanical balances/ Spring balances)	> 5 - 50 kg	88,-
961-102	Weight (Mechanical balances/ Spring balances)	> 50 - 350 kg	105,-
961-103	Weight (Mechanical balances/ Spring balances)	> 350 - 1500 kg	165,-
961-120	Wrench testing devices	1 Nm - 200 Nm	170,-
964-305	Temperature calibration moisture analyser		140,-
Additional services			
962-116	Calibration express service with 48 hour delivery (only on new purchases)		50,-/ Instrument

* Calibration is limited to the following models:

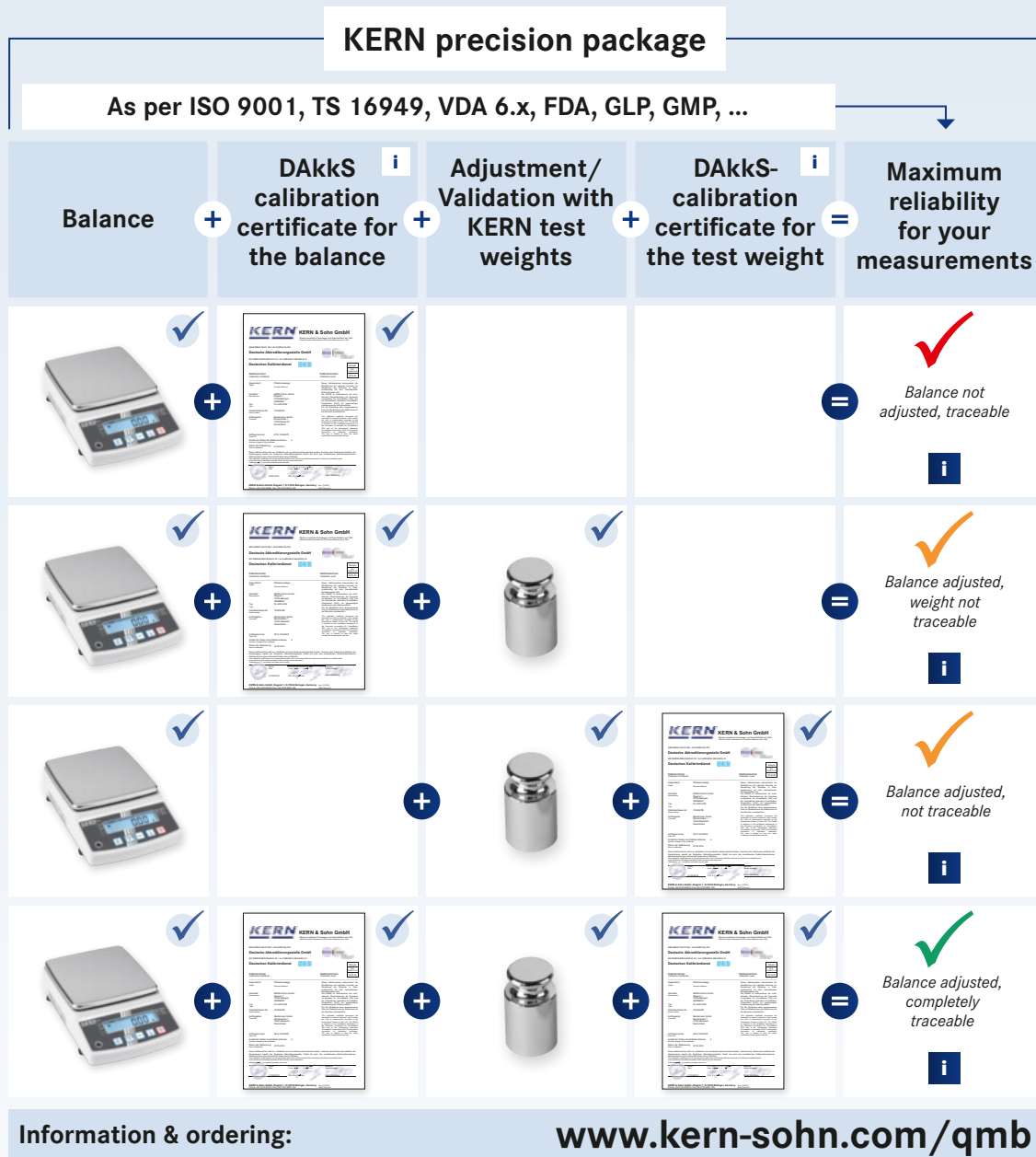
DAB 100-3, DBS 60-3, DLB 160-3A (depending on S/N), DLT 100-3N (depending on S/N), MLS 50-3D, MLS 50-3C, MLB 50-3

For up-to-date information on the test services for further measuring sizes please visit our website

www.kern-lab.com

Balance & weight in the quality management system

Do you already use all the modules of the KERN precision package for maximum accuracy and reliability of your balance?



CALIBRATION

Calibration is the testing and determination of the precision of a measure value without intervention in the measurement system. The calibration certificate contains the measured value with information on the relevant measuring uncertainty. If applicable, a statement can be made as to whether this is within tolerance limits. Industry requires calibration of measuring devices, in order to, for example, be able to connect parts manufactured at different locations without encountering problems. Calibrations must be repeated at appropriate time intervals, for which the user is responsible. KERN recommends that, with intensive (daily) use, you recalibrate the measuring devices every 6 months and with normal (weekly) use, every 12 months.

DAKKS CALIBRATION

DAkKS calibration is carried out for measuring devices, reference materials and material measures for particular measurement sizes and measurement ranges, which are defined individually for every laboratory as part of their accreditation. The issued DAkKS calibration certificates are proof of the metrological traceability to national and international standards, as required, for example, by the DIN EN ISO 9000 and DIN EN ISO/IEC 17025 standards. DAkKS calibration has no legally regulated period of validity. The operator is responsible for observing an appropriate time for recalibration. Usually the recalibration period is approx. 1 year.

INTERNATIONAL VALIDITY OF DAKKS CALIBRATION CERTIFICATES

DAkKS is represented in the EA (European co-operation for Accreditation) as well as in the ILAC (International Laboratory Accreditation Cooperation). This ensures that DAkKS calibration and DAkKS calibration certificates are recognised and valid almost anywhere in the world.

ADJUSTING

Precise setting of a measured value by professional intervention in the measurement system. For balances: Either with an external test weight using the adjustment function (CAL or CAL key), or with the automatic internal adjustment or adjustment control. This is necessary following changes in temperature, changed environmental conditions, change of location, etc. daily routine checks are recommended. The term “calibrating” was formerly also used for adjusting., but today it means something else (see above).

MONITORING YOUR CHECKING EQUIPMENT

This is a mandatory requirement of quality management systems.

TRACEABILITY

The pre-requisite for all perfect measurement is the complete, continuous proof, that a measuring device can be traced to international or national standards. The most important standards demand that all checking equipment (e.g. test weights) meets the national or international standards in accordance with defined tolerances. In weighing technology, these standards are the test weights. They are traced back to the national test weight in the PTB (Physikalisch Technische Bundesanstalt) in Braunschweig, which in turn is derived from the original kilogram in Paris. In this way, incorrect measurements through inaccurate checking equipment is avoided.

MEASURING UNCERTAINTY

Measurement uncertainty is determined for each balance according to a precisely given test method and documented in the Calibration certificate. It depends on various factors, both internal and external. The measuring uncertainty of a measuring device is an objective measure of its accuracy and is therefore an accurate statement for its appropriate use.

OIML

OIML (Organisation Internationale de Métrologie Légale) has representatives from almost 100 states who work on unified build and test regulations for all measuring devices. In the OIML certification system the certificates issued by the member states certify that a particular measuring device build type is in accordance with the OIML recommendations. In this way, a build type which was tested and approved in one country, can be approved in another country without having to repeat the test. (Excerpt from PTB). The OIML R111 guideline defines the construction-related characteristics for test weights, such as material, upper surface texture, markings, construction, shape etc.

FACTORY CALIBRATION CERTIFICATES

The testing of measuring devices for accuracy in accordance with a recognised, but not accredited, process – this is the difference when compared with DAkKS calibration.

CONVENTIONAL MASS

Every body experiences a relatively small loss of weight in air (buoyancy). This must be taken into account for accurate weighing procedures. In order to avoid this “distortion” in daily use, all weights are adjusted to the unit specifications as given in R111 OIML recommendation. (air pressure 1.2 kg/m³ and material density 8000 kg/m³)

KERN - Tradition and Innovation for over 170 years

An independent family business, KERN since already 7 generations is synonymous with quality and reliability in customer service.

Competent with the most rapid process times

- DAkkS accreditation
DIN EN ISO/IEC 17025
- Certified QM system
DIN EN ISO 9001
- Authorisation for initial
verification by the
manufacturer 2014/31/EU
- Medical certifications
DIN EN ISO 13485 and
Medical 93/42/EWG
- Verification point for
balances and weights

www.kern-lab.com – the central portal for everything you need to know about the extensive KERN calibration services

On our website you will always find the latest news and useful information about testing and measuring devices, calibration, legal metrology and expansions to our range of services. You will also find numerous online services on the website

Database supported management of test equipment

Information on your test equipment which has been calibrated by us is stored in our database. In this way it is possible to make trend calculations. You will therefore get an overview of the long-term stability and trend behaviour of your test equipment and the necessary recalibration period can easily be determined and specified.

Paperless documentation

So that there is no administrative effort, we can handle all calibration documentation in a paperless process. From quotation, through to order confirmation, delivery note and invoice right up to calibration certificate, you will receive all documents by e-mail or you can retrieve them online.

Would you prefer to receive your certificate or your invoice, for example, in paper form? Of course this is not a problem either.

Price quote generator

Create your own offer - you will receive your offer directly and without delay.



KERN & SOHN GmbH DAkkS Calibration service

Ziegelei 1

72336 Balingen

Deutschland

Tel. +49 [0] 7433 9933-196

Fax +49 [0] 7433 9933-29699

info@kern-sohn.com

 www.kern-sohn.com
www.kern-lab.com

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