180 YEARS since 1844 KERN & SOHN

KERN CALIBRATION

EN

Accredited Calibration and Verification Service for Balances, Test Weights, Force Measurement and more

TEST SERVICE

PROFESSIONAL MEASURING

ilac-MRA

DAkkS Deutsche Akkreditierungsstelle D-K-19408-01-00

Accredited calibrations according to DIN EN ISO/IEC 17025:2018 norms for balances, weights, force, volumes of solid bodies, densities of solid bodies, temperature, humidity.

i kern-lab.com

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The heart of calibration and verification*[1]

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.

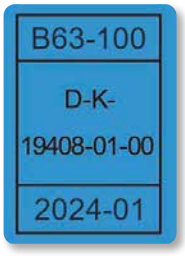
Calibration of measuring devices

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/EIC 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 (Deutsche Akkreditierungsstelle).

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.

Recalibration information (optional)



DAkkS calibration mark

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 body (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 fulfills this obligation.

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

KERN has a highly-automated laboratory with DAkkS accreditation according to DIN EN ISO/IEC 17025 in the field of balances, test weights, force measurement, humidity and temperature. 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.**

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

*[1] The "initial verification" for new balances is called conformity assessment according to NAWID: 2014/31/EU, a verification corresponds to the "reverification".

All you need to know about calibration and verification*1

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*1
(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 and 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.

*1 The “initial verification” for new balances is called conformity assessment according to NAWID: 2014/31/EU, a verification corresponds to the “reverification”.

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.s.

Calibration of balances on site (at the customer)
Calibration of your balances at your site. 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**.

Calibration of force
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.

Calibration of temperature and humidity
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 measuring devices within your production process.

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.

Factory calibration
The testing of measuring devices for accuracy in accordance with a recognised but not accredited process without proof of metrological traceability – this is the difference when compared with DAkkS calibration.

Digital Calibration Certificate (DCC)
The “Digital Calibration Certificate (DCC)” created by the PTB can be downloaded on www.kern-lab.com/dcc. You will find further information on page 22.
The paperless calibration certificate as PDF can be downloaded at the calibration download on www.kern-lab.com.

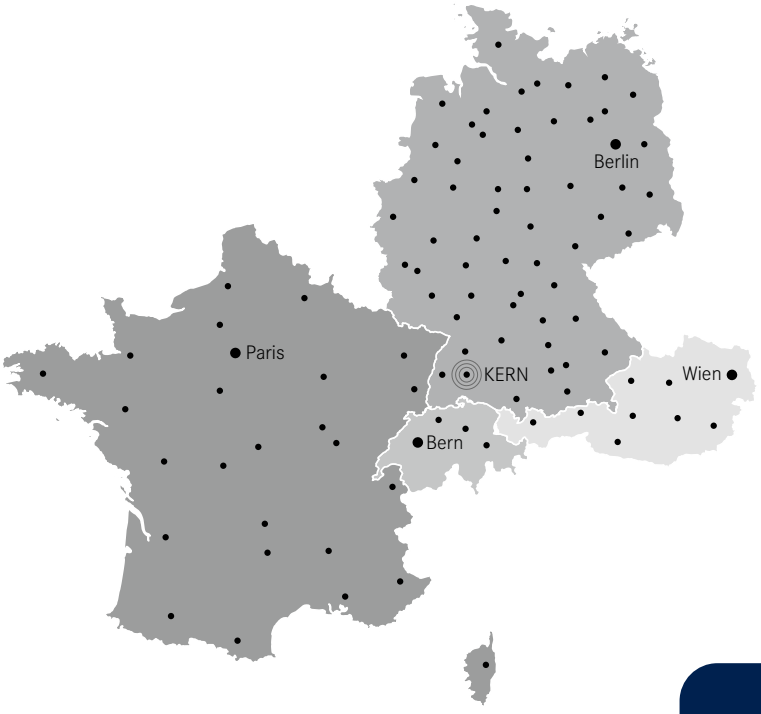
Reverification service for balances and test weights
The reverification of balances and weights is regulated on a national level and can therefore only be offered for balances and weights used in Germany. For reverification kindly contact the agencies in your country.

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



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

In Germany, the accredited calibration laboratory of KERN has a close-knit network of 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 arrangement. Prices for on-site calibration on request.

Tell us your desired date with indication of the scales to be tested or enter your inquiry directly in our offer generator on www.kern-lab.com. One of our calibration employees will then contact you immediately and discuss the calibration procedure with you at your premises – uncomplicated and competent.

phone: +49 7433 9933-400
e-Mail: testservices-onsite@kern-sohn.com

ADVANTAGES OF THE ON-SITE CALIBRATION:

+ Calibration in the field of use
+ Minimization of measuring uncertainty and guarantee of process accuracy strictly according to EURAMET cg-18
+ No risk of damage during transportation
+ Low downtime
+ Direct and personal contact with the service technician
+ 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

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 device and checking tool if it is calibrated and this calibration is documented. The issued calibration certificates with accreditation symbol 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 a recalibration every 6 months with intensive (daily) use and a recalibration every 12 months with normal (weekly) use.

ADVANTAGES OF THE 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 desired

b) 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 to travel for on-site calibration. Necessary repairs can be carried out at the same time, quickly and comprehensive.

The process is 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 evaluation your balance is returned.

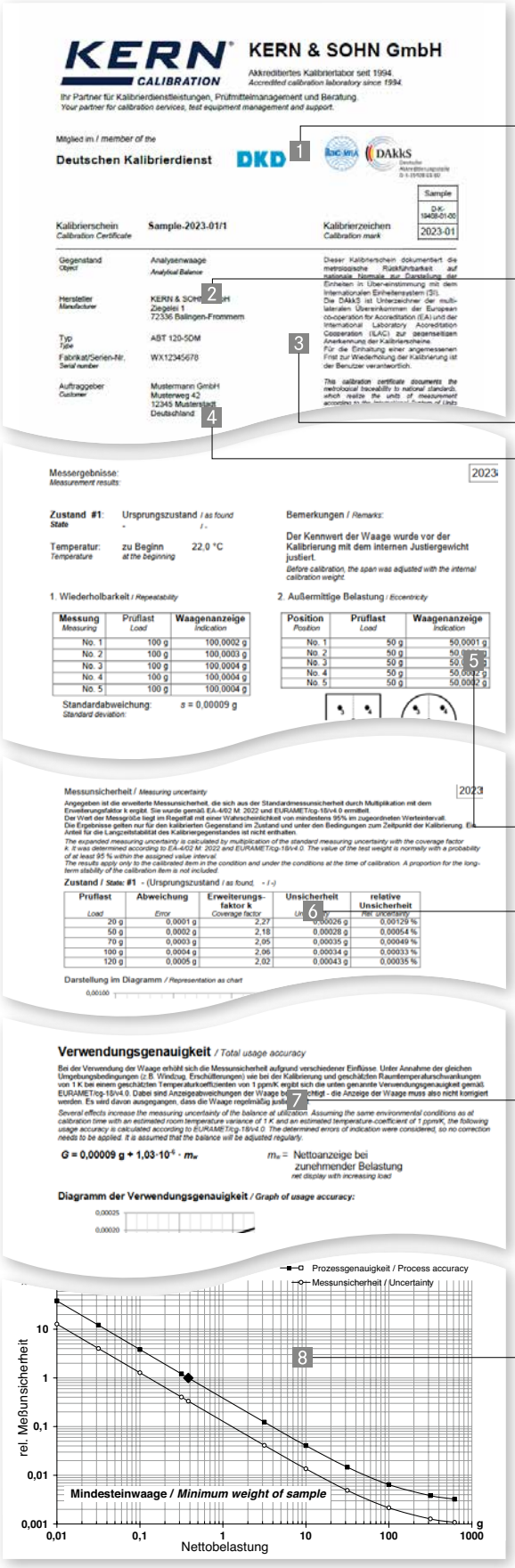
Recalibration

- **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 frequently): Recalibration period of 12 months

- **Recalibration prices:** Prices can be found in the price list. 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.

Calibration service for balances (accredited calibration)

The accreditation is valid for the scope defined in the document annex D-K-19408-01-00.



Calibration certificate with accreditation symbol for balances (extract)

Calibration certificate with accreditation symbol for balances

1. “Official” document

The calibration laboratory KERN (D-K-19408-01-00) is accredited by the accreditation body of the DAkkS (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 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 calibration certificate. In this way the basic fundamental traceability to the national standard is ensured.

4. Applicant

On the very first page of the 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 accredited 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)

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.

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.

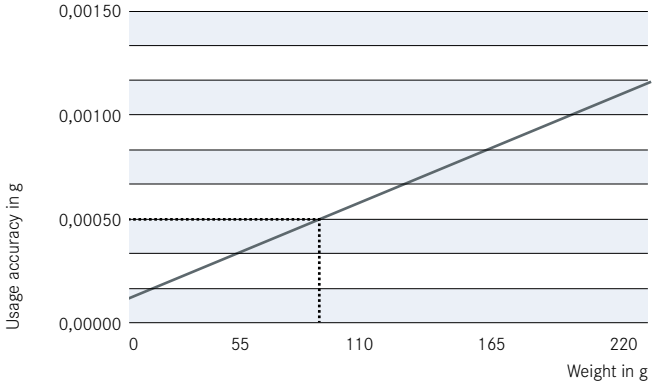
Safety coefficients and required process accuracy for the minimum sample weight:

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 %

	Safety coefficient			
Required process accuracy	**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.

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.

Pricing table for adjustment at the location of installation

Area	KERN	Price
[Max] ≤ 5 kg	961-247	**41,-**
[Max] > 5 – 50 kg	961-248	**50,-**
[Max] > 50 – 350 kg	961-249	**59,-**
[Max] > 350 – 1500 kg	961-250	**94,-**
[Max] > 1500 – 2900 kg	961-251	**125,-**
[Max] > 2900 – 6000 kg	961-252	**250,-**
[Max] > 6000 – 12000 kg	961-253	**285,-**

KERN CALIBRATION

KERN & SOHN GmbH

Kalibrierlabor seit 1994.
Calibration laboratory since 1994.

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

Justage auf den Aufstellungsort
Adjustment to the place of use

Kalibriergegenstand: *Calibration object*	IFB 30K5DM
Hersteller *Manufacturer*	KERN & SOHN GmbH Ziegelei 1 72336 Balingen Germany
Seriennummer *Serial no.*	DB1234567
Auftragsnummer *Order No.*	2023-12345678
Auftraggeber *Customer*	Mustermann GmbH Musterstr. 1 12345 Musterstadt Deutschland
Ort der Justage *Place of adjustment*	KERN & SOHN GmbH Ziegelei 1 72336 Balingen-Frommern Deutschland

Die Justage auf den Aufstellungsort wurde vom Kunden erwünscht. Die Waage wurde mit rückführbaren Normalen auf die angegebene Gravitation justiert. Gegen eine weitere Justage ist die Waage nicht gesichert.

The adjustment to the place of use was requested by the customer. The balance was adjusted using weights which are traceable to the national standards. The weighing instrument is not secured against a re-adjustment.

Certificate of conformity

Konformitätszertifikat / *Certificate of conformity*

ausgestellt für: / *issued for:*

Typ: *Type* PNJ 3000-2M Serien-Nr.: *Serial number* WX161234567 Inventar-Nr.: *Inventory number* -

Dieses Konformitätszertifikat bescheinigt die Gültigkeit der folgenden Konformitätsaussagen auf Basis der Messergebnisse des Kalibrierscheins:

This conformity certificate documents the validity of the following statements of conformity based on the measurement results of corresponding calibration certificate:

Konformitätsaussagen: / *Statements of conformity:*

A) Die im Rahmen der Kalibrierung festgestellten Anzeigeabweichungen der Waage (siehe Seite 4) liegen unter den angegebenen Mess- und Umgebungsbedingungen und unter Berücksichtigung der erweiterten Messunsicherheiten (Überdeckungswahrscheinlichkeit 95%) innerhalb der Toleranz. Die angegebene Messunsicherheit berücksichtigt bereits unter anderem die Einflüsse der Wiederholbarkeit und der außermittigen Belastung, weshalb eine separate Bewertung dieser Parameter nicht durchgeführt wurde.

The errors of indication determined during calibration (ref. page 4) are under given measurement and environmental conditions and considering the expanded measurement uncertainty (coverage probability 95%) within the specification. The given measurement uncertainty already includes the effects of repeatability and eccentricity. Therefore, those parameters have not been assessed separately.

Nr. *No.*	Prüflast *Test load*	Anzeige *Indication*	Abweichung *Error*	erw. Unsicherheit *exp. uncertainty*	Toleranz *Tolerance*	Konformität[1] *Conformity*[1]
1	500 g	500,01 g	0,01 g	0,016 g	0,050 g	✓
2	1000 g	1000,01 g	0,01 g	0,016 g	0,050 g	✓
3	1500 g	1500,01 g	0,01 g	0,016 g	0,050 g	✓
4	2000 g	2000,01 g	0,01 g	0,017 g	0,100 g	✓
5	3000 g	3000,02 g	0,02 g	0,018 g	0,100 g	✓

[1]) Bewertungskriterium: | [Abweichung] | + [erw. Unsicherheit] ≤ [Toleranz]
Assessment criterium: | *[Error]* | + *[exp. uncertainty]* ≤ *[Tolerance]*

Zusammenfassung / *Summary*

Zum Zeitpunkt der Prüfung lagen die im Rahmen dieses Kalibrierscheins ermittelten Messergebnisse **innerhalb der Toleranz.**
At the time of testing, all measurement results determined in the context of this calibration certificate were within the tolerance.

Für einen anderen Verwendungsort, bei anderen Umgebungsbedingungen oder nicht bestimmungsgemäßer Verwendung der Waage kann Gültigkeit der oben aufgeführten Konformitätsaussagen nicht garantiert werden.
The validity of the statements of conformity cannot be guaranteed for different places of use, environmental conditions or improper use.

With a certificate of conformity you get a statement about whether the balance meets your defined requirements.
In conjunction with a calibration certificate with accreditation symbol 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 absolute	969-511 969-512	**on request**
Calibration results*	relative absolute	969-513 969-514	**on request**
Measurements as manufacturer or customer specification	other manuf. cust. spec. KERN device	969-515 969-516 969-517	**on request** **on request** **21,-**

relative = % / absolute = g

*as supplement to the certificate with accreditation symbol
(For details see www.kern-lab.com)

Calibration and verification prices for electronic balances

Accredited initial calibration and recalibration of balances at the KERN factory

Checking equipment	Initial calibration	Price € excl. of VAT ex works	Recalibration	Price € excl. of VAT ex works
Weighing range				
Analytical balances				
[Max] ≤ 5 kg	963-101	**191,-**	963-101 (R)	**193,-**
[Max] > 5 kg	963-102	**240,-**	963-102 (R)	**245,-**
High resolution precision balances (>500.000d)				
[Max] ≤ 5 kg	963-103	**162,-**	963-103 (R)	**163,-**
[Max] > 5 kg – 50 kg	963-104	**184,-**	963-104 (R)	**186,-**
[Max] > 50 kg – 350 kg	963-105	**205,-**	963-105 (R)	**210,-**
Precision balances / industrial scales				
[Max] ≤ 5 kg	963-127	**98,-**	963-127 (R)	**99,-**
[Max] > 5 kg – 50 kg	963-128	**118,-**	963-128 (R)	**119,-**
[Max] > 50 kg – 350 kg	963-129	**146,-**	963-129 (R)	**147,-**
[Max] > 350 kg – 1500 kg	963-130	**205,-**	963-130 (R)	**210,-**
[Max] > 1500 kg – 2900 kg [1]	963-131	**275,-**	963-131 (R)	**275,-**
[Max] > 2900 kg – 6000 kg [1]	963-132	**550,-**	963-132 (R)	**550,-**
[Max] > 6000 kg – 12000 kg [1]	963-133	**620,-**	963-133 (R)	**630,-**
Hanging scales / crane scales				
[Max] ≤ 5 kg	963-127H	**98,-**	963-127H(R)	**99,-**
[Max] > 5 kg – 50 kg	963-128H	**118,-**	963-128H(R)	**119,-**
[Max] > 50 kg – 350 kg	963-129H	**138,-**	963-129H(R)	**139,-**
[Max] > 350 kg – 1500 kg	963-130H	**245,-**	963-130H(R)	**250,-**
[Max] > 1500 kg – 2900 kg	963-131H	**375,-**	963-131H(R)	**375,-**
[Max] > 2900 kg – 6000 kg	963-132H	**620,-**	963-132H(R)	**630,-**
[Max] > 6000 kg – 12000 kg [2] [3]	963-133H	**870,-**	963-133H(R)	**880,-**
Additional services				
Preparation for recalibration (cleaning, adjustment, function test)			969-003R	**24,-**
Minimum weight of sample (for details see page 9 or internet)			969-103	**10,-**
Express service with delivery time 48 hours, per scale			962-116(R)	**52,-**
Express shipping			in GER only	-

[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

Calibration prices for on-site calibration on request, for more information see page 6.

Verification[6] prices for electronic balances

Checking equipment	Initial verification[6] KERN	Price € excl. of VAT ex works	Reverification[7] KERN	Price € excl. of VAT ex works
Electronic balances, class I, [Max] ≤ 5 kg [4]	965-201	**150,-**	950-101R	**235,-**
Electronic balances, class I, [Max] > 5 kg [4]	965-202	**150,-**	950-102R	**305,-**
Electronic balances, class II, [Max] ≤ 5 kg [4]	965-216	**85,-**	950-116R	**120,-**
Electronic balances, class II, [Max] > 5 kg – 50 kg [4]	965-217	**99,-**	950-117R	**146,-**
Electronic balances, class II, [Max] > 50 kg – 350 kg [4]	965-218	**135,-**	950-118R	**225,-**
Electronic balances, class III–IV, [Max] ≤ 5 kg [4]	965-227	**65,-**	950-127R	**114,-**
Electronic balances, class III–IV, [Max] > 5 kg – 50 kg [4]	965-228	**84,-**	950-128R	**114,-**
Electronic balances, class III–IV, [Max] > 50 kg – 350 kg [4]	965-229	**110,-**	950-129R	**184,-**
Electronic balances, class III–IV, [Max] > 350 kg – 1500 kg [4]	965-230	**158,-**	950-130R	**270,-**
Electronic balances, class III–IV, [Max] > 1500 kg – 2900 kg [4]	965-231	**178,-**	950-131R	**375,-**
Electronic balances, class III–IV, [Max] > 2900 kg – 6000 kg [4]	965-232	**235,-**	950-132R	**580,-**
Preparation for recalibration (cleaning, adjustment, function test)	–	–	969-006R	**25,-**

Verification[6] prices for electronic crane scales

Checking equipment	Initial verification[6] KERN	Price € excl. of VAT ex works	Reverification[7] KERN	Price € excl. of VAT ex works
Electronic crane scales, class III–IV, [Max] > 50 kg – 350 kg [4]	965-129H	**119,-**	950-129HR	**200,-**
Electronic crane scales, class III–IV, [Max] > 350 kg – 1500 kg [4]	965-130H	**150,-**	950-130HR	**330,-**
Electronic crane scales, class III–IV, [Max] > 1500 kg – 2900 kg [4]	965-131H	**178,-**	950-131HR	**480,-**
Electronic crane scales, class III–IV, [Max] > 2900 kg – 6000 kg [4]	965-132H	**235,-**	950-132HR	**720,-**
Electronic crane scales, class III–IV, [Max] > 6000 kg – 12000 kg [4]	965-133H	**355,-**	950-133HR	**1160,-**
Electronic crane scales, class III–IV, [Max] > 12000 kg – 31000 kg [5]	–	–	950-134HR	**1420,-**
Electronic crane scales, class III–IV, [Max] > 31000 kg – 50000 kg [5]	–	–	950-135HR	**1420,-**
Preparation for recalibration (cleaning, adjustment, function test)	–	–	969-006R	**25,-**

[4] Processing time 4 working days, [5] processing time 15 working days,

[6] "Initial verification"/conformity assessment according to NAWID: 2014/31/EU, only when purchasing a balance from KERN, valid throughout Europe

[7] Verification ("reverification"), only for Germany

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. True to the guiding principle of GMP/GLP: "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 as well as our EQS (Equipment qualification software) 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 in the software EQS (Equipment qualification software).

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.

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:
+49 7433 9933-400
testservices-onsite@kern-sohn.com

Important elements of equipment qualification:

Design Qualification (DQ)

With the design qualification, which ist carried out under consideration of a requirement specification/functional description, all the requirements on which you as a user depend on, are defined. The purchase decision is made on the basis of the design specifications and the available devices. Careful selection in the DQ can prevent later deficiencies.

Installation Qualification (IQ)

During the installation qualification based on a FMEA, we perform a documented installation, up to the qualified commissioning of your device. Points of this qualification are:

- Scope of delivery and identification
- Visual inspection of the system components
- Evaluation of the installation site
- Hardware installation and device settings
- Cleaning
- Query of work instructions during use
- Clarification of deviations
- Document review and approval

We carry out our qualifications in accordance with the GMP standard.

Function Qualification (OQ)

Instruction is given to the user/s. Items of the OQ are:

- Function test of the system
- Initial adjustment on site
- Metrological verification including USP & Ph.Eur.
- Creation of test protocols
- Check of menu function and error message
- Review and approval of documents
- Evaluation of performance and determination of further test procedure

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).

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. Maintenance is carried out with the help of a maintenance schedule. We are pleased to support you with a maintenance contract for the entire organization of your measuring system.

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
  - Standard: approx. 4 working days
  - 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 calibration certificates with accreditation symbol 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 please go to kern-sohn.com.

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 ± ... 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

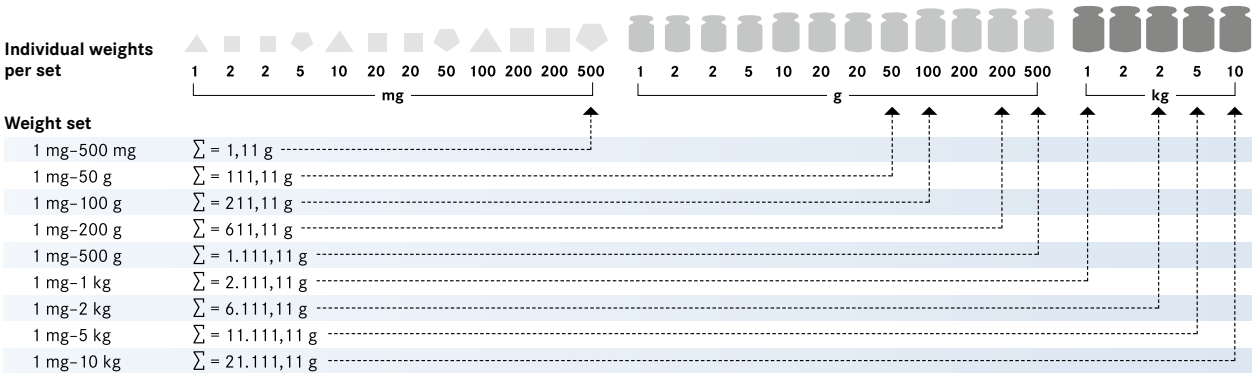
The problem is the air buoyancy, which makes the weight appear lighter. In order to avoid this "distortion" in daily use, all weights are adjusted to the unit specifications as given in R 111, e.g. it is accepted that: material density of the weights is 8000 kg/m³, air density is 1.2 kg/m³ and measuring temperature is 20 °C.

KERN cylindrical test weights

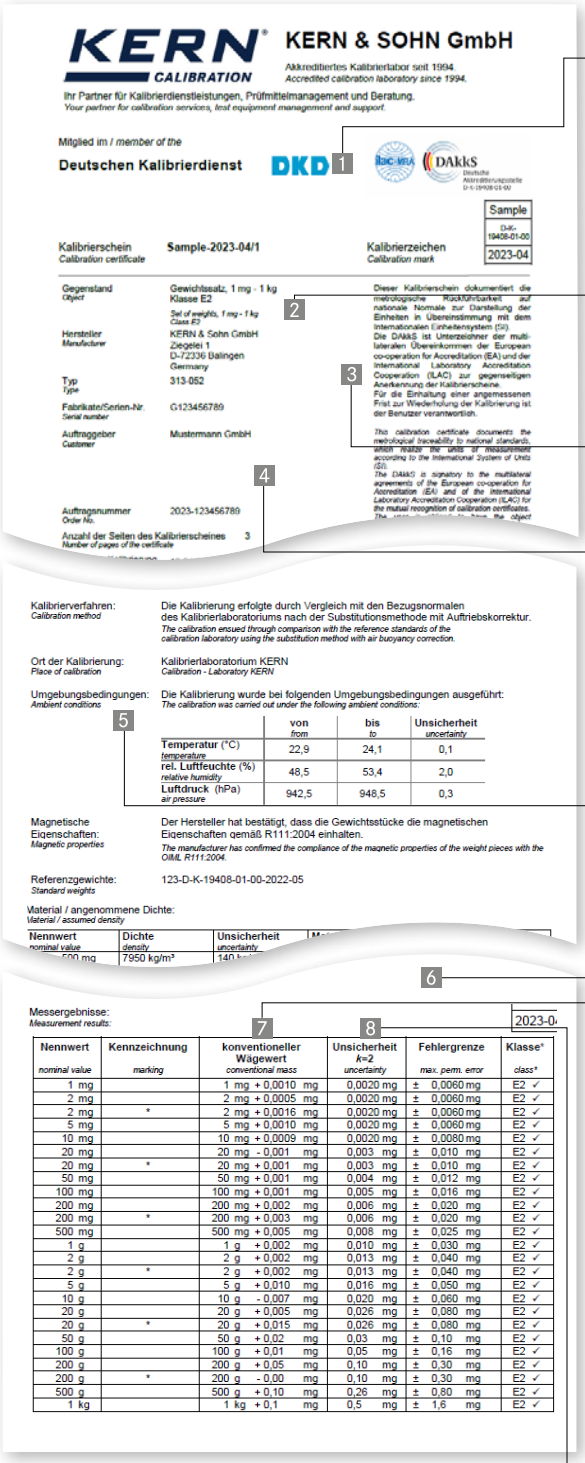
Comply with OIML R 111 in all respects, without exception.

Nominal value ↓	OIML R 111:2004 Maximum permissible errors for weights = permissible tolerances "Tol ± 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	± 1000 mg
5 kg	± 2,5 mg	± 8,0 mg	± 25 mg	± 80 mg	± 250 mg	± 800 mg	± 2500 mg
10 kg	± 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



The accreditation is valid for the scope defined in the document annex D-K-19408-01-00.



KERN CALIBRATION

KERN & SOHN GmbH

Akkreditiertes Kalibrierlabor seit 1994
Accredited calibration laboratory since 1994.

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

Mitglied im / *member of the*
Deutschen Kalibrierdienst DKD 1

Sample D-K-19408-01-00 2023-04

Kalibrierschein / *Calibration certificate*: Sample-2023-04/1
Kalibrierzeichen / *Calibration mark*

Gegenstand / *Object*: Gewichtssatz, 1 mg - 1 kg Klasse E2
Set of weights, 1 mg - 1 kg Class E2
2

Hersteller / *Manufacturer*: KERN & Sohn GmbH, Ziegelei 1, D-72336 Balingen, Germany

Typ / *Type*: 313-052

Fabrikate/Serien-Nr. / *Serial number*: G123456789

Auftraggeber / *Customer*: Mustermann GmbH

Dieser Kalibrierschein dokumentiert die metrologische Rückführbarkeit auf nationale Normale zur Darstellung der Einheiten in Übereinstimmung mit dem Internationalen Einheitensystem (SI). Die DAkkS ist 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 der Benutzer verantwortlich.
3

This calibration certificate documents the metrological traceability to national standards, which realize the units of measurement according to the International System of Units (SI). The DAkkS is signatory to the multilateral agreements of the European co-operation for Accreditation (EA) and of the International Laboratory Accreditation Cooperation (ILAC) for the mutual recognition of calibration certificates.

4

Auftragsnummer / *Order No.*: 2023-123456789

Anzahl der Seiten des Kalibrierscheines / *Number of pages of the certificate*: 3

Kalibrierverfahren / *Calibration method*: Die Kalibrierung erfolgte durch Vergleich mit den Bezugsnormalen 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.

Ort der Kalibrierung / *Place of calibration*: Kalibrierlaboratorium KERN / *Calibration - Laboratory KERN*

Umgebungsbedingungen / *Ambient conditions*: Die Kalibrierung wurde bei folgenden Umgebungsbedingungen ausgeführt: *The calibration was carried out under the following ambient conditions:*
5

	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

Magnetische Eigenschaften / *Magnetic properties*: Der Hersteller hat bestätigt, dass die Gewichtsstücke die magnetischen Eigenschaften gemäß R111:2004 einhalten.
The manufacturer has confirmed the compliance of the magnetic properties of the weight pieces with the OIML R111:2004.

Referenzgewichte / *Standard weights*: 123-D-K-19408-01-00-2022-05

Material / angenommene Dichte / *Material / assumed density*

Nennwert / *nominal value*	Dichte / *density*	Unsicherheit / *uncertainty*
500 mg	7950 kg/m³	140 kg/m³

6

Messergebnisse / *Measurement results:* 2023-0

7 8

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 - 0,00 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 ✓

Calibration certificate with accreditation symbol for test weights (extract)
Please see www.kern-lab.com for more details on our calibration service and other useful information

Calibration certificate with accreditation symbol for weights

1. "Official" document

The calibration laboratory KERN (D-K-19408-01-00) is accredited by the accreditation point of the Deutsche Akkreditierungsstelle GmbH. The cal. certificate with accreditation symbol 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 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 calibration certificate. In this way the basic fundamental traceability to the national standard is ensured.

4. Applicant

On the very first page of the 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.

Recalibration prices of test weights (accredited 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	**77,-**	962-351R	**34,-**	962-451R	**22,-**	962-651R	**18,-**
2 mg	–	–	962-252R	**77,-**	962-352R	**34,-**	962-452R	**22,-**	962-652R	**18,-**
5 mg	–	–	962-253R	**77,-**	962-353R	**34,-**	962-453R	**22,-**	962-653R	**18,-**
10 mg	–	–	962-254R	**77,-**	962-354R	**34,-**	962-454R	**22,-**	962-654R	**18,-**
20 mg	–	–	962-255R	**77,-**	962-355R	**34,-**	962-455R	**22,-**	962-655R	**18,-**
50 mg	–	–	962-256R	**77,-**	962-356R	**34,-**	962-456R	**22,-**	962-656R	**18,-**
100 mg	–	–	962-257R	**77,-**	962-357R	**34,-**	962-457R	**22,-**	962-657R	**18,-**
200 mg	–	–	962-258R	**77,-**	962-358R	**34,-**	962-458R	**22,-**	962-658R	**18,-**
500 mg	–	–	962-259R	**77,-**	962-359R	**34,-**	962-459R	**22,-**	962-659R	**18,-**
1 g	963-231	**245,-**	962-231R	**77,-**	962-331R	**34,-**	962-431R	**22,-**	962-631R	**18,-**
2 g	963-232	**245,-**	962-232R	**77,-**	962-332R	**34,-**	962-432R	**22,-**	962-632R	**18,-**
5 g	963-233	**245,-**	962-233R	**77,-**	962-333R	**34,-**	962-433R	**22,-**	962-633R	**18,-**
10 g	963-234	**245,-**	962-234R	**77,-**	962-334R	**34,-**	962-434R	**22,-**	962-634R	**18,-**
20 g	963-235	**245,-**	962-235R	**77,-**	962-335R	**34,-**	962-435R	**22,-**	962-635R	**18,-**
50 g	963-236	**245,-**	962-236R	**77,-**	962-336R	**34,-**	962-436R	**22,-**	962-636R	**18,-**
100 g	963-237	**245,-**	962-237R	**77,-**	962-337R	**43,-**	962-437R	**25,-**	962-637R	**20,-**
200 g	963-238	**245,-**	962-238R	**77,-**	962-338R	**43,-**	962-438R	**25,-**	962-638R	**20,-**
500 g	963-239	**245,-**	962-239R	**77,-**	962-339R	**43,-**	962-439R	**25,-**	962-639R	**20,-**
1 kg	963-241	**245,-**	962-241R	**77,-**	962-341R	**43,-**	962-441R	**25,-**	962-641R	**20,-**
2 kg	963-242	**550,-**	962-242R	**95,-**	962-342R	**52,-**	962-442R	**31,-**	962-642R	**21,-**
5 kg	963-243	**550,-**	962-243R	**95,-**	962-343R	**52,-**	962-443R	**31,-**	962-643R	**21,-**
10 kg	963-244	**550,-**	962-244R	**95,-**	962-344R	**52,-**	962-444R	**31,-**	962-644R	**21,-**
20 kg	963-245	**1280,-**	962-245R	**720,-**	962-345R	**68,-**	962-445R	**35,-**	962-645R	**27,-**
50 kg	963-246	**1500,-**	962-246R	**800,-**	962-346R	**79,-**	962-446R	**46,-**	962-646R	**29,-**
100 kg	–	–	–	–	–	–	962-591R*	**143,-**	962-691R	**77,-**
200 kg	–	–	–	–	–	–	962-592R*	**143,-**	962-692R	**77,-**
500 kg	–	–	–	–	–	–	962-593R*	**143,-**	962-693R	**77,-**
1000 kg	–	–	–	–	–	–	–	–	962-694R	**169,-**
2000 kg	–	–	–	–	–	–	–	–	962-695R	**310,-**
1 mg – 500 mg	–	–	962-250R	**500,-**	962-350R	**235,-**	962-450R	**124,-**	962-650R	**77,-**
1 mg – 50 g	963-201	**1400,-**	962-201R	**820,-**	962-301R	**385,-**	962-401R	**205,-**	962-601R	**132,-**
1 mg – 100 g	963-202	**1520,-**	962-202R	**850,-**	962-302R	**425,-**	962-402R	**220,-**	962-602R	**138,-**
1 mg – 200 g	963-203	**1750,-**	962-203R	**930,-**	962-303R	**485,-**	962-403R	**245,-**	962-603R	**155,-**
1 mg – 500 g	963-204	**1860,-**	962-204R	**970,-**	962-304R	**520,-**	962-404R	**255,-**	962-604R	**162,-**
1 mg – 1 kg	963-205	**1980,-**	962-205R	**1050,-**	962-305R	**560,-**	962-405R	**270,-**	962-605R	**170,-**
1 mg – 2 kg	963-206	**2580,-**	962-206R	**1110,-**	962-306R	**610,-**	962-406R	**310,-**	962-606R	**187,-**
1 mg – 5 kg	963-207	**2890,-**	962-207R	**1160,-**	962-307R	**650,-**	962-407R	**325,-**	962-607R	**198,-**
1 mg – 10 kg	963-208	**3290,-**	962-208R	**1200,-**	962-308R	**700,-**	962-408R	**355,-**	962-608R	**205,-**
1 g – 50 g	963-215	**1010,-**	962-215R	**365,-**	962-315R	**159,-**	962-415R	**83,-**	962-615R	**51,-**
1 g – 100 g	963-216	**1100,-**	962-216R	**395,-**	962-316R	**190,-**	962-416R	**95,-**	962-616R	**61,-**
1 g – 200 g	963-217	**1340,-**	962-217R	**475,-**	962-317R	**250,-**	962-417R	**121,-**	962-617R	**75,-**
1 g – 500 g	963-218	**1460,-**	962-218R	**520,-**	962-318R	**290,-**	962-418R	**135,-**	962-618R	**85,-**
1 g – 1 kg	963-219	**1600,-**	962-219R	**560,-**	962-319R	**320,-**	962-419R	**148,-**	962-619R	**91,-**
1 g – 2 kg	963-220	**2240,-**	962-220R	**640,-**	962-320R	**395,-**	962-420R	**186,-**	962-620R	**110,-**
1 g – 5 kg	963-221	**2620,-**	962-221R	**660,-**	962-321R	**445,-**	962-421R	**205,-**	962-621R	**119,-**
1 g – 10 kg	963-222	**3060,-**	962-222R	**720,-**	962-322R	**480,-**	962-422R	**225,-**	962-622R	**128,-**

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	**5,-**
Weight set	969-002R	**20,-**
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	**15,-**
Second calibration after adjustment or substitution, per weight		
Class E1	969-210R	**63,-**
Class E1 incl. volume determination	969-211R	**230,-**
Class E2	969-310R	**30,-**
Class F1/F2	969-410R	**20,-**
Class M1–M3	969-610R	**16,-**
Testing of magnetic properties according to OIML R111-2004, per weight	961-115R	**15,-**
Calibration of NON-OIML test weights, additional price per weight	–	**8,-**

KERN delivery times	
Standard service Class E2-M3	4 working days
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

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 express Service, for each
- KERN test weight KERN 962-115 € **21,–**
- 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	952-351R	**55,-**	952-451R	**47,-**	952-651R	**32,-**
2 mg	952-352R	**55,-**	952-452R	**46,-**	952-652R	**32,-**
5 mg	952-353R	**55,-**	952-453R	**47,-**	952-653R	**32,-**
10 mg	952-354R	**55,-**	952-454R	**47,-**	952-654R	**32,-**
20 mg	952-355R	**55,-**	952-455R	**47,-**	952-655R	**32,-**
50 mg	952-356R	**55,-**	952-456R	**47,-**	952-656R	**32,-**
100 mg	952-357R	**55,-**	952-457R	**47,-**	952-657R	**32,-**
200 mg	952-358R	**55,-**	952-458R	**47,-**	952-658R	**32,-**
500 mg	952-359R	**55,-**	952-459R	**47,-**	952-659R	**32,-**
1 g	952-331R	**55,-**	952-431R	**47,-**	952-631R	**32,-**
2 g	952-332R	**55,-**	952-432R	**47,-**	952-632R	**32,-**
5 g	952-333R	**55,-**	952-433R	**47,-**	952-633R	**32,-**
10 g	952-334R	**55,-**	952-434R	**47,-**	952-634R	**32,-**
20 g	952-335R	**55,-**	952-435R	**47,-**	952-635R	**32,-**
50 g	952-336R	**55,-**	952-436R	**47,-**	952-636R	**32,-**
100 g	952-337R	**61,-**	952-437R	**47,-**	952-637R	**32,-**
200 g	952-338R	**61,-**	952-438R	**49,-**	952-638R	**32,-**
500 g	952-339R	**61,-**	952-439R	**49,-**	952-639R	**32,-**
1 kg	952-341R	**61,-**	952-441R	**49,-**	952-641R	**32,-**
2 kg	952-342R	**70,-**	952-442R	**55,-**	952-642R	**34,-**
5 kg	952-343R	**70,-**	952-443R	**55,-**	952-643R	**34,-**
10 kg	952-344R	**70,-**	952-444R	**55,-**	952-644R	**43,-**
20 kg	952-345R	**80,-**	952-445R	**57,-**	952-645R	**49,-**
50 kg	952-346R	–	952-446R	**68,-**	952-646R	**51,-**
1 mg – 500 mg	952-350R	**275,-**	952-450R	**143,-**	952-650R	**90,-**
1 mg – 50 g	952-301R	**450,-**	952-401R	**235,-**	952-601R	**150,-**
1 mg – 100 g	952-302R	**485,-**	952-402R	**255,-**	952-602R	**159,-**
1 mg – 200 g	952-303R	**550,-**	952-403R	**285,-**	952-603R	**178,-**
1 mg – 500 g	952-304R	**590,-**	952-404R	**295,-**	952-604R	**186,-**
1 mg – 1 kg	952-305R	**610,-**	952-405R	**310,-**	952-605R	**196,-**
1 mg – 2 kg	952-306R	**710,-**	952-406R	**355,-**	952-606R	**215,-**
1 mg – 5 kg	952-307R	**760,-**	952-407R	**380,-**	952-607R	**230,-**
1 mg – 10 kg	952-308R	**800,-**	952-408R	**405,-**	952-608R	**235,-**
1 g – 50 g	952-315R	**180,-**	952-415R	**104,-**	952-615R	**68,-**
1 g – 100 g	952-316R	**215,-**	952-416R	**110,-**	952-616R	**73,-**
1 g – 200 g	952-317R	**280,-**	952-417R	**140,-**	952-617R	**87,-**
1 g – 500 g	952-318R	**320,-**	952-418R	**155,-**	952-618R	**96,-**
1 g – 1 kg	952-319R	**350,-**	952-419R	**170,-**	952-619R	**106,-**
1 g – 2 kg	952-320R	**435,-**	952-420R	**215,-**	952-620R	**126,-**
1 g – 5 kg	952-321R	**480,-**	952-421R	**235,-**	952-621R	**138,-**
1 g – 10 kg	952-322R	**530,-**	952-422R	**260,-**	952-622R	**148,-**

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	**5,-**
Weight set	969-009R	**19,-**
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	**15,-**
Verification after adjustment or substitution, per weight		
Class E2	969-310R	**30,-**
Class F1 / F2	969-410R	**20,-**
Class M1	969-610R	**16,-**

! Verification only valid in Germany

The force gauge

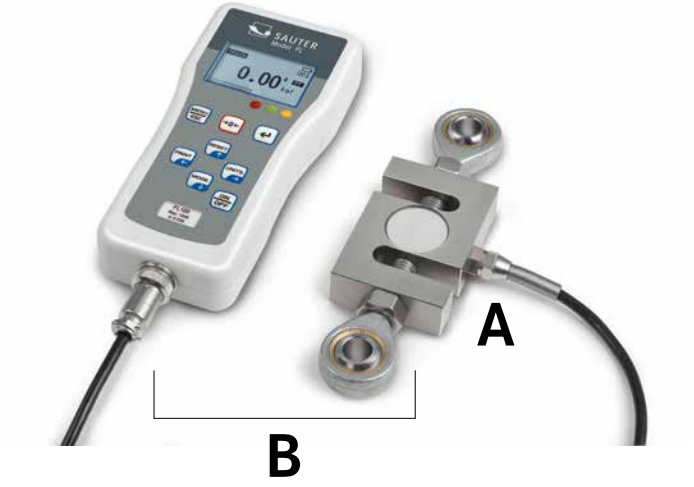
Accredited calibration with calibration certificate for force gauges

The KERN calibration laboratory is at your side when you need an accredited calibration reliably.
From the transducer to the full measuring chain, we are happy to take care of traceable calibration of your test equipment for you.
Our accreditation includes the calibration of tensile and pressure 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 measuring chain (situation A) or voltage ratio/transmission coefficient (mV/V, situation B).

Below you will find a comparison of which standard meets which criteria:

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 measuring chains	Force transducers and complete measuring chains
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

We can offer you a calibration solution for the following situations:



Situation A:

separate force transducer,
display unit **mV/V**

Situation B:

complete force gauge
(consisting of transducer, amplifier and display),
display unit **N**

You can find further information on this topic at:
www.kern-lab.com

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.

Mitglied im / *member of the*
Deutschen Kalibrierdienst DKD

Sample
D-K-19408-01-00
2023-01

Kalibrierschein *Calibration Certificate* **Sample-2023-01/1**

Kalibrierzeichen *Calibration mark*

Gegenstand *Object*	Kraftmessgerät *Force gauge* Max 1000 N, d= 0,5 N
Hersteller *Manufacturer*	Sauter GmbH Ziegelei 1 72336 Balingen Deutschland
Typ *Type*	FH 1K
Seriennummer *Serial number*	5A20H02287
Auftraggeber *Customer*	Musterfirma GmbH Musterstraße 1

Dieser Kalibrierschein dokumentiert die metrologische Rückführbarkeit auf nationale Normale zur Darstellung der Einheiten in Übereinstimmung mit dem internationalen Einheitensystem (SI). Die DAkkS ist 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 der Benutzer verantwortlich.

Messwerte (Zugkraft) / Measurement results (tension force) 2023-01

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
200,0 N	-199,5 N	-199,5 N	-199,5 N	-200,0 N	-199,5 N	-200,0 N
400,0 N	-399,5 N	-399,5 N	-399,5 N	-399,5 N	-399,5 N	-399,5 N
600,0 N	-599,5 N	-599,5 N	-599,5 N	-599,5 N	-599,5 N	-599,5 N
800,0 N	-799,0 N	-799,0 N	-799,0 N	-799,5 N	-799,0 N	-799,5 N
1000,0 N	-998,5 N	-999,0 N	-999,0 N	-999,0 N	-999,0 N	-999,0 N
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. Kalibrierendwertabweichung / *Rel. cal. max. load error:* b_f = 0,000 %
Rel. Nullpunktabweichungen / *Rel. zero error:* f_0 = 0,000 % (R1), 0,000 % (R2), 0,000 % (R3/R4'), 0,000 % (R5/R6')

Kraft force	arith. Mittelwert $\bar{X}_o$ average $\bar{X}_o$	rel. Wiederholpräzision b' rel. repeatability b'	rel. Vergleichspräzision b rel. reproducibility b	rel. Umkehrspanne v hysteresis v
200,0 N	-199,5 N	0,000 %	0,000 %	+0,251 %
400,0 N	-399,5 N	0,000 %	0,000 %	0,000 %
600,0 N	-599,5 N	0,000 %	0,000 %	0,000 %
800,0 N	-799,0 N	0,000 %	0,000 %	+0,063 %
1000,0 N	-998,8 N	+0,050 %	+0,050 %	0,000 %

Calibration certificate with accreditation symbol for force gauges (extract)

Prices for the accredited 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	**240,-**	963-161V (R)	≤ 500 N	**225,-**
963-162IV (R)	≤ 2 kN	**285,-**	963-162V (R)	≤ 2 kN	**265,-**
963-163IV (R)	≤ 5 kN	**370,-**	963-163V (R)	≤ 5 kN	**345,-**
Compression force:					
963-261IV (R)	≤ 500 N	**240,-**	963-261V (R)	≤ 500 N	**225,-**
963-262IV (R)	≤ 2 kN	**285,-**	963-262V (R)	≤ 2 kN	**265,-**
963-263IV (R)	≤ 5 kN	**370,-**	963-263V (R)	≤ 5 kN	**345,-**
Tensile & Compression force:					
963-361IV (R)	≤ 500 N	**400,-**	963-361V (R)	≤ 500 N	**370,-**
963-362IV (R)	≤ 2 kN	**475,-**	963-362V (R)	≤ 2 kN	**445,-**
963-363IV (R)	≤ 5 kN	**640,-**	963-363V (R)	≤ 5 kN	**580,-**

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	**197,-**	963-161 (R)	≤ 500 N	**178,-**
963-162I (R)	≤ 2 kN	**240,-**	963-162 (R)	≤ 2 kN	**215,-**
963-163I (R)	≤ 5 kN	**330,-**	963-163 (R)	≤ 5 kN	**300,-**
Compression force:					
963-261I (R)	≤ 500 N	**197,-**	963-261 (R)	≤ 500 N	**178,-**
963-262I (R)	≤ 2 kN	**240,-**	963-262 (R)	≤ 2 kN	**215,-**
963-263I (R)	≤ 5 kN	**330,-**	963-263 (R)	≤ 5 kN	**300,-**
Tensile & Compression force:					
963-361I (R)	≤ 500 N	**355,-**	963-361 (R)	≤ 500 N	**325,-**
963-362I (R)	≤ 2 kN	**440,-**	963-362 (R)	≤ 2 kN	**400,-**
963-363I (R)	≤ 5 kN	**590,-**	963-363 (R)	≤ 5 kN	**530,-**

(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	**225,-**	961-161 (R)	≤ 500 N	**178,-**
961-162V (R)	≤ 2 kN	**265,-**	961-162 (R)	≤ 2 kN	**215,-**
961-163V (R)	≤ 5 kN	**345,-**	961-163 (R)	≤ 5 kN	**300,-**
961-164V (R)	≤ 20 kN	**440,-**	961-164 (R)	≤ 20 kN	**390,-**
961-165V (R)	≤ 50 kN	**440,-**	961-165 (R)	≤ 50 kN	**390,-**
961-166V (R)	≤ 250 kN	**470,-**	961-166 (R)	≤ 250 kN	**435,-**
Compression force:					
961-261V (R)	≤ 500 N	**225,-**	961-261 (R)	≤ 500 N	**178,-**
961-262V (R)	≤ 2 kN	**265,-**	961-262 (R)	≤ 2 kN	**215,-**
961-263V (R)	≤ 5 kN	**345,-**	961-263 (R)	≤ 5 kN	**300,-**
961-264V (R)	≤ 20 kN	**440,-**	961-264 (R)	≤ 20 kN	**390,-**
961-265V (R)	≤ 50 kN	**440,-**	961-265 (R)	≤ 50 kN	**390,-**
961-266V (R)	≤ 250 kN	**470,-**	961-266 (R)	≤ 250 kN	**435,-**
Tensile & Compression force					
961-361V (R)	≤ 500 N	**370,-**	961-361 (R)	≤ 500 N	**325,-**
961-362V (R)	≤ 2 kN	**445,-**	961-362 (R)	≤ 2 kN	**400,-**
961-363V (R)	≤ 5 kN	**580,-**	961-363 (R)	≤ 5 kN	**530,-**
961-364V (R)	≤ 20 kN	**630,-**	961-364 (R)	≤ 20 kN	**580,-**
961-365V (R)	≤ 50 kN	**630,-**	961-365 (R)	≤ 50 kN	**580,-**
961-366V (R)	≤ 250 kN	**690,-**	961-366 (R)	≤ 250 kN	**640,-**

(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

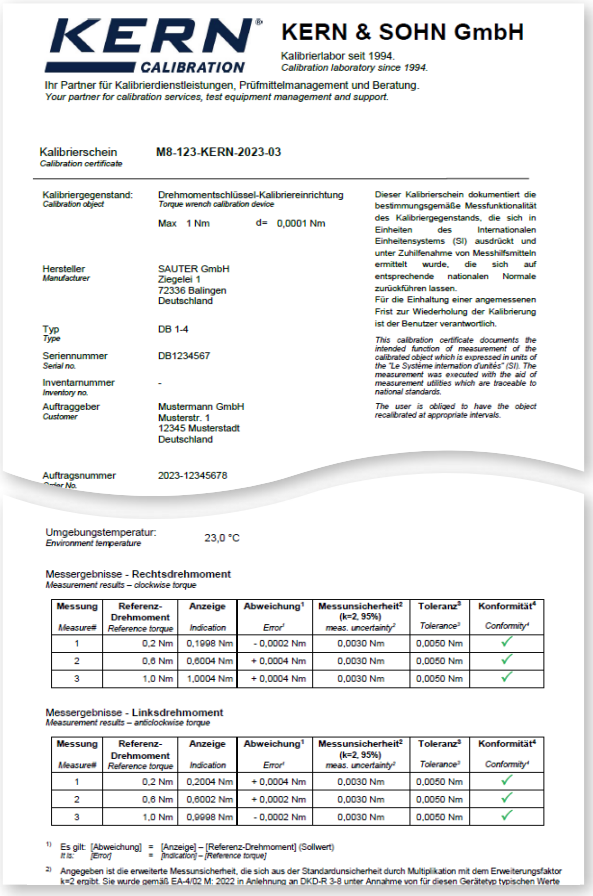
The temperature and relative humidity
Accredited calibration with calibration certificate for temperature and relative humidity

We perform accredited calibrations according to DKD-R 5-1 and DKD-R 5-8 for measuring instruments for the recording of ambient conditions. Our scope of accreditation covers a measuring range of 5°C to 50°C for temperature sensors and a measuring range from 20 % to 75 % relative humidity for humidity sensors.

Checking equipment	**KERN**	**Price €** excl. of VAT ex works
Temperature measuring device, external sensor	963-613R	**130,-**
Temperature measuring device, internal sensor	963-623R	**130,-**
Temperature and humidity, combi-sensor, external sensor, 1 temperature & 3 humidity points	963-631R	**200,-**
Temperature and humidity, combi-sensor, external sensor, 3 temperature & 3 humidity points	963-633R	**330,-**
Temperature and humidity, combi-sensor, internal sensor, 1 temperature & 3 humidity points	963-641R	**200,-**
Temperature and humidity, combi-sensor, internal sensor, 3 temperature & 3 humidity points	963-643R	**330,-**
Temperature - additional test point	963-605R	**23,-**
Humidity - additional test point	963-606R	**23,-**

For each measuring device without interface we charge a surcharge of **10,- €** for the additional effort.

Factory calibration
for other measuring instruments



KERN CALIBRATION

KERN & SOHN GmbH

Kalibrierlabor seit 1994.
Calibration laboratory since 1994.

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

Kalibrierschein / *Calibration certificate* M8-123-KERN-2023-03

Kalibriergegenstand / *Calibration object*: Drehmomentschlüssel-Kalibriereinrichtung / *Torque wrench calibration device*
Max 1 Nm d= 0,0001 Nm

Hersteller / *Manufacturer*: SAUTER GmbH, Ziegelei 1, 72336 Balingen, Deutschland

Typ / *Type*: DB 1-4

Seriennummer / *Serial no.*: DB1234567

Inventarnummer / *Inventory no.*: -

Auftraggeber / *Customer*: Mustermann GmbH, Musterstr. 1, 12345 Musterstadt, Deutschland

Auftragsnummer: 2023-12345678

Dieser Kalibrierschein dokumentiert die bestimmungsgemäße Messfunktionalität des Kalibriergegenstands, die sich in Einheiten des Internationalen Einheitensystems (SI) ausdrückt und unter Zuhilfenahme von Messhilfsmitteln ermittelt wurde, die sich auf entsprechende nationalen Normale zurückführen lassen.
Für die Einhaltung einer angemessenen Frist zur Wiederholung der Kalibrierung ist der Benutzer verantwortlich.

This calibration certificate documents the intended function of measurement of the calibrated object which is expressed in units of the "Le Système internation d'unités" (SI). The measurement was executed with the aid of measurement utilities which are traceable to national standards.

The user is obliged to have the object recalibrated at appropriate intervals.

Umgebungstemperatur / *Environment temperature*: 23,0 °C

Messergebnisse - Rechtsdrehmoment / *Measurement results – clockwise torque*

Messung / *Measure#*	Referenz-Drehmoment / *Reference torque*	Anzeige / *Indication*	Abweichung[1] / *Error[1]*	Messunsicherheit[2] (k=2, 95%) / *meas. uncertainty[2]*	Toleranz[3] / *Tolerance[3]*	Konformität[4] / *Conformity[4]*
1	0,2 Nm	0,1998 Nm	- 0,0002 Nm	0,0030 Nm	0,0050 Nm	✓
2	0,6 Nm	0,6004 Nm	+ 0,0004 Nm	0,0030 Nm	0,0050 Nm	✓
3	1,0 Nm	1,0004 Nm	+ 0,0004 Nm	0,0030 Nm	0,0050 Nm	✓

Messergebnisse - Linksdrehmoment / *Measurement results – anticlockwise torque*

Messung / *Measure#*	Referenz-Drehmoment / *Reference torque*	Anzeige / *Indication*	Abweichung[1] / *Error[1]*	Messunsicherheit[2] (k=2, 95%) / *meas. uncertainty[2]*	Toleranz[3] / *Tolerance[3]*	Konformität[4] / *Conformity[4]*
1	0,2 Nm	0,2004 Nm	+ 0,0004 Nm	0,0030 Nm	0,0050 Nm	✓
2	0,6 Nm	0,6002 Nm	+ 0,0002 Nm	0,0030 Nm	0,0050 Nm	✓
3	1,0 Nm	0,9998 Nm	- 0,0002 Nm	0,0030 Nm	0,0050 Nm	✓

[1] Es gilt: [Abweichung] = [Anzeige] – [Referenz-Drehmoment] (Sollwert) / *If is: [Error] = [Indication] – [Reference torque]*

[2] Angegeben ist die erweiterte Messunsicherheit, die sich aus der Standardunsicherheit durch Multiplikation mit dem Erweiterungsfaktor k=2 ergibt. Sie wurde gemäß EA-4/02 M: 2022 in Anlehnung an DKD-R 3-8 unter Annahme von für diesen Gerätetyp typischen Werte

Factory calibration certificate for wrench testing devices (extract). Further details on the internet www.kern-lab.com

Factory calibration certificates

As calibration certificates with accreditation symbol cannot be offered for all measuring devices or measurement sizes, or where it is not customary, we then offer factory calibration certificates. These calibrations are carried out according to internal factory specifications and are available for many measuring devices, e.g:

- 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

This is not an accredited calibration (no proof of metrological traceability).

We carry out calibrations brand-independent. 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			
961-102K	Force (for hand grip dynanometer KERN MAP)	≤ 130 kg	**159,–**
961-110	Coating thickness	≤ 2000 µm F or N	**159,–**
961-112	Coating thickness	≤ 2000 µm FN	**225,–**
961-113	Wall thickness (ultra sound)	≤ 300 mm (in stainless steel))	**159,–**
961-114	Wall thickness (test blocks)	≤ 300 mm	**198,–**
961-170	Hardness Shore	For sets up to 7 plates	**126,–**
961-131	Hardness Leeb	400 – 800 HLD	**159,–**
961-132	Hardness Leeb	Test block (for Leeb durometer)	**159,–**
961-270	Hardness (UCI)	200 - 800 HV	**345,–**
961-150	Length	≤ 300 mm	**159,–**
961-190	Light	≤ 200000 lx	**308,–**
961-100	Weight (Mechanical balances/ Spring balances)	≤ 5 kg	**94,–**
961-101	Weight (Mechanical balances/ Spring balances)	> 5 – 50 kg	**117,–**
961-102	Weight (Mechanical balances/ Spring balances)	> 50 – 350 kg	**139,–**
961-103	Weight (Mechanical balances/ Spring balances)	> 350 – 1500 kg	**215,–**
961-104	Weight (Mechanical balances/ Spring balances)	> 1500 – 3000 kg	**290,–**
961-105	Weight (Mechanical balances/ Spring balances)	> 3000 – 6000 kg	**580,–**
961-106	Weight (Mechanical balances/ Spring balances)	> 6000 – 12000 kg	**660,–**
961-120	Wrench testing devices	1 Nm - 200 Nm	**225,-**
964-305	Temperature calibration moisture analyser		**174,-**
Additional services			
962-116	Calibration express service with 48 hour delivery (only on new purchases)		**52,–**/ Instrument

* Calibration is limited to the following models:
DAB 100-3, DAB 200-2, DBS 60-3, DLB 160-3A, MLS 150-2A, MLS 65-3A, MLB 50-3, MLB 50-3N, MLB 50-3C, DLT 100-3N, MLS 50-3D, MLS 50-3C

For up-to-date information on the test services for further measuring sizes please visit our website www.kern-lab.com

Digital calibration certificate (DCC)

The DAkkS calibration certificate becomes digital

The digital age is constantly revealing new opportunities for technological innovations. As a result, topics such as sustainability and resource-saving work are becoming increasingly important, especially in the industrial context. Calibration certificates, as metrological proof of a check of the respective measurand, are still printed on paper and sent to the customer by post. However, the option of a calibration certificate in PDF format is already available. Both variants no longer meet the current requirements of a laboratory. In cooperation of the PTB (Physikalisch Technische Bundesanstalt) and several expert groups from industry, the idea of a digital calibration certificate (DCC) was born. Based on the file format XML, this should be both human- and machine-readable. The basic idea is to transmit the information contained in a conventional calibration certificate to the customer electronically and securely as data. KERN DCCs comply with the requirements of VDI/VDE 2623 and PTB.

- You can download your digital calibration certificate (DCC) on www.kern-lab.com/dcc
- This service is **free of charge**!
- The Digital Calibration Certificate (DCC) is currently available for the calibration of weights. Gradually, this will also be available for other measuring devices.

For classical calibration certificates there is a scheme predefined by standards, to which the calibration laboratories shall adhere in order to be or remain accredited. This ensures standardization and simplification of the calibration procedure and its documentation. PTB is constantly working on designing such a scheme also for the DCC. Within such a scheme, of course, all previous information of a calibration certificate shall be included. This is implemented by using a so-called XML schema file in XSD format. In conclusion the generated XML file can be checked against the schema, which guarantees that the DCC is well-formed and complies with the specifications of the PTB.

Appropriate encryption algorithms and a digital signature ensure that no one can subsequently change the document and customers have the security of knowing that their tested measuring equipment has been processed and documented according to maximum quality requirements.

Within this context, KERN not only stands for precision and quality, but also for innovation in all technical matters.

YOUR ADVANTAGES OF THE DIGITAL CALIBRATION CERTIFICATE:

- Meets the requirements of DIN EN ISO/IEC 17025:2018
- Secure and error-free data transmission
- Automatic transfer of data into digital processes
- Evaluation of measurement data and optimisation of measurements
- Forgery protection through digital signature
- Internationally recognised through XML-based format
- Machine readability, supporting the quality monitoring processes

KERN GLOSSARY

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.

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 measuring device 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 precondition of a perfect measurement is the complete proof that a measuring device is traceable to the SI units. This is also a requirement of the most importang international standards. For example the correct display of balances and test weigths is checked and - if necessary - corrected (adjusted). The test weights are traced back through a chain of calibrations to the national standard at the PTB (Physikalisch Technische Bundesanstalt) in Braunschweig, which in turn is traceable to the SI definition via various physical realizations (the "watt balance" or the "silicon sphere").

The correct traceability is what makes internation comparable measurements possible in the first place.

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 without proof of metrological traceability – 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/m^3 and material density 8000 kg/m^3)

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DIN EN ISO/IEC 17025:2018

NAWI: 2014/31/EU

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

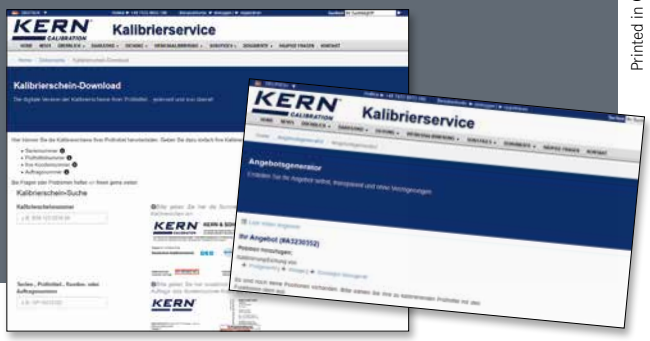
Database supported management of test equipment
Information on your test equipment which has been calibrated by us is stored in our database. In this way it is possible to make trend calculations. You will therefore get an overview of the long-term stability and trend behaviour of your test equipment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

RMA (Return Material Authorization)
Using the quotation generator, you can have a Return Material Authorization (RMA) number created directly for sending your test equipment. This makes it very easy to send in your test equipment and to start the calibration directly after arrival in our laboratory!



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