

PRECISION  
MEASURING  
STANDARDS



## KOBA®-step Precision Step Gauge

+

Training

+

Data Analysis Software

=

Complete Monitoring System  
for Coordinate Measuring  
Machines



Our Quality Assures  
Highest Precision



# Step gauges for the calibration and monitoring of coordinate measuring machines

In industrial metrology for geometrical quantities, length measures for tactile probing play an important role as reference standards.

They are of particular importance when it comes to the calibration and monitoring of one-, two- and three-dimensional coordinate measuring machines by means of mechanical probing.

The use of the length measurement error approach in combination with artifacts suitable for tactile probing has a proven track record as an accurate and cost-effective method for the acceptance testing and continuous monitoring of coordinate measuring machines. Here, a step gauge offers universal usability and maximum flexibility.

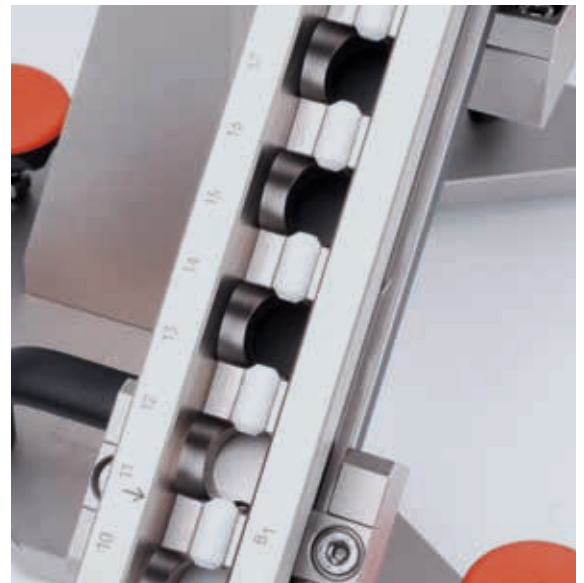
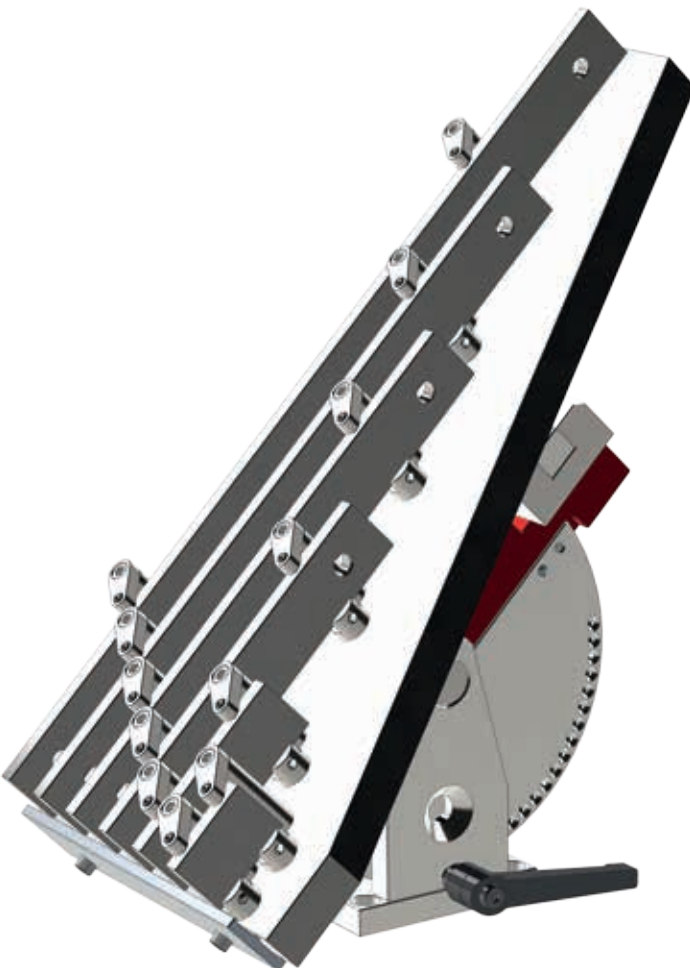
The special importance of physical material measures for metrological traceability, calibration and monitoring is partly based on the requirements of the VDI/ VDE 2617 guideline series and the DIN EN/ISO 10360 standard. These technical rules underline the outstanding suitability of length measures for the monitoring of test and measuring equipment which is a mandatory requirement in relation to quality assurance.

## THE STEP GAUGE CONCEPT

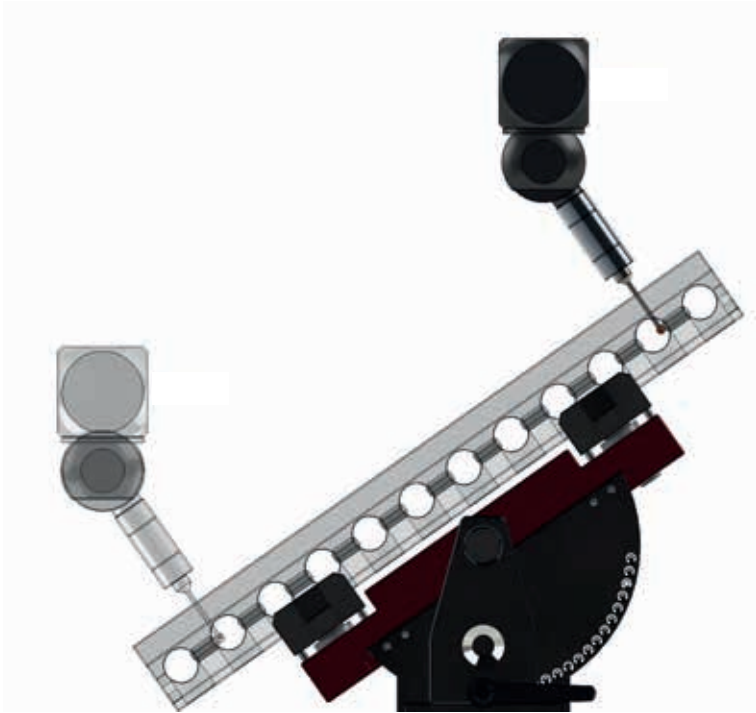
Gauge blocks are the most accurate standard for representing the measured value of length. They are still used for calibration even today, mostly using a so-called gauge block harp.

The disadvantage is that it only allows a very limited number of possible measuring lengths and length steps. Gauge blocks are considerably more complex to use, since every nominal size has to be individually calibrated in the measuring volume of the CMM.

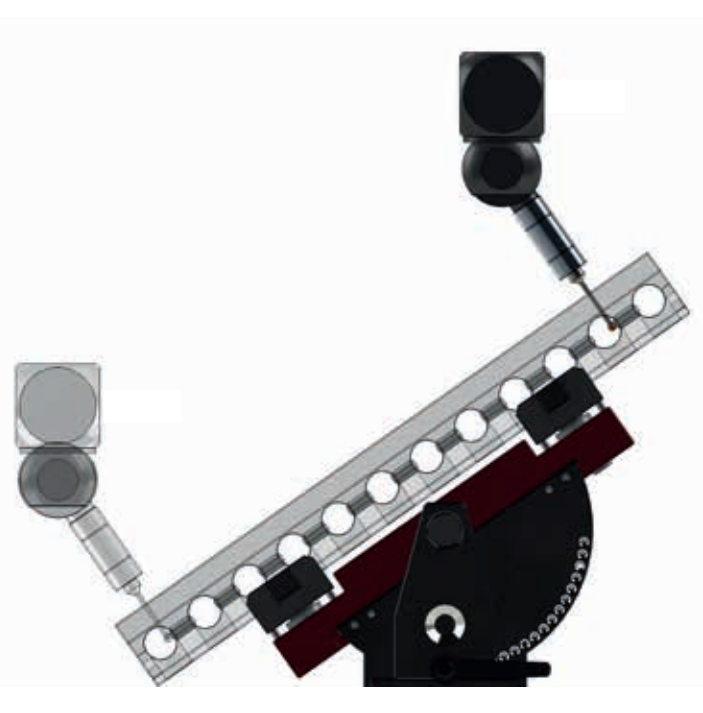
This is where the step gauge concept provides the solution. In the step gauge, a large number of small gauge blocks (cylindrical gauge blocks) are arranged along the neutral fiber in a rigid support structure. The distance between each gauge block allows the probing of all the measuring surfaces.



KOBA gauge block harp on a swivel arm



**Fig. 1:** Bidirectional probing - internal dimension

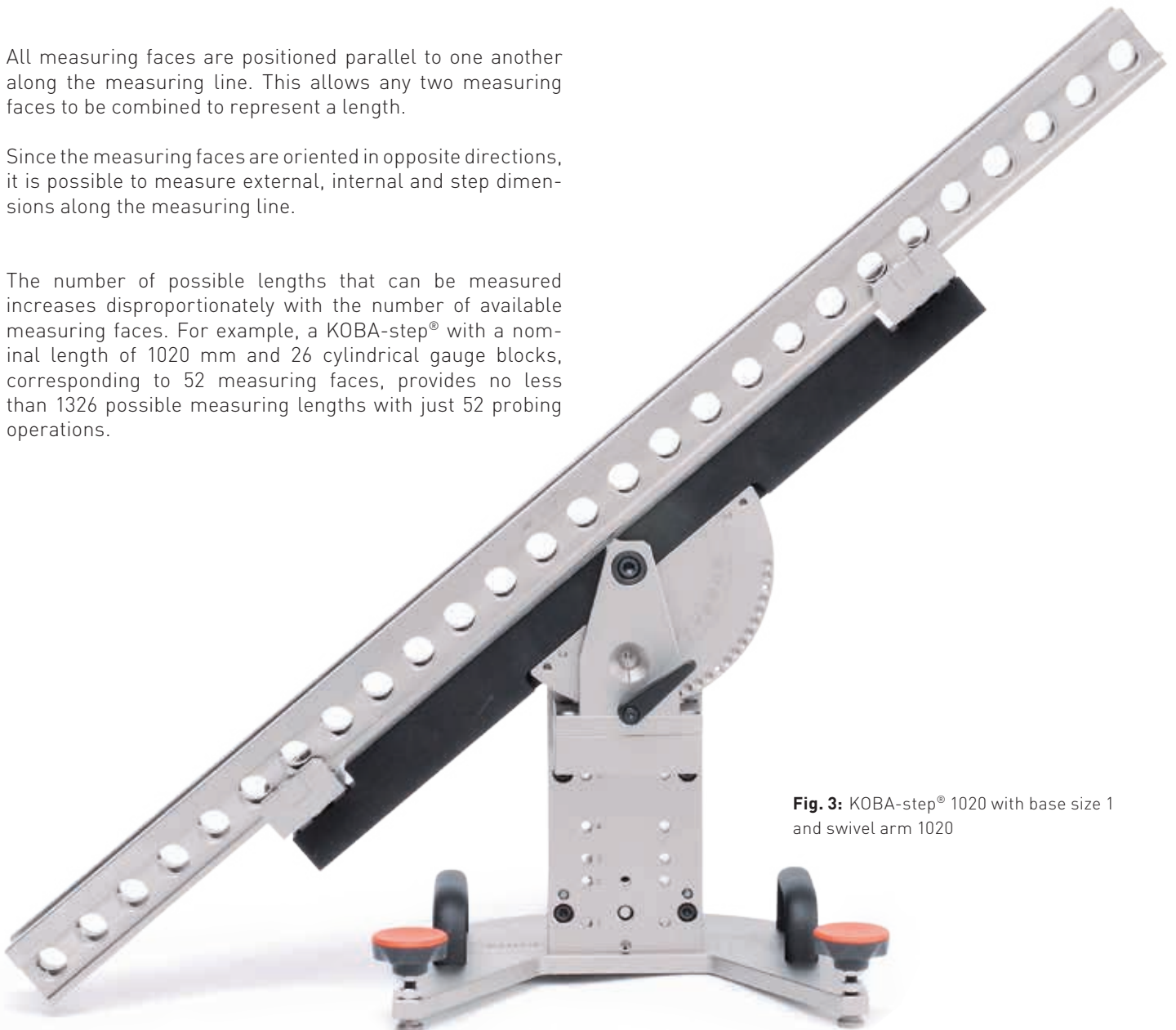


**Fig. 2:** Unidirectional probing - step dimension

All measuring faces are positioned parallel to one another along the measuring line. This allows any two measuring faces to be combined to represent a length.

Since the measuring faces are oriented in opposite directions, it is possible to measure external, internal and step dimensions along the measuring line.

The number of possible lengths that can be measured increases disproportionately with the number of available measuring faces. For example, a KOBA-step® with a nominal length of 1020 mm and 26 cylindrical gauge blocks, corresponding to 52 measuring faces, provides no less than 1326 possible measuring lengths with just 52 probing operations.



**Fig. 3:** KOBA-step® 1020 with base size 1 and swivel arm 1020

# KOBA-step®

The history of the step gauge is closely linked with the name KOBA. As a key partner in the development of the concept, which remains largely unchanged to this day, we have been the established manufacturer of the KOBA-step® step gauge since 1980. The design has been optimized over the decades on the basis of continuous further development and adaptation to new requirements. Today, we can offer you a range of different sizes and universal accessories for practically every application.

In addition to the KOBA-step® step gauge, we also offer training courses for optimum handling and effective use of the step gauge.

To ensure that all your series of measured values are evaluated according to standards and guidelines, manufacturer-independent data analysis software is available for processing the measurement data of leading CMM manufacturers.

## OUR SOLUTION

The KOBA-step® and KOBA-step® mini step gauges are essentially comprised of two components.

The specially shaped support structure is made of a steel material which guarantees maximum dimensional stability because it has been subjected to intensive thermal treatment.

The electroplated surface coating provides the best possible protection against corrosion and, in combination with the surface treatment, a high-quality appearance appropriate to the product.

The support structure profile has a square cross-section of 55 x 55 mm for all sizes of the KOBA-step® and 30 x 30 mm for the KOBA-step® mini model.

The probe elements (cylindrical gauge blocks) themselves are held in this support structure. The measuring faces can be easily accessed via the wide groove in the profile and via the transverse holes in the support structure. The T-shaped profile of the base area, in combination with the KOBA clamping system, enables the step gauge to be fastened securely and above all without deformation in the measuring volume.

The cylindrical gauge blocks are made of wear-resistant, stabilized zirconium oxide ceramic and are absolutely non-corrosive. This eliminates the need for the time-consuming removal of corrosion inhibitors. Cleaning can generally be carried out quickly and easily with just a microfiber cloth. The measuring surfaces conform with the highest level of quality for gauge blocks.

The probing faces at the front have a diameter of 5 mm and the nominal length of the cylindrical gauge block is 20 mm for the 40 mm pitch and 10 mm for the 20 mm pitch.



Fig. 4: Profile cross-section

KOBA-step® step gauge system				
Nominal length / length overall [mm]	Cylinder / pitch [mm]	Number of measuring faces	Profile cross-section [mm]	Swivel unit and base
420 / 480	20 / 40	22	55 x 55	Size 1
620 / 680		32		Size 1
1020 / 1080		52		Size 1
1540 / 1600		78		Size 2
2020 / 2080		102		Size 2

KOBA-step® mini step gauge system				
Nominal length / length overall [mm]	Cylinder / pitch [mm]	Number of measuring faces	Profile cross-section [mm]	Swivel unit and base
210 / 220	10 / 20	22	30 x 30	Gr. 0
310 / 320		32		Gr. 0

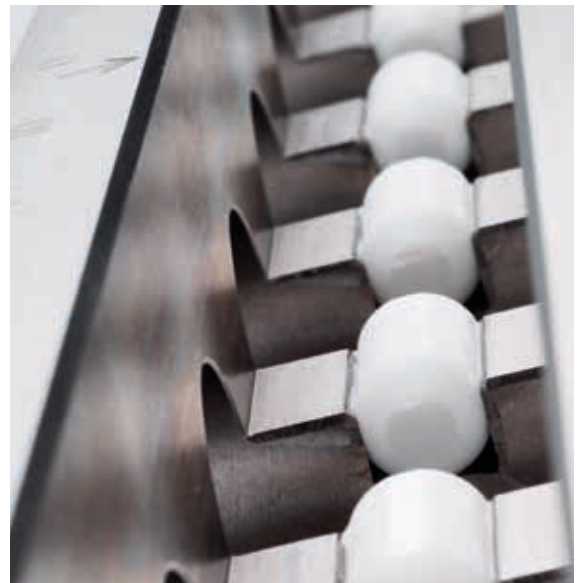


All the cylindrical gauge blocks are securely embedded in position in the support structure profile. The material has been selected to prevent creeping of the cylindrical gauge blocks due to thermal influences. The fastening method guarantees maximum dimensional stability. Long-term studies prove the outstanding characteristics of the KOBA-step® step gauge. The measuring line, which runs through the center of the front probing faces, is congruent with the neutral fiber of the cross-section of the support structure. The high degree of squareness of the measuring surfaces in relation to the measuring line allows the KOBA-step® to be calibrated with the smallest possible measurement uncertainty.

To cover different CMM measuring volumes, we have seven standard sizes available in our product range.

For your special requirements we will also be pleased to manufacture special sizes and custom-tailored designs on request.

Suitable swivel units and bases are available for positioning the step gauges safely, securely and accurately in the measuring volume of the CMM. A cleverly designed fastening concept prevents any negative effects on the calibration values when clamping.



**Fig. 5:** KOBA-step® mini



## CALIBRATION

To enable the step gauge to be used to the fullest extent and for the purpose of metrological traceability of the CMM, the step gauge has to be calibrated. You can choose between different calibration options in order to best meet your specific requirements. We offer inhouse calibration, for example, or various levels of DAkkS calibration and calibration by national metrological institutes (e.g. NPL, NIST, etc.)

The KOBA-step® step gauge is ideally suited for calibration with the smallest accredited uncertainties of measurement within the DAkkS.

## TRAINING

To enable the artifacts to be used most effectively and efficiently, we offer a range of training courses.

A half-day introductory seminar provides an introduction to the KOBA-step® step system and its components. It provides an understanding of how to handle the system correctly and with a view to maintaining its value, along with installation tips and care advice. A brief introduction to the metrological use of the standard completes this seminar and makes it a must for the professional user.

Full-day training courses cover the implementation of the VDI/VDE 2617 guidelines and DIN EN/ISO 10360 and the acceptance testing of CMMs in accordance with standards. Also covered in this seminar is the development of the programming of the measuring routines for the CMM together with the user.



Fig. 6: Vertical installation

## DATA ANALYSIS SOFTWARE

In addition to our calibration and monitoring systems, we also offer our customers manufacture-independent data analysis software. iti-check analyses the ASCII output files of the measurement programs and compares the measurement results with the calibration values which have been saved.

The analysis is carried out in accordance with VDI/VDE 2617 guidelines and the DIN EN/ISO 10360 standard or by using all the available measurement data for far more detailed and accurate results.

The software also includes the production of meaningful calibration records and calibration certificates.

The software is available in the iti-check lite version (limited to one standard type, for example, step gauges) and as an iti-check full version (handles different standard types such as step gauges, ball plates, ball bars and beams).

## FURTHER INFORMATION

These high-quality products should be adequately protected and packaged of course. For this reason our step gauges, swivel units and bases are supplied in attractive aluminum storage cases. These cases are shipped in sturdy wooden transport containers.





**Fig. 7:** KOBA-step® 1540 with base/swivel unit size 2

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## Quality for the highest standards

You as the customer set the benchmark for our quality.

Our priority is to fulfill all the **requirements in terms of quality** to be met by the product as defined in standards and to fulfill the requirements of each individual customer. We are also committed to supplying functional, attractively designed **storage containers**, issuing credible **calibration certificates and declarations of conformity** with an attractive presentation, and meeting promised deadlines in combination with **attentive and professional customer care**, from dealing with initial inquiries through to the delivery of the product.



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