CH-3003 Bern-Wabern, 1. June 2025

Measurement Services
Laboratory for Length, Nano- and Microtechnology

Valid from: 01.06. 2025

In our laboratory we perform high accuracy calibrations of your standards and measuring instruments for the quantities length, form, angle and surface texture. Our measurement results are traceable to national standards and thus to internationally supported realizations of the SI units.

The services listed in this catalogue correspond to our standard measurement capabilities. Other services, with e.g. reduced measurement uncertainty or an extended measurement range, are possible and may be discussed directly with the responsible expert. In addition, our lab team with its specialist knowledge is available for consultation and assisting in finding solutions to demanding metrological tasks in the field of dimensional measurements.

Measurement uncertainty

The measurement uncertainties are supplied for information only and can be evaluated only after the measurements being completed. They contain contributions originating from the measurement standard, from the calibration method, from the environmental conditions and from the device under test. The indicated uncertainty of measurement is stated as the combined standard uncertainty multiplied by a coverage factor $k = 2$. The measured value (y) and the associated uncertainty (U) represent the interval $(y \pm U)$ which contains the value of the measured quantity with a probability of approximately 95 %. The uncertainty is estimated following the guidelines of the ISO.

The writing rule for the uncertainties Q[.., ..] is to be interpreted as the square root of the sum of squared terms:

$Q[a,b \times L] = \sqrt{a^2 + (b \times L)^2}$, where L is the measured length.

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1. Lasers and interferometers

1.1 Laser interferometer

Quantity	Optical frequency Wavelength: 633 nm
Uncertainty	1xE-9
Procedure	Determination of the optical frequency by comparison with an iodine stabilised HeNe-Laser (realisation of the metre definition).
Quantity	Error of indicated displacement up to 50 m
Procedure	Test of the entire system by comparison with a reference laser interferometer
Quantity	Refractive index compensation
Extend of service	Calibration of the pressure, temperature and humidity sensor at the current laboratory conditions.

1.2 Angular interferometer

Quantity	Linearity and correction factor ± 10°
Uncertainty	0.002 %
Procedure	Comparison with reference rotary table.

1.3 Straightness interferometer

Quantity	Linearity and correction factor ± 1 mm
Uncertainty	0.03 %
Procedure	Comparison with linear interferometer.

2. Length instruments

2.1 Electronic displacement transducer (active), horizontal position

Quantity	Error of indicated length
Uncertainty	Q[0.1 µm, 4E-6xL]
Procedure	Calibration with laser interferometer

2.2 Electronic displacement transducer, vertical position

Quantity	Error of indicated length up to 100 mm
Uncertainty	Q[0.03 µm, 0.8E-6xL]
Procedure	Calibration with laser interferometer.

2.3 Laser distance mesuring instrument

Quantity	Deviation of indicated length up to 50 m
Uncertainty	Q[0.6 mm, 4E-5xL]
Procedure	Comparison with laser interferometer

3. End standards

3.1 Gauge blocks, up to 100 mm, measurement by interferometry

Quantity	Central length 0.5 to 100 mm
Uncertainty	Q[19 nm, 0.19E-6xL]
Procedure	Calibration by optical interferometry according to ISO 3650. For grade K and 0.
Quantity	Central length, variation in length 0.5 to 100 mm
Uncertainty	Q[19 nm, 0.19E-6xL]; fo, fu: 20 nm
Procedure	Calibration by optical interferometry according to ISO 3650. For grade K and 0. fo, fu by mechanical measurement in 5 points

3.2 Gauge blocks, up to 100 mm, measurement by comparison high accuracy

Quantity	Central length 0.5 to 100 mm
Uncertainty	Q[25 nm, 0.25E-6xL]
Procedure	Mechanical comparison according to ISO 3650. For grade K and 0.
Quantity	Central length, variation in length 0.5 to 100 mm
Uncertainty	Q[25 nm, 0.25E-6xL]; fo, fu: 20 nm
Procedure	Mechanical comparison in 5 points according to ISO 3650. For class K and 0.

3.3 Gauge blocks, up to 100 mm, measurement by comparison

Quantity	Central length 0.5 to 100 mm
Uncertainty	Q[38 nm, 0.5E-6xL]
Procedure	Mechanical comparison according to ISO 3650.
Quantity	Central length, variation in length 0.5 to 100 mm
Uncertainty	Q[38 nm, 0.5E-6xL]; fo, fu: 20 nm
Procedure	Mechanical comparison in 5 points according to ISO 3650.

3.4 Gauge blocks LM

Quantity	Central length 0.01 to 0.5 mm
Uncertainty	0.2 µm
Procedure	Calibration of the central length using mechanical comparator.

3.5 Gauge blocks, up to 1000 mm, measurement by interferometry

Quantity	Central length 125 to 1000 mm
Uncertainty	Q[40 nm, 0.17E-6xL]
Procedure	Calibration by optical interferometry according to ISO 3650. For grade K and 0.

3.6 Gauges block, up to 3000 mm, measurement by comparison

Quantity	Central length 125 mm to 500 mm
Uncertainty	Q[0.15 µm, 0.5E-6xL]
Procedure	Calibration on length measurement machine with laser interferometer and mechanical probes.
Quantity	Central length 600 mm to 1000 mm
Quantity	Central length 1100 mm to 3000 mm

3.7 Gauge blocks for micrometer

Quantity	Central length 25 mm to 500 mm
Uncertainty	Q[0.6 µm, 0.6E-6xL]
Procedure	Calibration on length measurement machine with laser interferometer and mechanical probes.
Quantity	Central length >500 mm to 1000 mm
Quantity	Central length >1000 mm to 3000 mm

3.8 Step gauge, 20 mm steps

Quantity	Measurement of face interval up to 680 mm
Uncertainty	Q[0.17 µm, 0.65E-6xL]
Procedure	Calibration on length measurement machine with laser interferometer and mechanical probes.
Quantity	Measurement of face interval 700 mm to 1000 mm

3.9 Step gauge, 10 mm steps

Quantity	Measurement of face interval up to 680 mm
Uncertainty	Q[0.17 µm, 0.65E-6xL]
Procedure	Calibration on length measurement machine with laser interferometer and mechanical probes.
Quantity	Measurement of face interval 700 mm to 1000 mm

3.10 Calibration set for Mahr MFU 100

Quantity	Measurement face interval
Uncertainty	50 nm
Procedure	Calibration on length measurement machine with laser interferometer and mechanical probes.

4. Line scales

4.1 Glass line scale, up to 600 mm, length measuring machine

Quantity	Line spacing 0.1 mm to 600 mm
Uncertainty	Q[1.5 µm, 3E-6xL]
Procedure	Calibration on length measurement machine with laser interferometer. Location of the lines with a video-microscope.

4.2 Glass line scale, up to 400 mm, photomask measuring machine

Quantity	Line spacing 0.01 mm to 400 mm
Uncertainty	Q[50 nm, 0.1E-6xL]
Procedure	Calibration on photo-mask measuring machine. Location of the lines with a video-microscope and digital image processing.
Parameters	In clean room class 100
Extra length	Up to 600 mm on request

4.3 Stage micrometer, up to 50 mm, photomask measuring machine

Quantity	Line spacing 0.01 mm to 50 mm
Uncertainty	Q[50 nm, 0.1E-6xL]
Procedure	Calibration on photo-mask measuring machine. Location of the lines with a video-microscope and digital image processing.
Parameters	In clean room class 100

4.4 Grid plate, photomask measuring machine

Quantity	Grid coordinates up to 300 mm x 400 mm
Uncertainty	Q[50 nm, 0.4E-6xL]
Procedure	Calibration on photo-mask measuring machine. Location of the lines with a video-microscope and digital image processing.
Parameters	In clean room class 100
Extend of service	Measurement crosses, centres of gravity of markings and crossing points of lines and borders. Other evaluations upon request.

4.5 Grid plate small, up to 50 mm, photomask measuring machine

Quantity	Grid coordinates up to 50 mm x 50 mm
Uncertainty	Q[50 nm, 0.4E-6xL]
Procedure	Calibration on photo-mask measuring machine. Location of the lines with a video-microscope and digital image processing.
Parameters	In clean room class 100
Extend of service	Measurement crosses, centres of gravity of markings and crossing points of lines and borders. Other evaluations upon request.

4.6 Photomask with test circles

Quantity	Diameter and roundness up to ø1 mm
Uncertainty	Diameter: 0.7 µm Roundness: 0.07 µm
Procedure	Calibration on photo-mask measuring machine. Measurement with a video-microscope and digital image processing.
Parameters	In clean room class 100
Extend of service	Roundness according to EN ISO 12181 with filter 15, 50, 150, 500 W/U
Quantity	Diameter and roundness > ø1 up to ø50 mm
Uncertainty	Diameter: 1 µm Roundness: > 0.07 µm
Procedure	Calibration on photo-mask measuring machine. Measurement with a video-microscope and digital image processing.
Parameters	In clean room class 100
Extend of service	Roundness according to EN ISO 12181 with filter 15, 50, 150, 500 W/U

4.7 Engineer tape

Quantity	Line spacing up to 50 m
Uncertainty	Q[20 µm, 5.5E-6xL]
Procedure	Calibration on 50 m measurement bench with laser interferometer. Location of the lines with visual or photo-electric microscope.

4.8 PI tape

Quantity	Line spacing up to 50 m
Uncertainty	0.01 mm for diameter
Procedure	Calibration on 50 m measurement bench with laser interferometer. Location of the lines with visual or photo-electric microscope.
Extend of service	4 scale intervals and 5 vernier intervals, tape thickness

4.9 Engineer scale

Quantity	Line spacing up to 3000 mm
Uncertainty	0.01 mm
Procedure	Calibration on 50 m measurement bench with laser interferometer. Location of the lines with visual or photo-electric microscope.

5. Diameter standards

5.1 Plug gauge, high accuracy

Quantity	Diameter 0.2 mm to 10 mm
Uncertainty	50 nm
Procedure	Calibration on micro CMM with laser interferometer
Extend of service	Diameter and roundness in 3 heights
Quantity	Diameter 5 mm to 50 mm
Uncertainty	Q[70 nm, 0.3E-6xL]
Procedure	Calibration on length measurement machine with laser interferometer and mechanical probes.
Extend of service	Diameter and roundness in 3 heights. Straightness and parallelism of 2 generating lines as diagram.
Quantity	Diameter 51 mm to 200 mm
Uncertainty	Q[70 nm, 0.3E-6xL]
Extend of service	Diameter and roundness in 3 heights. Straightness and parallelism of 2 generating lines as diagram.
Quantity	Diameter 201 mm to 400 mm
Uncertainty	Q[70 nm, 0.6E-6xL]
Extend of service	Diameter and roundness in 3 heights. Straightness and parallelism of 2 generating lines as diagram.

5.2 Plug gauge, medium accuracy

Quantity	Diameter 5 mm to 100 mm
Uncertainty	Q[0.2 µm, 1E-6xL]
Procedure	Calibration on length measurement machine with laser interferometer and mechanical probes.
Extend of service	1 measurement heights, including roundness
Quantity	Diameter 5 mm to 100 mm
Uncertainty	Q[0.15 µm, 1E-6xL]
Extend of service	Diameter and roundness in 3 heights. Straightness and parallelism of 2 generating lines as diagram.
Quantity	Diameter 101 mm to 300 mm
Uncertainty	Q[0.15 µm, 1E-6xL]
Extend of service	Diameter and roundness in 3 heights. Straightness and parallelism of 2 generating lines as diagram.

5.3 Ring gauge, high accuracy

Quantity	Diameter 0.2 mm to 10 mm
Uncertainty	50 nm
Procedure	Calibration on micro CMM with laser interferometer
Extend of service	Diameter and roundness in 3 heights
Quantity	Diameter 5 mm to 50 mm
Uncertainty	Q[70 nm, 0.3E-6xL]
Procedure	Calibration on length measurement machine with laser interferometer and mechanical probes.
Extend of service	Diameter and roundness in 3 heights. Straightness and parallelism of 2 generating lines as diagram.
Quantity	Diameter 51 mm to 200 mm
Uncertainty	Q[70 nm, 0.3E-6xL]
Extend of service	Diameter and roundness in 3 heights. Straightness and parallelism of 2 generating lines as diagram.
Quantity	Diameter 201 mm to 400 mm
Uncertainty	Q[70 nm, 0.6E-6xL]
Extend of service	Diameter and up to ø280 mm incl. roundness in 3 heights as well as straightness and parallelism of 2 generating lines as diagram.

5.4 Pin gauge, Setting gauge

Quantity	Diameter 0.05 mm to 0.5 mm
Uncertainty	0.08 µm
Extend of service	1 measurement height
Quantity	Diameter 0.05 mm to 0.5 mm
Uncertainty	0.08 µm
Extend of service	3 measurement heights
Quantity	Diameter 0.5 mm to 5 mm
Uncertainty	0.08 µm
Extend of service	1 measurement height, including roundness
Quantity	Diameter 0.5 mm to 5 mm
Uncertainty	0.08 µm
Extend of service	3 measurement heights, including roundness

5.5 Pin gauge, limit gauge

Quantity	Circumscribed diameter 0.2 mm to 0.5 mm
Uncertainty	0.08 µm
Extend of service	1 measurement height, including roundness evaluation according ISO 4292

5.6 Wires for screw gauge measurement

Quantity	Diameter 0.05 mm to 0.2 mm
Uncertainty	0.25 µm
Extend of service	1 measurement height
Quantity	Diameter 0.2 mm to 5 mm
Uncertainty	0.08 µm
Extend of service	1 measurement height, including roundness evaluation according to ISO 4292

6. Various gauges

6.1 Spherical standard

Quantity	Diameter 0.5 mm to 2 mm
Uncertainty	Diameter: 20 nm; form: 30 nm
Procedure	Calibration on with micro CMM and laser interferometer.
Extend of service	Mean diameter and form deviation.
Quantity	Diameter 0.5 mm to 35 mm
Uncertainty	50 nm
Procedure	Calibration on with micro CMM and laser interferometer.
Extend of service	Mean diameter and form deviation.
Quantity	Diameter 4 mm to 100 mm
Uncertainty	Diameter: 0.15 µm; Roundness: 0.05 µm
Procedure	Calibration on length measurement machine with laser interferometer and mechanical probes.
Extend of service	Including roundness in 3 planes.
Quantity	Diameter 8, 10, 15, 20, 25, 30, 35 mm (Al2O3)
Uncertainty	Diameter: 0.08 µm; Roundness: 0.03 µm
Extend of service	Including roundness in three planes.

6.2 Spherical stylus

Quantity	Mean diameter 0.3 mm to 30 mm
Uncertainty	0.2 µm
Procedure	Calibration using a mechanical comparator.
Extend of service	Including roundness in the plane perpendicular to the shaft.

6.3 Double ball stylus for screw gauge measurement

Quantity	Mean diameter from 0.2 mm
Uncertainty	0.1 µm
Procedure	Calibration on micro-CMM with laser interferometer
Extend of service	Including roundness in 3 profiles parallel and ±8° to the shaft.
Quantity	Mean diameter from 0.5 mm
Uncertainty	0.2 µm
Procedure	Calibration using a mechanical comparator.
Extend of service	Including roundness in the plane perpendicular to the shaft.
Quantity	Mean diameter from 0.5 mm
Uncertainty	0.2 µm
Procedure	Calibration using a mechanical comparator.
Extend of service	Without roundness.

6.4 Taper standard

Quantity	Cone angle and diameter
Uncertainty	Diameter: 0.7 µm; Angle: 1.5"
Procedure	Calibration of the diameter at one or several defined heights and of the mean taper angle using a coordinate measuring machine.
Extend of service	Including roundness

6.5 Setting disk for external micrometers

Quantity	Mean diameter 3 mm to 700 mm
Uncertainty	0.5 µm
Procedure	Calibration by means of a coordinate measuring machine.
Extend of service	Diameter in 2 heights and form deviation.

6.6 Setting gauge for 3-point internal micrometer

Quantity	Mean diameter 3 mm to 700 mm
Uncertainty	0.5 µm
Procedure	Calibration by means of a coordinate measuring machine.
Extend of service	Diameter in 3 heights and form deviation.

7. Angular standards and circle divisions

7.1 Optical polygon

Quantity	Angle division 6-sided
Uncertainty	0.1"
Procedure	Calibration in combination with a numerically controlled reference table and an indexing table using the method of full closure.
Quantity	Angle division 12-sided
Uncertainty	0.1"
Quantity	Angle division 24-sided
Quantity	Angle division 36-sided

7.2 Index table

Quantity	Angle division
Uncertainty	0.12"
Procedure	Comparison with a reference rotary table.

7.3 Rotary table

Quantity	Angle division
Uncertainty	0.12"
Procedure	Depending on application.

7.4 Rotary encoder scale

Quantity	Angle division
Uncertainty	0.12"
Procedure	Depending on application.

7.5 Angular gauge block

Quantity	Included Angle
Uncertainty	0.15"
Procedure	Calibration with the reference rotary table and an autocollimator.

7.6 Granite square

Quantity	Squareness up to 500 mm
Uncertainty	0.2"
Procedure	Calibration by reversal method using a vertical column with a precision air bearing slide.
Parameters	standing on surface plate
Quantity	Squareness 600 mm to 1000 mm
Quantity	Squareness up to 700 mm
Uncertainty	0.16"
Procedure	Calibration with reference rotary table and a high precision air bearing guide way.
Parameters	horizontal

8. Angle instruments

8.1 Autocollimator

Quantity	Error of indicated angle, 1 axis
Uncertainty	0.1"
Procedure	Comparison with reference rotary table.
Quantity	Error of indicated angle, 2 axes
Uncertainty	0.1"
Procedure	Comparison with reference rotary table.
Quantity	Error of indicated angle, 1 axis
Uncertainty	0.03"
Procedure	Comparison with angle interferometer.
Quantity	Error of indicated angle, 2 axes
Uncertainty	0.03"
Procedure	Comparison with angle interferometer.

8.2 Electronic level

Quantity	Error of indicated angle max. +/- 1°
Uncertainty	0.25"
Procedure	Calibration on an inclination table in comparison with an angular laser interferometer.

9. Flatness standards

9.1 Optical flat

Quantity	Flatness
Uncertainty	0.02 µm
Procedure	Measurement of the flatness deviation with the help of a Fizeau interferometer with video-electronic fringe processing.
Parameters	Diameter <95 mm

9.2 Optical flat for micrometers

Quantity	Flatness, parallelism and thickness
Uncertainty	0.02 µm
Procedure	Measurement of the flatness deviation with the help of a Fizeau interferometer as well as the thickness and parallelism with a mechanical comparator.
Parameters	Diameter 25 mm to 30 mm

10. Roundness standards

10.1 Roundness standard, high precision

Quantity	Roundness
Uncertainty	10 nm
Procedure	Roundness measuring instrument with error separation technique, in particular for hemispheres.

10.2 Roundness standard, medium accuracy

Quantity	Roundness
Uncertainty	50 nm
Procedure	Roundness measuring instrument.

10.3 Magnification standard (Flick)

Quantity	Roundness
Uncertainty	Q[0.2 µm, 3E-3xRONt]
Procedure	Roundness measurement instrument.

11. Straightness standards

11.1 Straight edge

Quantity	Straightness up to 500 mm
Procedure	Calibration of the straightness using a form tester.

11.2 Straightness standard (granite, steel or ceramic)

Quantity	Straightness up to 800 mm
Uncertainty	15 nm + 0.12E-6xL
Procedure	Calibration of the straightness deviation with a high precision air bearing guide way.

12. Cylindricity standards

12.1 Cylinder

Quantity	Roundness, straightness and squareness
Uncertainty	Straightness: 0.08 µm + 5E-8xH; Squareness: 0.24"
Procedure	Measurement of roundness using form tester as well as straightness and squareness of the generating lines using a vertical column with a high precision air bearing guide way.
Parameters	Height up to 1000 mm, 2 generating lines
Quantity	Roundness, straightness and squareness
Parameters	Height up to 1000 mm, 4 generating lines

13. Surface texture standards

13.1 Depth setting standard (type A)

Quantity	Groove depth according to ISO 5436-1
Uncertainty	Q[10 nm, 2E-4xPt]
Procedure	Measurement with surface profiler with internal reference plane.

13.2 Wavelength standard (type C)

Quantity	Roughness parameters according to ISO 4287
Uncertainty	Q[4 nm, 0.016xRa]
Procedure	Measurement with surface profiler with internal reference plane.

13.3 Roughness standard (type D)

Quantity	Roughness parameters according to ISO 4287
Uncertainty	Q[4 nm, 0.016xRa]
Procedure	Measurement with surface profiler with internal reference plane.

13.4 Profile coordinate standard

Quantity	Radii, angles and distances
Uncertainty	upon request
Procedure	Measurement with surface profiler with internal reference plane.

13.5 Cutting tool edge standard

Quantity	Edge radius (>10 µm), angle and form deviation
Uncertainty	upon request
Procedure	Measurement with surface profiler with internal reference plane.
Extend of service	5 profiles

14. Microscopy standards

14.1 Grating (1-D), Diffraction measurement

Quantity	Pitch
Uncertainty	Q[0.006 nm, 9E-6xp]
Procedure	Measurement with laser diffractometer.

14.2 Grating (2-D), Diffraction measurement

Quantity	Pitch in 2 D
Uncertainty	Q[0.006 nm, 9E-6xp]
Procedure	Measurement with laser diffractometer.
Quantity	Orthogonality (option)

14.3 Step height standard, AFM

Quantity	Step height 10 nm to 2 µm
Uncertainty	1 nm + 5E-3xh
Procedure	Metrology AFM with interferometrically calibrated capacitive z-sensor.

14.4 Particle standards, AFM

Quantity	Mean diameter 50 nm to 1.0 µm
Uncertainty	2.5 nm + 2 % D
Procedure	Metrology AFM
Parameters	Uniform size, spherical

14.5 Particle standards, photomask measuring machine

Quantity	Mean diameter 1 µm bis 200 µm
Uncertainty	15 nm + 1.8 % D
Procedure	Photo mask method
Parameters	Uniform size, spherical
Extend of service	Only particles in suspension 250.- extra for dry particles

15. Screw gauges

15.1 Thread plug

Quantity	Simple pitch diameter, Pitch: 0.08 mm to 0.5 mm (NIHS)
Uncertainty	1.2 µm
Procedure	Calibration of the pitch diameter with a length comparator using a three wires as probing elements. For the pitch and the flank angle, the nominal values are assumed.
Quantity	Simple pitch diameter Pitch: 0.5 mm to 6 mm
Uncertainty	1.8 µm
Procedure	Calibration of the pitch diameter with a length comparator using a three wires as probing elements. For the pitch and the flank angle, the nominal values are assumed.
Quantity	Pitch diameter, pitch, flank angle Pitch: 0.5 mm to 6 mm
Uncertainty	1.8 µm
Procedure	Calibration of the pitch diameter with a length comparator using three wires as probing elements. Measurement of the pitch and the flank angle using a surface profile instrument.
Parameters	Diameter > 3 mm

16. Coordinate metrology

16.1 Ball plate

Quantity	Ball centre coordinates 600 mm x 600 mm
Uncertainty	Q[0.6 µm, 1.1E-6xL]
Procedure	Error separation based on 4 position reversal technique

16.2 Various gauges

Quantity	various measures up to 1200 mm

17. Computer tomography

17.1 Form error

Quantity	Form error compared to CAD data
Uncertainty	Q[0.3 µm, 2E-5xL] Corresponds to best possible uncertainty. Depends strongly on the shape and material composition of the respective measurement object.
Procedure	High-resolution tomography