



Celebrating **100** YEARS  **Wilson®** Hardness



# Test Block

## Application Guide

A complete line of Hardness Test Blocks and Accessories



*Strong Partner, Reliable Solutions*

[www.buehler.com](http://www.buehler.com)



HARDNESS TESTING IS

# CRITICAL

Hardness testing provides critical information and insight into a material's durability, strength, flexibility and capabilities. It is a commonly used test method in many industries to verify heat treatment, structural integrity and quality of components. Hardness testing ensures the materials utilized in components we use every day contribute to a well engineered, efficient and safe world.

## Ensure Accurate Hardness Results

Calibrated test blocks are an integral part of hardness testing. They ensure accuracy, integrity and traceability of hardness testing processes. They are used to verify instruments performance and provide a means for performing indirect instrument calibrations.

## Trusted in the Industry

Buehler's Wilson test blocks are trusted by leading companies in industry, especially those in the following industries:



Aerospace



Automotive



Medical

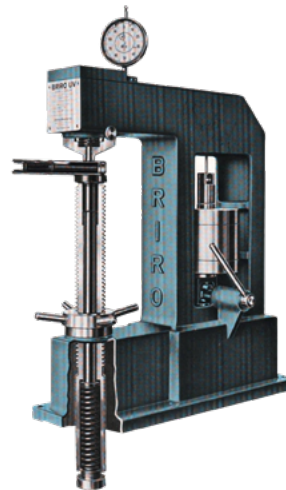


Primary  
Metals



# Buehler Leads the Way in Hardness Testing.

Buehler, with its Wilson line of hardness testers, is the global leader in hardness testing software, equipment and accessories. Buehler is proud to be the proprietor of 100-year old legacy brands including Wilson Instruments, Reichert, and Wolpert, the innovators and founders of the hardness testing industry. Today, Buehler provides innovative solutions for hardness testers, DiaMet™ software and hardness test blocks.



*Wilson  
Instruments*



 **Wilson®**

# What Sets **BUEHLER** Apart

## Consistency of Results

Strict control over the raw materials and tight specifications for heat treating improve the homogeneity and consistency of Buehler's test blocks. These controls ensure that customers can have confidence in the results achieved with Buehler's test blocks.

Wilson Hardness Reference Blocks are certified according to ASTM E18, ASTM E10, ASTM E92, ISO 6506-3, ISO 6507-3, ISO 6508-3, ISO 4545-3, JIS B 7730, JIS B 7735, JIS B 7734 and JIS B 7736 for Brinell, Rockwell, Vickers and Knoop scales.

## Leaders in the Industry

Wilson originally developed the Rockwell testing process and standards. Today, Buehler is continuing to push the materials testing industry forward through active participation in ASTM and ISO committees. Buehler has been named an authorized calibrating agency for certain Master and Secondary standardized test blocks by ASTM.

# Globally Recognized Accreditation

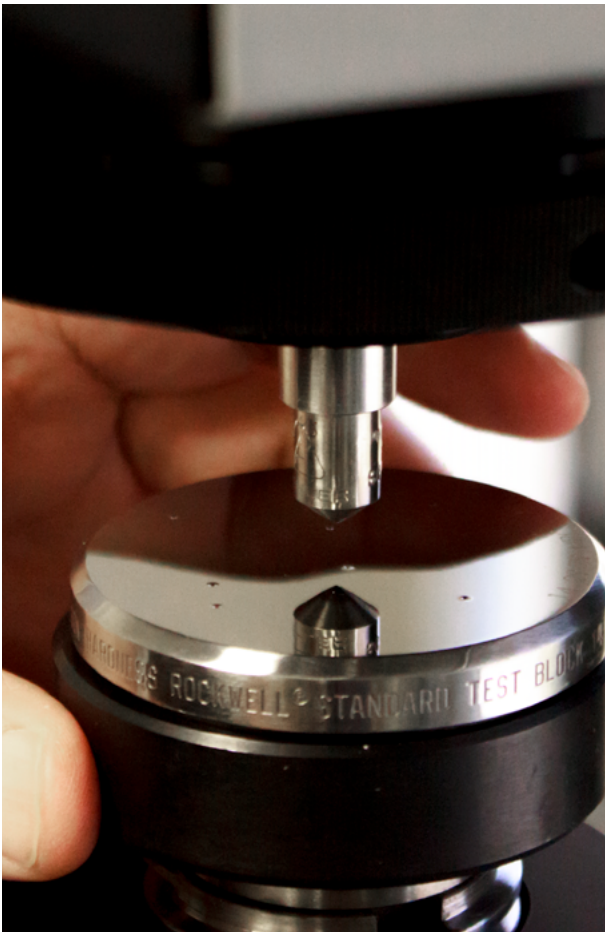


Buehler's Test Block Calibration Laboratory is accredited to ISO / IEC 17025 by the American Association for Laboratory Accreditation (A2LA). A2LA participates in the International Laboratory Accreditation Cooperation (ILAC) Mutual Recognition Arrangement (MRA). The ILAC MRA creates a global network of testing and calibration laboratories that have been accredited to provide accurate and reliable results.



CERT#2237.01 - CALIBRATION

## Advanced Production Capabilities



### Extensive Product Offering

Buehler's Test Block Calibration Laboratory has the capability to produce and calibrate test blocks for many different hardness scales.

- **Rockwell:** Regular and Superficial scales
- **Vickers Microindentation:** Loads from 10gf to 1kgf
- **Vickers Macroindentation:** Loads from 1kgf to 120kgf
- **Knoop Microindentation:** Loads from 10gf to 1kgf
- **Brinell:** HBW5/750, HBW5/250, HBW10/1000, HBW10/3000, HBW2.5/62.5, HBW2.5/187.5

### Experts in Surface Preparation

Surface preparation is a critical aspect that affects the accuracy and consistency of a finished test block. Buehler's expertise in sample preparation and high quality products have been applied to the in-house processing to continually produce test blocks with the highest quality surface finish.

### Advanced Hardness Testing Machines

The Buehler Test Block Calibration Laboratory utilizes state of the art Buehler hardness testing systems for the calibration process. These advanced systems have been built to provide the tightest control and consistency in the calibration process.

# Proper Use of Test Blocks

## Useful Life of a Test Block

The useful life of a test block is determined by the density of indents on the surface. The density of indents is determined by the allowable indent spacing and varies by hardness test. Once recommended densities are reached, the test block must be replaced. Test blocks must be used on the top side only and are recommended to be replaced after five years.

## In-House Verification Testing

In-house verification testing is a critical part of hardness testing performed by the user to ensure conformance with ASTM, ISO & JIS standards. The frequency is determined by the standard to which the lab is operating. Some common reasons for conducting a verification test are:

- Beginning production each day
- Changing indenters
- Changing test force

## Third-Party Verification Testing

In addition to in-house daily verifications, standards also require indirect verifications to be completed periodically by a certified body. These verifications check that the performance of the machine meets specifications and must be done on all hardness scales and loads that the machine is used for. NADCAP certified customers can be assured that verification test meet indent spacings requirement because Rockwell and Brinell blocks are calibrated to ISO and ASTM standards and engraved with a grid on the top surface.

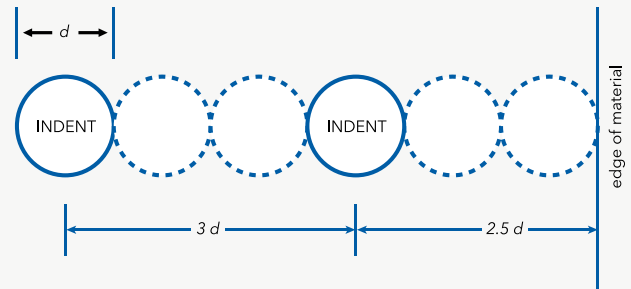
# Proper Indent Spacing

When making indentations on a test block, the hardness of the material immediately surrounding an indentation will usually increase due to the residual stress and work hardening caused by the indentation process. If an indentation is made too close to the edge of a test piece, there may be insufficient material to constrain the deformation around the indentation. Both of these scenarios can lead to inaccurate hardness readings. To prevent incorrect readings, recommended spacing has been defined in the standards for each type of hardness test. To ensure proper spacing is followed, Buehler offers pattern engraving on the surface of test blocks.

## Rockwell & Brinell

**According to ASTM, ISO and JIS Standards:** The distance between the centers of two adjacent indentations shall be at least three times the diameter ( $d$ ) of the indentation.

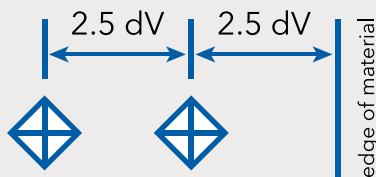
The distance from the center of any indentation to an edge of the test piece shall be at least two and a half times the diameter of the indentation.



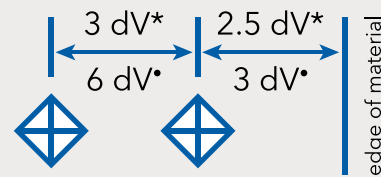
## Vickers

**According to ASTM Standards:** The distance between two indents or an indent and the edge of the test piece shall be at least two and a half times the diagonal ( $dV$ ) of the indentation.

**According to ISO and JIS Standards:** The distance between the centers of two indents shall be at least three times the diagonal ( $dV$ ) of the indent for steel, copper and copper alloys, and at least six times for light metals, lead and tin and their alloys. The distance between the center of an indent and the edge of the test piece shall be at least two and a half times the diagonal ( $dV$ ) for steel, copper and copper alloys, and at least three times for light metals, lead and tin and their alloys.



$dV$  = Vickers Diagonal



\* For steel, copper and copper alloys

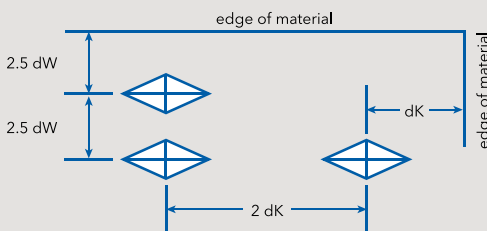
\* For light metals, lead, tin and their alloys

## Knoop

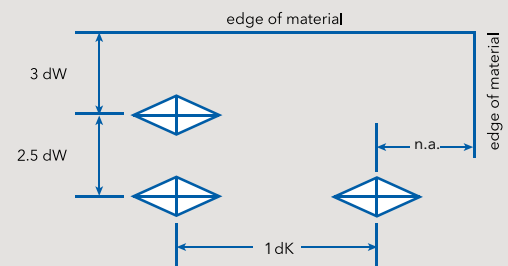
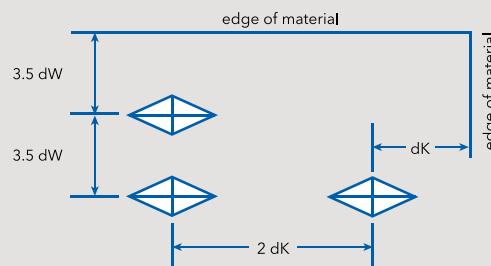
**According to ASTM Standards:** The distance between two indents shall be at least two times the diagonal ( $dK$ ) of the indentation and two and a half times the width ( $dW$ ) of the indentation. The distance between the center of an indentation and the edge of a test piece shall be at least one diagonal ( $dK$ ) or two and a half times the width ( $dW$ ) of the indentation.

**According to ISO Standards:** The distance between two indents shall be at least two times the diagonal ( $dK$ ) of the indentation and three and a half times the width ( $dW$ ) of the indentation. The distance between the center of an indentation and the edge of a test piece shall be at least one diagonal ( $dK$ ) or three and a half times the width ( $dW$ ) of the indentation.

**According to JIS Standards:** The minimum distance between any indentation and the edge of a test piece shall be at least 3 times the short diagonal ( $dW$ ). The distance between two adjacent indentations shall be at least two and a half times the short diagonal ( $dW$ ), or at least one time the long diagonal ( $dK$ ). If two indentations differ in size, the minimum spacing shall be based on the short diagonal ( $dW$ ) of the larger indentation.



$dK$  = Knoop Long Diagonal  
 $dW$  = Knoop Short Diagonal



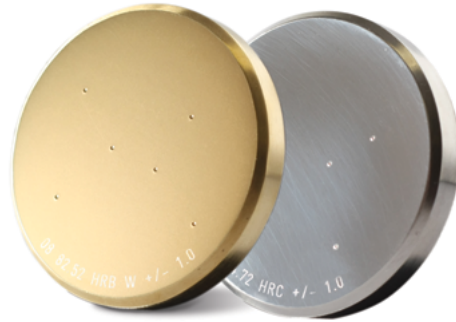
# TEST BLOCK ORDERING INFO

Wilson Hardness test blocks set the standard for the industry and are made from the highest quality material to insure the most uniform and repeatable blocks available. A comprehensive variety of scales and blocks are available to meet the wide ranges and hardness scales associated with Rockwell®, Brinell, Knoop and Vickers testing. All Wilson test blocks are calibrated in the Wilson Hardness Calibration Laboratory in Binghamton, NY. The Wilson lab is accredited to ISO-IEC 17025 by A2LA and the testers used in the calibration process undergo a stringent monitoring process using NIST traceable devices. For the ultimate accuracy and performance in tester verification, calibration sets are available for most Rockwell scales.

- We work directly with the steel and brass mills to specify the chemical composition
- Our machining processes (grinding, lapping, polishing) are all done in house, at the site of calibration
- 100% inspection to ensure that every single test block meets the physical requirements of ASTM (thickness, flatness, parallelism, surface roughness)

## Wilson® Rockwell Test Blocks

According to ASTM E18, ISO 6508-3 and JIS B 7730



	Part Number	Nominal Hardness
Rockwell A	9201110	63HRA
	9201150	73HRA
	9201190	83HRA
Rockwell B	9202050W	40HRB
	9202060W	50HRB
	9202070W	60HRB
	9202080W	70HRB
	9202090W	80HRB
Rockwell C	9203111	25HRC
	9203121	30HRC
	9203131	35HRC
	9203141	40HRC
	9203151	45HRC
	9203161	50HRC
	9203171	55HRC
	9203181	60HRC
	9203191	63HRC
	Rockwell E	9205010W
9205020W		63HRE
9205050W		81HRE
9205060W		87HRE
Rockwell F	9206020W	63HRF
	9206050W	80HRF
	9206070W	91HRF

	Part Number	Nominal Hardness
Superficial Rockwell 15-N	9212110	72HR15N
	9212150	83HR5N
	9212190	91HR15N
Superficial Rockwell 15-T	9218020W	64HR15T
	9218050W	74HR15T
	9218070W	80HR15T
Superficial Rockwell 30-N	9213110	46HR30N
	9213130	55HR30N
	9213150	64HR30N
	9213190	80HR30N
Superficial Rockwell 30-T	9219050W	43HR30T
	9219070W	56HR30T
	9219090W	70HR30T

• Certified using a Tungsten Carbide ball indenter

### Special Order Items

Part Number	Description
9201002	Special value - please provide hardness value and Rockwell scale
9201003	Special value with grid - please provide hardness value and Rockwell scale
9201006	API compliance - special tolerance - please provide hardness value and Rockwell scale



# Wilson® Vickers-Knoop Test Blocks



## Vickers Test Blocks

According to ASTM E92, ISO 6507-3 and JIS B 7735

HV0.05	HV0.1	HV0.2	HV0.3	HV0.5	HV1	HV2	HV3	HV5	HV10	HV20	HV30	HV50	Value
930005-	93001-	93002-	93003-	93005-	9301-	9302-	9303-	9305-	9310-	9320-	9330-	9350-	150
930005-	93001-	93002-	93003-	93005-	9301-	9302-	9303-	9305-	9310-	9320-	9330-	9350-	200
930005-	93001-	93002-	93003-	93005-	9301-	9302-	9303-	9305-	9310-	9320-	9330-	9350-	250
930005-	93001-	93002-	93003-	93005-	9301-	9302-	9303-	9305-	9310-	9320-	9330-	9350-	300
930005-	93001-	93002-	93003-	93005-	9301-	9302-	9303-	9305-	9310-	9320-	9330-	9350-	350
930005-	93001-	93002-	93003-	93005-	9301-	9302-	9303-	9305-	9310-	9320-	9330-	9350-	400
930005-	93001-	93002-	93003-	93005-	9301-	9302-	9303-	9305-	9310-	9320-	9330-	9350-	450
930005-	93001-	93002-	93003-	93005-	9301-	9302-	9303-	9305-	9310-	9320-	9330-	9350-	500
930005-	93001-	93002-	93003-	93005-	9301-	9302-	9303-	9305-	9310-	9320-	9330-	9350-	550
930005-	93001-	93002-	93003-	93005-	9301-	9302-	9303-	9305-	9310-	9320-	9330-	9350-	600
930005-	93001-	93002-	93003-	93005-	9301-	9302-	9303-	9305-	9310-	9320-	9330-	9350-	700
930005-	93001-	93002-	93003-	93005-	9301-	9302-	9303-	9305-	9310-	9320-	9330-	9350-	775
930005-	93001-	93002-	93003-	93005-	9301-	9302-	9303-	9305-	9310-	9320-	9330-	9350-	830

Item number example: 93003700 for a 700 HV0.3 test block

	not ISO 6507 due to <20µm diagonal length
	Macro Vickers blocks (2.4in x 0.35in [60mm x 9mm])
	Micro Vickers blocks (1.25in x 0.63in [32mm x 16mm])

## Knoop Test Blocks

According to ASTM E92, ISO 4545-3 and JIS B 7734

Load (kg)	Part Number	Nominal Hardness	Range
HK0.5	94-005-225	225 HK	200-250
	94-005-315	315 HK	290-340
	94-005-440	440 HK	415-465
	94-005-540	540 HK	515-565
	94-005-630	630 HK	605-655
	94-005-730	730 HK	705-755
	94-005-850	850 HK	825-875

## Special Order Items

not applicable for Europe, please contact Buehler Europe etc..

Part Number	Description
93-000-001*	Special block - please provide hardness value and Vickers scale
93-000-002*	Special block - please provide hardness value and Vickers scale
94-000-001*	Special block - please provide hardness value and Knoop scale
93-000-012*	Special block - 2 scales certification - please provide hardness value and Vickers/Knoop scale
93-000-013*	Special block - 3 scales certification - please provide hardness value and Vickers/Knoop scale
93-000-014*	Special block - 4 scales certification - please provide hardness value and Vickers/Knoop scale

\*Specify hardness required and load force for calibration

•Specify additional load force for calibration



# TEST BLOCK ORDERING INFO

## Wilson® Brinell Test Blocks

According to ASTM E10, ISO 6506-3 and JIS B 7736

### Brinell reference blocks up to 250kgf load

Nominal value	Range	HBW2.5-62.5 scale	HBW2.5-187.5 scale	HBW5-250 scale
140 HBW	115-169	WH-140HBW-625	WH-140HBW-1875	WH-140HBW-250
200 HBW	170-224	WH-200HBW-625	WH-200HBW-1875	WH-200HBW-250
250 HBW	225-274	WH-250HBW-625	WH-250HBW-1875	WH-250HBW-250
300 HBW	275-324	WH-300HBW-625	WH-300HBW-1875	
350 HBW	325-375	WH-350HBW-625	WH-350HBW-1875	
400 HBW	375-449		WH-400HBW-1875	
500 HBW	450-525		WH-500HBW-1875	

### Brinell reference blocks up to 3000kgf load

Nominal value	Range	HBW5-750 scale	HBW10-3000 scale
140 HBW	115-169	WH-140HBW-750	WH-140HBW-3000
200 HBW	170-224	WH-200HBW-750	WH-200HBW-3000
225 HBW	212-238		WH-225HBW-3000
250 HBW	225-274	WH-250HBW-750	WH-250HBW-3000
275 HBW	262-288		WH-275HBW-3000
300 HBW	275-324	WH-300HBW-750	WH-300HBW-3000
325 HBW	312-338		WH-325HBW-3000
350 HBW	325-375	WH-350HBW-750	WH-350HBW-3000
375 HBW	362-388		WH-375HBW-3000
400 HBW	375-449	WH-400HBW-750	WH-400HBW-3000
500 HBW	450-525	WH-500HBW-750	WH-500HBW-3000



### Other Brinell scales that use 1mm 2.5mm, 5mm or 10mm ball indenters †

not applicable for Europe, please contact Buehler Europe etc..

Part Number	Description
WHSMLBRIN*	Special block - please provide hardness value and Brinell scale using 1mm or 2.5mm ball indenter

Part Number	Description
WHSPECBRIN*	Special block - please provide hardness value and Brinell scale using 5mm or 10mm ball indenter

† Specify hardness required, load force, and ball indenter size for certification

# MORE HARDNESS TESTING PRODUCTS

## Rockwell® Verification Kits

The kits contain recommended indenters and blocks for the dedicated scales.

Part Number	Description
A582143	Rockwell Regular Kit - includes Rockwell C Indenter, 25 HRC, 63 HRC and 80 HRB test blocks
A58239	Rockwell Superficial Kit - includes Rockwell N Indenter, 46 HR30N, 80 HR30N and 70 HR30T test blocks
A582144	Rockwell Twin Kit - includes Rockwell C and N Indenters, 25 HRC, 63 HRC, 80 HRB, 80 HR30N and 70 HR30T test blocks

Visit the [Rockwell Test Blocks webpage](#) for more information.

## Hardness Testing Machines

Buehler's product offering includes a comprehensive range of Wilson hardness testers for Rockwell, Vickers, Knoop and Brinell testing. These testers are supported by DiaMet automation software to provide a complete testing solution. DiaMet software focuses on fast and simple operation to satisfy the needs of low trained operators while maintaining the flexibility and high level of features required by expert users.

Visit the [Hardness Testing webpage on the Buehler website](#) for more information.



## Indenters

Buehler also offers a full range of indenters for Rockwell, Vickers, Knoop and Brinell hardness testing.

Please see the current [Product Catalog](#) or [Buehler website](#) for more information.



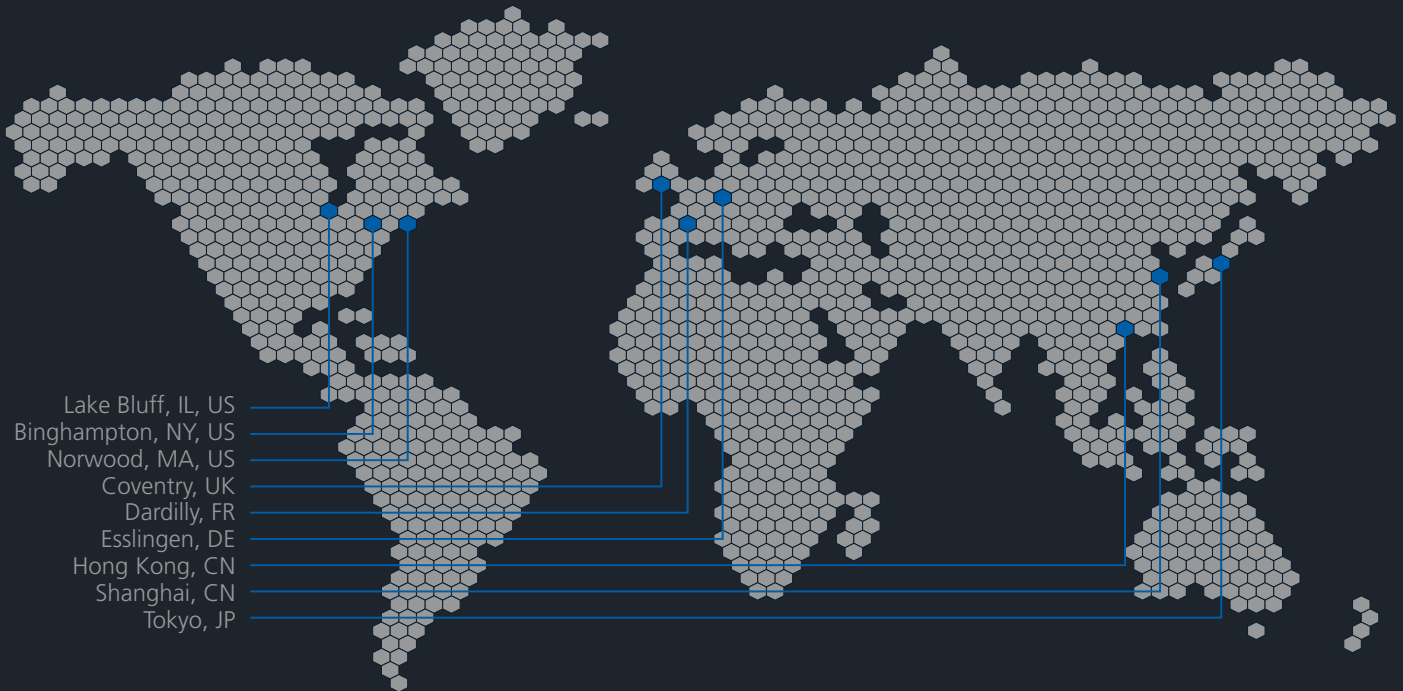
## Global Service Teams

Buehler's global service teams are committed to supporting our customers around the world. Our goal is to help our customers protect their investment, ensure consistent performance, minimize downtime and reduce the likelihood of costly repairs. To support our customers, we offer preventative maintenance plans, calibration & verification services, machine repair, spare parts and more.

Visit the [Service webpage on the Buehler website](#) for more information.



# Buehler Worldwide Locations



Lake Bluff, IL, US  
Binghampton, NY, US  
Norwood, MA, US  
Coventry, UK  
Dardilly, FR  
Esslingen, DE  
Hong Kong, CN  
Shanghai, CN  
Tokyo, JP



Solutions for Materials Preparation, Testing and Analysis

## **BUEHLER**

41 Waukegan Road, Lake Bluff, Illinois 60044  
**P:** 847 295 6500 | 800 BUEHLER (800 283 4537)  
**W:** [www.buehler.com](http://www.buehler.com) | **E:** [info@buehler.com](mailto:info@buehler.com)

## **North America-South America Offices**

**BUEHLER Worldwide Headquarters**  
**P:** 847 295 6500 | 800 BUEHLER (800 283 4537)  
**W:** [www.buehler.com](http://www.buehler.com) | **E:** [info@buehler.com](mailto:info@buehler.com)

## **Europe Offices**

**BUEHLER Germany - Esslingen**  
European Headquarters  
**P:** +49 (0) 711 4904690-0  
**E:** [info.eu@buehler.com](mailto:info.eu@buehler.com)

**BUEHLER France - Dardilly**  
**P:** +33 (0) 800 89 73 71  
**E:** [info.eu@buehler.com](mailto:info.eu@buehler.com)

**BUEHLER United Kingdom - Coventry**  
**P:** +44 (0) 800 707 6273  
**E:** [info.eu@buehler.com](mailto:info.eu@buehler.com)

## **Asia-Pacific Offices**

**BUEHLER Japan**  
**P:** +81 03 5439 5077 | **F:** +81 03 3452 7220  
**E:** [info.japan@buehler.com](mailto:info.japan@buehler.com)

**BUEHLER Asia-Pacific - Hong Kong**  
**P:** +852 2307 0909 | **F:** +852 22721 6659  
**E:** [info.asia@buehler.com](mailto:info.asia@buehler.com)

**BUEHLER China - Shanghai**  
ITW Test & Measurement (Shanghai) Co., Ltd.  
**P:** +86 400 000 3418 | **F:** +86 21 6410 6671  
**E:** [info.cn@buehler.com](mailto:info.cn@buehler.com)

Visit [www.buehler.com](http://www.buehler.com) for more information  
on a Buehler location near you.

