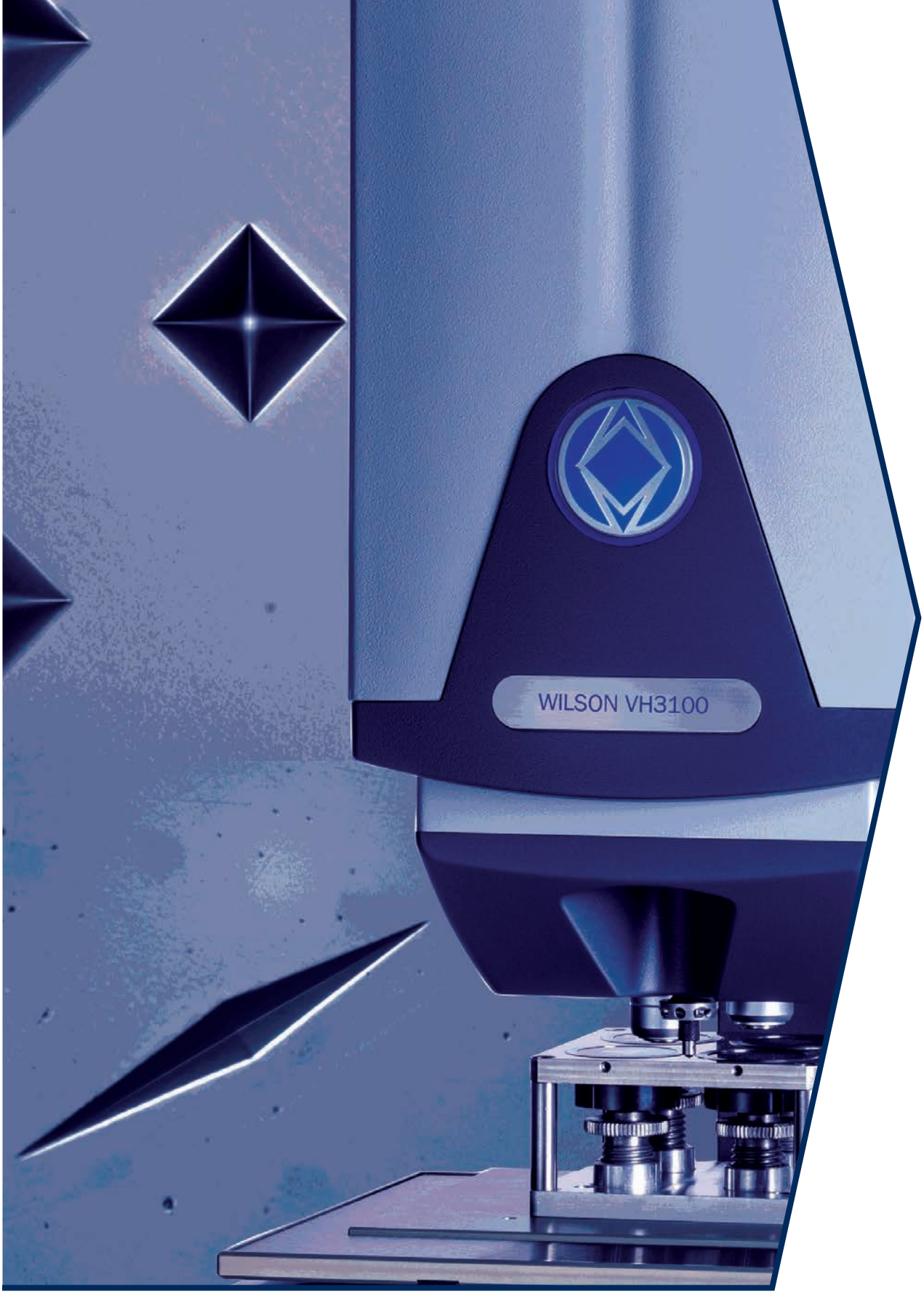
HARDNESS TESTING



Wilson Hardness Testers At A Glance:

HARDNESS TESTING

Wilson® hardness testers include a comprehensive range of hardness testers from Rockwell®, Knoop/Vickers, and Brinell to fully automatic production systems. Our testers are complemented by a range of test blocks, accessories, and fixtures, and our calibration laboratory is recognized as the global leader in the production of premium test blocks and indenters.

Providing service and support that is dedicated to ensuring the highest quality calibration, verification, and service throughout the world and our applications support combines years of experience with unparalleled expertise. With dedicated sales, manufacturing, and research & development facilities located around the world, including the Americas, Europe, and Asia we are always close to you.

Rockwell



	Rockwell 574	Rockwell 2000	BRIRO R/RK
Load Range	15 - 150kgf	15 - 150kgf	3 - 250kgf
Scale	Rockwell	Rockwell	Rockwell, Brinell Depth
Test Load Control	Dead weight	Closed Loop, Loadcell	Spring

Knoop/Vickers





	400 Series	Tukon™ 1102/1202	Automation	Tukon 2500	Wilson VH3100
Load Range	0.3 - 50kgf	0.01 - 2kgf	0.01 - 3000kgf	0.01 - 50kgf	0.05 - 10kgf
Scale	Vickers, Knoop	Vickers, Knoop	Vickers, Knoop, Brinell, Rockwell	Vickers, Knoop	Vickers, Knoop
Test Load Control	Dead weight	Dead weight		Closed Loop, Loadcell	Closed Loop, Loadcell

Universal/Brinell




	UH930	UH250	UH750/3000	BH3000
Load Range	1 - 250kgf	1 - 250kgf	3 - 3000kgf	187.5 - 3000kgf
Scale	Vickers, Brinell, Rockwell, Superficial Rockwell	Vickers, Brinell, Rockwell, Superficial Rockwell	Vickers, Brinell, Rockwell, Superficial Rockwell	Brinell
Test Load Control	Closed Loop, Loadcell	Closed Loop, Loadcell	Closed Loop, Loadcell	Closed Loop, Loadcell

Products available Worldwide unless noted by the following:

1 North & South America

2 Europe, Africa & Middle East

3 Asia

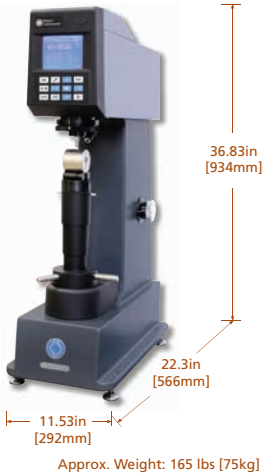
The Rockwell test is based on the difference in indentation depth between a smaller preliminary force (minor) and larger total force (major). Rockwell hardness values are expressed as a combination of a hardness number and a scale symbol representing the indenter and the minor and major loads. The hardness number is expressed by the symbol HR and the scale designation. Rockwell testing requires no optical measurement and so has excellent speed and reproducibility.

Applications:

- Steel
- Copper
- Cast irons
- Thin materials
- Cemented carbides
- Deep case hardened materials
- Shallow case hardened materials

Rockwell 574 Hardness Tester

- Easy to operate, high precision system
- Dial selectable load range
- Durable, industrial design to withstand harsh environments
- Automatic minor load braking system



Approx. Weight: 165 lbs [75kg]

	574R Regular	574S Superficial	574T Twin
Pre-load	10kgf	3kgf	3, 10kgf
Main-load	60, 100, 150kgf	15, 30, 45kgf	15, 30, 45, 60, 100, 150kgf
Hardness scales	HRA, HRB, HRC, HRD, HRE, HRF, HRG, HRH, HRK, HRL, HRM, HRP, HRR, HRS, HRV	15N, 30N, 45N, 15T, 30T, 45T, 15W, 30W, 45W, 15X, 30X, 45X, 15Y, 30Y, 45Y	HRA, HRB, HRC, HRD, HRE, HRF, HRG, HRH, HRK, HRL, HRM, HRP, HRR, HRS, HRV, 15N, 30N, 45N, 15T, 30T, 45T, 15W, 30W, 45W, 15X, 30X, 45X, 15Y, 30Y, 45Y
Test load type	Calibrated Spring (Minor Load), Dead weight stack (Major load)		
Test cycle type	Motorized with automatic pre-load brake		
Vertical test capacity	11.43in [289mm] *accessories may decrease available capacity*		
Horizontal test capacity	6.93in [175mm] at the top, 6.13in [155mm] at the bottom		
Indenters (optional)	120° Diamond cone, 1/16in, 1/8in, 1/4in, 1/2in Ball		
Data-out	USB and RS232		
Standards Compliant	ASTM E18, ASTM D785, ASTM B294, ISO 6508, JIS Z 2245, GB/T 230		
Power	100 - 240VAC, 60/50Hz		

Part Number	Description
W574R	Rockwell 574R - for all Regular test scales
W574S	Rockwell 574S - for all Superficial test scales
W574T	Rockwell 574T - for all Regular and Superficial test scales

Accessories
Suitable indenters must be selected separately for each test scale to be used.
See pages 90-91 for the Rockwell 574 indenter and anvil options.

Rockwell® 2000 Hardness Tester

- Most accurate, fast and easy to use Rockwell tester
- Automatic, one button start
- Fiber optic illumination
- User friendly hand set for quick test method setup
- Industry-leading Gauge Repeatability and Reproducibility (GR&R)

Approx. Weight: Rockwell 2002: 236 lbs [107kg]
Rockwell 2003: 250 lbs [113kg]

	2002R & 2003R Regular	2002S & 2003S Superficial	2002T & 2003T Twin
Pre-load	10kgf	3kgf	3, 10kgf
Main-load	60, 100, 150kgf	15, 30, 45kgf	15, 30, 45, 60, 100, 150kgf
Hardness scales	HRA, HRB, HRC, HRD, HRE, HRF, HRG, HRH, HRK, HRL, HRM, HRP, HRR, HRS, HRV	15N, 30N, 45N, 15T, 30T, 45T, 5W, 30W, 45W, 15X, 30X, 45X, 15Y, 30Y, 45Y	HRA, HRB, HRC, HRD, HRE, HRF, HRG, HRH, HRK, HRL, HRM, HRP, HRR, HRS, HRV, 15N, 30N, 45N, 15T, 30T, 45T, 15W, 30W, 45W, 15X, 30X, 45X, 15Y, 30Y, 45Y
Test load type	Electronic closed-loop loadcell		
Test cycle type	Automatic, one button start		
Vertical test capacity	2002 models 10in [254mm]; 2003 models 14in [356mm]		
Horizontal test capacity	8.5in [216mm]		
Indenters (optional)	120° Diamond cone, 1/16in, 1/8in, 1/4in, 1/2in Ball		
Resolution	0.1 or 0.01 HR (adjustable)		
Data-out	RS232		
Standards Compliant	ASTM E18, B254, ISO 6508, JIS Z2245		
Power	100, 120, 220 or 240VAC +/- 10%, 47-63Hz		

Part Number	Description
WH2002R	Rockwell 2000 Size-2 Regular main unit
WH2002S	Rockwell 2000 Size-2 Superficial main unit
WH2002T	Rockwell 2000 Size-2 Twin main unit
WH2003R	Rockwell 2000 Size-3 Regular main unit
WH2003S	Rockwell 2000 Size-3 Superficial main unit
WH2003T	Rockwell 2000 Size-3 Twin main unit

Accessories

RB2000-C2	Anvil, Pedestal spot
RB2000-C3	Anvil, 1/2in [12.7mm] Shallow "V", < 6mm diam
RB2000-C4	Anvil, 1.5in [38.1mm] Standard "V", > 6mm diam
RB2000-C5	Flat Anvil, 8in [203mm] testing table
RB2000-F2	NIST standard "C" diamond indenter
RB2000-F3	NIST standard "N" diamond indenter
RB2000-F5	1/16in Carbide Ball Indenter with ball
RB2000-F7	1/8in Carbide Ball Indenter with ball
CP102392	Three Bar Jominy Fixture
9100-564	Specimen Clamping Fixture
9100-568	T-Slot table
CP107588	Camera Video Option with integrated lighting

Kits contain recommended indenters and test blocks.
Please refer to your local Buehler representative for details.

WA582143	Regular scale accessory kit
WA58239	Superficial scale accessory kit
WA582144	Twin scale accessory kit

Products available Worldwide unless noted by the following:

1 North & South America
2 Europe, Africa & Middle East
3 Asia

Rockwell® BRIRO R Series Hardness Tester

- Extremely durable, highly accurate system
- Reicherter high-force clamping system for safe testing of both small and very large parts
- Easy exchange of indenters
- User-friendly HM-Control display

	Briro R	Briro RK
Pre-load	10kgf	3kgf
Main-load	60, 62.5, 100, 150, 187.5, 250kgf	15, 30, 45kgf
Hardness scales	HRA, HRB, HRC, HRD, HRE, HRF, HRG, HRH, HBT 2.5/62.5; HBT2.5/187.5; HBT 5/250	15N, 30N, 45N, 15T, 30T, 45T, 15W, 30W, 45W, 15X, 30X, 45X, 15Y, 20Y, 30Y, 45Y
Test load type	Low-mass spring load	
Test cycle type	Manual, with Reicherter clamping	
Vertical test capacity	Normal (R): 9.44in [240mm] Extended Version (RL): 14.37in [365mm] Extra Extended (RXL): 19.68in [500mm]	
Horizontal test capacity	5.9in [150mm]	
Indenters (optional)	120° Diamond cone, 1/16in, 1/8in, 1/4in, 1/2in Ball	
Data-out	RS232	
User interface	HM Control panel	
Standards Compliant	ASTM E18, ASTM D785, ASTM B294, ISO 6508, JIS Z 2245, GB/T 230	
Power	230V, 50/60Hz	

Part Number	Description
W702802	Briro R Regular scale main unit
W702805	Briro RK Superficial scale main unit
W702820	Briro RL extended test height main unit
W702809	Briro RXL extended test height main unit

Rockwell Diamond and Ball Indenters

Rockwell 2000 and Rockwell 574

9100401	Certified Diamond Indenter Rockwell "C" 120° Cone
900006838	Certified Diamond Indenter Rockwell "A" 120° Cone
900002015	Certified Diamond Indenter Rockwell "N" 120° Cone
9100405	Certified Carbide Ball Indenter, 1/16in with 4 additional spare balls
9100405	Certified Carbide Ball Indenter, 1/8in with 2 additional spare balls
9100407	Certified Carbide Ball Indenter, 1/4in with 1 additional spare ball
9100408	Certified Carbide Ball Indenter, 1/2in with 1 additional spare ball

BRIRO Series

740207	Certified Diamond Indenter Rockwell 120° Cone
740091	Certified Carbide Ball Indenter, 1/16in
740236	Certified Carbide Ball Indenter, 1/8in
740252	Certified Carbide Ball Indenter, 1/4in
740092	Certified Carbide Ball Indenter, 2.5mm
740093	Certified Carbide Ball Indenter, 5mm

Spare Balls for all Rockwell Testers

9100422	Certified Carbide Balls, 1/16in Ø (qty 5)
9100423	Certified Carbide Balls, 1/8in Ø (qty 5)
900000461	Certified Carbide Ball, 1/4in Ø
900000464	Certified Carbide Ball, 1/2in Ø

See pages I-IV for ordering information or visit www.buehler.com.

KNOOP/VICKERS HARDNESS TESTERS

Knoop and Vickers tests are performed by pressing an indenter of a specific geometry into the test surface at a known test force for a specified time. After removing this force, the size of the resulting impression left in the material is measured optically. The size of the indent is used to calculate hardness.

The Vickers indenter is a square based pyramid, and is best for comparability of hardness across a wide range of materials and loads. The Knoop indenter is an elongated rhomboid and is usually used when very shallow or closely spaced indents are required. This form of test machine is often split into two categories: Macro- and Micro-Hardness.

Macro Hardness testing (using loads greater than 1kg) produces larger indents and is suited to testing general materials properties. This is usually only done with Vickers type indenters.

Micro Hardness testing uses loads less than 1kg and is used to test small areas, when multiple indents need to be made close to each other (e.g. to assess changing hardness), for testing close to edges or interfaces, or for thin samples. Both Vickers and Knoop indenters can be used in this test range.

Applications:

- Ferrous, steel & non ferrous metals
- IC wafers
- Thin plastics
- Metal foils & laminates
- Platings
- Coatings
- Surface layers
- Heat treatment effects
- Case depth
- Carburized layer depth
- Ceramics
- Carbides
- Hardness from welding to deposition

400 Series Knoop/Vickers Hardness Testers

- Versatile and user friendly system
- Available in 2 different models with maximum loads of 30kgf and 50kgf
- Two optical paths
- Motorized turret
- Optional motorized stage and motorized Z-axis

Approx. Weight: 121 lbs [55kg]

	432SVD	452SVD
Hardness scales	HV, HK	
Main-load	003 - 30kgf	1 - 50kgf
Test cycle type	Motorized dead weight	
Vertical test capacity	8.3in [210mm]	
Horizontal test capacity	6.3in [160mm]	
Objectives	10x and 20x objectives for 100x and 200x magnification	
Indenters	1 indenter position Select Vickers or Knoop	
XY-stage options	Manual 100 x 100mm stage, 25 x 25mm travel Motorized stage 100 x 100mm travel (with PC software only)	
Camera Software	Optional - contact your local Buehler representative for more information	
Standards Compliant	ISO 6507, ASTM E384 & E92, and JIS Z2244	
Power	100 - 240VAC, 60/50Hz	

Part Number	Description
W432SVD	Vickers Tester 432SVD
W452SVD	Vickers Tester 452SVD

Tukon™ 1102/1202 Knoop/Vickers Hardness Tester

- Versatile and user friendly system with a wide range of micro-hardness test scales
- Eight dial selectable load ranges
- 3 position (1102) or 6 position (1202) motorized turret
- High powered LED illumination
- Regular (R) or Long Working Distance (L) objectives (model dependent)
- Optional Hi Res CCD camera system can be integrated inside the frame - no visible wires
- Motorized turret with "Shortest Path" program logic control.
- USB output to CSV file, easy to open in Excel

	Tukon 1102	Tukon 1202
Hardness scales	HV, HK	
Main-load	10gf - 1kgf (2kgf optional)	
Test cycle type	Motorized dead weight	
Vertical test capacity	4.1in [130mm] / with XY-stage 3.7in [95mm]	
Horizontal test capacity	5.1in [130mm]	
Objectives	10x and 50x Regular	5x, 10x and 50x Long Working Distance
Total magnification	100x, 500x	50x, 100x, 500x
Indenters	1 indenter position Select Vickers or Knoop	2 indenter positions Select Vickers and/or Knoop
Data-out	USB and RS232	
User interface	Multilanguage 4.7in LCD touchscreen	
XY-stage options	Manual 100 x 100mm stage, 25 x 25mm travel Motorized stage 100 x 100mm travel (with PC software only)	
Camera Software	Options available from basic camera kit to full automatic system. Contact your local Buehler representative for more information	
Standards Compliant	ISO 6507, ASTM E384	
Power	100 - 240VAC, 60/50Hz	

See page 94 for Automation options.

See page 98 for vises.

Part Number	Description
W1102	Tukon 1102 Micro-hardness Tester (10-1000g), 2kgf optional see 9150-501
W1202	Tukon 1202 Micro-hardness Tester (10-1000g), 2kgf optional see 9150-501

Indenters for Tukon 1102/1202, 2100, 2500 Testers

9100-687	Vickers indenter 136°, includes ASTM & ISO certificate (Vickers A)
9100-684	Knoop indenter 172°, includes ASTM & ISO certificate (Knoop A)
9100-682	Vickers 136°, includes DKD certificate according to ISO standard (HV0.2-HV5) (Vickers B)
9100-681	Vickers 136°, includes DKD certificate according to ISO standard (HV0.01-HV0.2) (Vickers C)
9100-683	Knoop 172°, includes DKD certificate according to ISO standard (Knoop B)

Manual Stages

9170-506	XY-stage with analog metric micrometers
9170-507	XY-stage with digital micrometers

Objectives - Individual

WH-5X-LWD	5x Long Working Distance objective
WH-10X-LWD	10x Long Working Distance objective
WH-20X-LWD	20x Long Working Distance objective
WH-40X-LWD	40x Long Working Distance objective
WH-50X-LWD	50x Long Working Distance objective
WH-100X-LWD	100x Long Working Distance objective

Tukon 1102/1202 Accessories

9150-501	Extended weight option for 2kg load
9170-505	Digital eyepiece 10x

See pages I-IV for ordering information or visit www.buehler.com.

Automation packages for Tukon™ 1102/1202

Automated microindentation system solutions available with different levels of automation. All control of the hardness instrument can be handled through comprehensive software – automatically test and measure indentations, as well as set up and run automatic testing sequences with minimal operator interaction. All parameters of the test, such as load monitoring, dwell times, and focusing are controlled through the software providing a very user friendly system. Hardness scale conversions into other scales are supported.

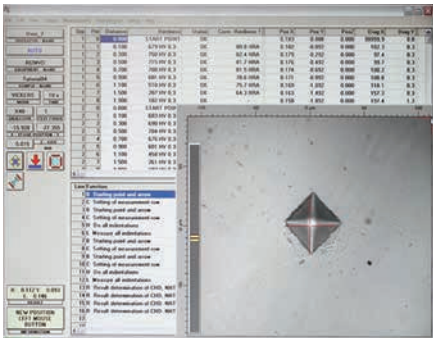
Available automation packages
- Full - for fully automatic testing
- Semi - for semi-automatic testing *(requires manual focusing)*
- Basic - for manual stage testing

Contact your local Buehler Representative for more information on configurations.

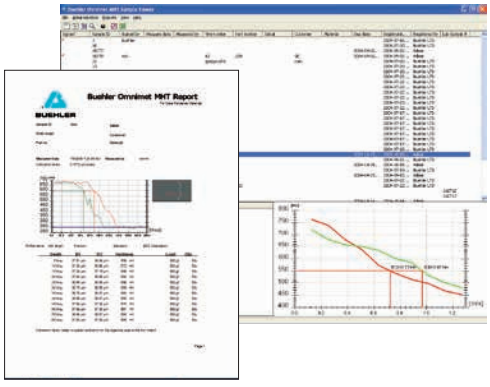
	Basic	Semi	Full
Manual Filar Measurement	•	•	•
Automatic Measurement Analysis	o	o	•
Automatic Sample Focusing			•
Automatic edge detection		o	o
Automatic Stage Movement		•	•
Turret control	•	•	•
High-Performance PC	o	o	o
Manual XY-Stage	•		
Motorized XY-Stage		•	•
Motorized Z-Axis			•

• *Included* o *Optional*

Note
A complete automated testing solution consists of a Tukon 1102 or 1202 Hardness Tester, Automation Kit, and any additional Hardness Testing accessories required.



Windows® software for indent measurement algorithms detect indents and automatically measures the Vickers or Knoop hardness of the specimen. Additionally, conversions into other scales are supported. Measurement of a Vickers indent is depicted on left.



Integrated data storage archives all measurements. Data may be retrieved at any time, reviewed, or sent to automatically generated reports as shown. Various report templates are available.

Automation Accessories

9180-105 Camera Adapter for Tukon 1102/1202 testers
9180-104 Automation RS232-DB9 Female Cable
9180-101 Automation Power Distribution Kit
9180-102 Motorized XY Stage Kit - 100 x 100mm travel
9180-103S Z-axis Installation Kit

86-1-0006 Digital Camera, UI 1540LE-M-HQIR, 1.3MP
86-1-0007 Workstation with MS® Windows 7 and Office® 2010 *(Does not include monitor)*

Tukon™ 2500 Knoop/Vickers Hardness Tester

- Wide load range of 10gf - 50kgf test load
- Versatile, configurable solution for accurate and efficient testing
- Automated control, method setup, data collection and manipulation
- Digital zooming with optional 30x - 2000x magnification

Tukon 2500 is a highly configurable system. Contact your local Buehler representative for more information on various options and accessories.

Approx. Weight: 165 lbs [75kg]

Software Features	1	2	3	4	5	6
Calibrated Digital Zooming	•	•	•	•	•	•
Manual Filar Measurement	•	•	•	•	•	•
Automatic Measurement Analysis		•	•	•	•	•
Automatic Sample Focusing			•		•	•
Automatic Stage Movement				•	•	•
Hardware						
Overview Camera						•
High-Performance PC	•	•	•	•	•	•
Sample Support						
Stationary Flat Anvil	•	•				
Manual XY-Stage with PC Interface			•			
Motorized XY-Stage				•	•	•

Specifications	Tukon 2500
Hardness scales	HV, HK
Main-load	10gf - 50kgf (select loadcells)
Test cycle type	Electronic closed-loop
Vertical test capacity	4.5in [114mm] anvil, 4.3in [110mm] manual stage, 3.1in [79mm] motorized stage
Horizontal test capacity	6.5in [165mm]
Standard magnification	50X, 100X, 200X, 300X, 400X, 500X, 700X
Extended magnification	30X, 50X, 100X, 200X, 300X, 500X, 600X, 1000X, 2000X
Indenters	2 indenter positions, select Vickers and/or Knoop
Data-out	PC Software
Standards Compliant	ASTM E384, ASTM E92, ISO 6507, ISO 9385, ISO 4545
Power	100, 120, 220 or 240VAC +/- 10%, 47-63Hz

Part Number	Description
W25001	Tukon 2500 & 63mm flat anvil
W25002	Tukon 2500 & 63mm flat anvil (incl. Autom.)
W25003	Tukon 2500 & manual XY-stage with 2 digital micrometers
W25004	Tukon 2500 Semi Automatic, Motorized XY Stage
W25005	Tukon 2500 Full automatic
W25006	Tukon 2500 Full automatic incl. overview

Accessories

9100-960	10N load cell (10gf to 1000gf)	WH-OBJEXT-2500	Extended objective set - includes 4x, 20x and 100x objectives
9100-961	500N load cell (300 gf to 50 Kgf)		
9100-687	Vickers indenter, ASTM compliant	WH-OBJSTD-2500	Standard objective set - includes 10x and 50x objectives

See pages I-IV for ordering information or visit www.buehler.com.

Wilson® VH3100 Automatic Vickers/Knoop Hardness tester

For automated case hardness depth (CHD), weld testing and many other programmable hardness tasks

- Range of high velocity motorized stages
- Motorized Z-axis with auto-focus
- Fast and accurate automatic indent measurement algorithms
- Wide range of objectives with digital zoom
- Optional overview camera
- Flexible connectability, USB, ethernet and external monitor connection

Approx. Weight: 82.7 lbs [37.5kg] *without monitor*
Approx. Monitor Weight: 11.5 lbs [5.2kg] *excluding arm*

	Wilson VH3100
Scales	HV, HK, HB
Test Load	0.05, 0.1, 0.2, 0.3, 0.5, 1, 2, 3, 5, 10kgf
Test Load Accuracy	±1.5% < 200g, ±1% > 200g
Force Application	Load Cell
Dwell Time	1 - 999 seconds
Standard Compliance	ASTM E384 & E92; ISO 6507, 9385, 4546
Turret	Automatic virtual turret
Magnification Range	30X - 2000X with digital zooming
Overview Camera (optional)	0.5 x 0.5in [13 x 13mm] or 0.78 x 0.78in [20 x 20mm]
Power	100-240VAC, 50/60Hz
Weight	82.7lbs [37.5kg] without monitor

Unique Collision Protection System

The Collision Resistant System prevents indenter or objective damage by detecting unintended obstructions in the test path. The motion system is continuously monitored during the test process and system movement is instantaneously stopped if an obstruction is detected. The Collision Resistant System provides an unparalleled, unique to market essential safety benefit for operators, while reducing downtime and maintenance costs.

Stationary Test Head

The Wilson VH3100 significantly reduces system complexity with indenter, objectives and overview camera at fixed positions. All turret positioning is handled by the high-speed stage, while the test head stays stationary. The lack of moving parts, actuators and sensors, simplify adjustments and reduce service needs.

The optional built-in high resolution overview camera allows easy navigation over the specimen and accurately position indents.

Products available Worldwide unless noted by the following:

1 North & South America
2 Europe, Africa & Middle East
3 Asia

Accurate & Flexible Load

- High precision closed loop system for 50gf - 10kgf load range

Safety

- Resist breakage of an indenter or objective with the Collision Resistant System for indenter and objectives

Virtual Turret

- No moving parts in the test head means reduced error sources
- Two objectives with zoom capability and an optional overview camera

Best in Class Optics

- Microscope quality optics
- Long working distance optics

Fast & Accurate Stage

- Incredibly fast motorized stage with 5µm or better repeatability

Large Capacity

- Three different height options
- Up to 8.26in [215mm] vertical capacity

Part Number	Description
W3101	VH3100 Automatic Knoop/Vickers hardness tester
W3100A01	Minuteman Full-automatic Software package
W3100A02	WinControl Full-automatic Software package
W3100B01	Media HW package - Touch screen
W3100B02	Media HW package - Standalone LCD monitor
W3100C02	Large High Speed Automatic XY Stage 180x180mm
W3100C03	Extra large High Speed Automatic XY Stage 300x180mm
W3100E02	Loadcell 10kg integrated

Accessories

W3100F01	VH3100 - Overview camera high resolution	W5XLWD	5X Long Working Distance objective
W3100G01	Standard fixed mounted indenter holder	W10XLWD	10X Long Working Distance objective
W3100G02	Snap Grip indenter holder - start kit	W20XLWD	20X Long Working Distance objective
W3100G02A	Snap Grip additional indenter holder	W40XLWD	40X Long Working Distance objective
W9100687	Tukon/VH Vickers indenter 136° certified	W50XLWD	50X Long Working Distance objective
W9100684	Tukon/VH Knoop indenter 172° certified	W100XLWD	100X Long Working Distance objective

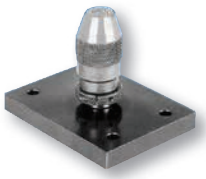
See pages I-IV for ordering information or visit www.buehler.com.

Vises for Vickers/Knoop Hardness Testers

Universal Clamping & Leveling Device

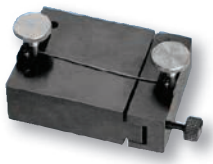
9000-86323

Vertical Clamp



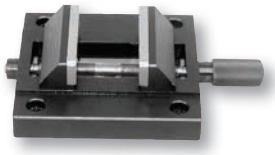
9000-86167

Wire Testing Fixture



9000-85144

Universal Vise, 2in [50mm]



1600-2253

Thin Metal Clamp

9000-85128

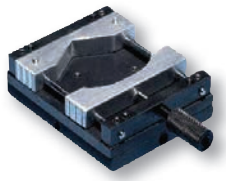
"V" Testing Cradle

9000-85129

Special "V" Testing Cradle

9000-85253

Turntable Vise



9000-85130

Additional Vises

9100-258
Precision vice for specimens up to 3.93 x 3.93in [100 x 100mm]

9100-260
Axel chuck

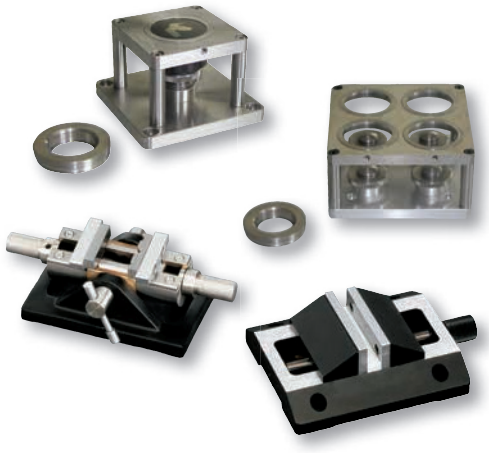
9170-507
Manual XY stage with digital micrometers for Tukon™ 1102/1202, and KV400 series testers

EZ Clamp

9100-773	Single Mount Holder and Leveling device for 1in mounts
9100-774	Single Mount Holder and Leveling device for 1.25in mounts
9100-775	Single Mount Holder and Leveling device for 1.5in mounts
9100-570	Mount Cap for 1in mounts (requires Canister)
9100-571	Mount Cap for 1.25in mounts (requires Canister)
9100-572	Mount Cap for 1.5in mounts (requires Canister)
9100-576	Mount Cap for 2in mounts (requires Canister)
9100-575	Canister (requires cap selection)
9100-574	Magnetic Stop Stage mount and hardware for single mount holders

Regional Accessories for Vickers/Knoop Hardness Testers

2 3



Vises and Clamping Devices

88-6168	Self leveling vise for round mounted samples (without insert)
88-6169	4x Self leveling vise for round mounted samples (without insert)
88-6170	Ø 1in [25mm] insert for 88-6168 and 88-6169
88-6171	Ø 30mm insert for 88-6168 and 88-6169
88-6172	Ø 40mm insert for 88-6168 and 88-6169
88-6173	Ø 1.25in insert for 88-6168 and 88-6169
88-6174	Ø 1.5in insert for 88-6168 and 88-6169
88-6176	Self leveling vise for Ø 50mm round mounted samples
88-6175	4x Self leveling vise for Ø 50mm round mounted samples
1600-1155	Universal Precision Vise, 50mm maximum capacity
1600-2254	Universal Precision Vise, 45mm maximum capacity (810-016)
1600-1-0018	Universal Precision Vise, 100mm maximum capacity
1600-1151	Universal Inclining Holder with tilt control (40mm maximum capacity, height: 82mm)

Various Accessories

88-6340	Vibration damping support for microhardness testers, 330mm W x 440mm D x 50mm H, black polymer with rubber elements for reducing vibration
JU-TWKII	Vibration isolated table, massive artificial stone, 900mm W x 600mm D x 750mm H

Products available Worldwide unless noted by the following:

1 North & South America

2 Europe, Africa & Middle East

3 Asia

Our Universal Hardness Testers are equipped with a closed-loop load system, eliminating overshoot and combining a fully-automatic controlled test cycle with a wide load range. The built-in optics allow for easy Brinell and Vickers indent evaluation and a complete Rockwell® cycle is initiated by the push of a button.

UH930 Universal Hardness Tester

2 3

- Load cell technology for accurate and efficient results
- Automatic test cycle for quick processing
- Durable industrial design to withstand harsh environment
- High clamping force system for safe testing of both small and very large parts
- Integrated optics
- User friendly

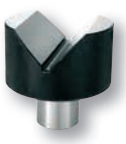
Approx. Weight: 440 lbs [200kg]

	UH930
Hardness scales	Brinell, Vickers, Rockwell, Super-Rockwell (HB, HV, HR)
Main-load	1 - 250kgf
Test cycle type	Electronic closed-loop loadcell
Vertical test capacity	11.8in [300mm]
Horizontal test capacity	5.9in [150mm]
Optics	Glassmat projection screen
Objectives (optional)	Interchangeable 20X, 44X, 70X, 140X magnification
Indenters (optional)	Brinell Balls: 1, 2.5, 5, 10mm Vickers Diamond: 136° Rockwell: Diamond Cone 120°, Balls: 1/16in, 1/8in, 1/4in, 1/2in
Data-out	RS232
User interface	Dual-language 4.7in LCD (EN, DE)
Standards Compliant	ISO 6506, ISO 6507, ISO 6508, ASTM E18, ASTM E92, ASTM E10, and JIS
Power	220 - 240VAC, 60/50Hz

Part Number	Description	Region
WHUH930	UH930 main unit	2, 3

Accessories

9110-401	Objective 20x
9110-402	Objective 44x
9110-403	Objective 70x
9110-404	Objective 140x
9110-100	Indenter Rockwell - with certificate
9110-106	Indenter Rockwell - Ball 1/16in
9110-107	Indenter Rockwell - Ball 1/8in
9110-108	Indenter Rockwell - Ball 1/4in
9110-109	Indenter Rockwell - Ball 1/2in
9110-140	Indenter Vickers - with certificate
9110-123	indenter 10mm carbide ball with certificate
9110-122	indenter 5mm carbide ball with certificate
9110-121	indenter 2.5mm carbide ball with certificate
9110-120	indenter 1mm carbide ball with certificate
9110-200	V-anvil 1-4mm
9110-201	V-anvil 3-10mm
9110-202	V-anvil 7-20mm
9110-203	V-anvil 15-45mm
9110-204	V-anvil 20-60mm
9110-205	V-anvil 60-150mm
9110-213	Testing table diameter 235mm
9110-220	XY stage 25mm x 25mm, manual
9110-216	Vice, opening 0-80mm



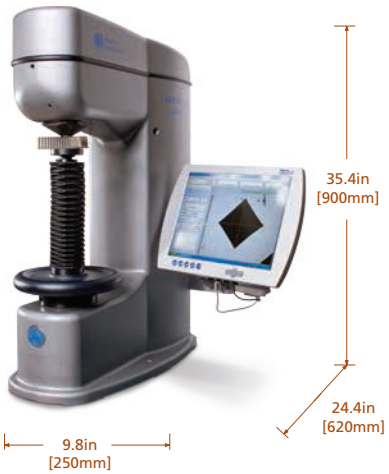
Contact us for more accessories

HARDNESS TESTING

See pages I-IV for ordering information or visit www.buehler.com.

UH250 Universal Hardness Tester

- Closed-loop system for quick and highly accurate test results
- Automatic test cycle for quick processing
- Automatic evaluation of the indent (optional)
- High clamping force system for safe testing of both small and very large parts
- Various levels of automation available
- Wide load range
- Integrated optics



Approx. Weight: 507 lbs [230kg]

	UH250
Hardness scales	Brinell, Vickers, Rockwell, Super-Rockwell (HB, HV, HR)
Main-load	1 - 250kgf
Test cycle type	Electronic closed-loop loadcell
Vertical test capacity	12.6in [320mm]
Horizontal test capacity	8.4in [215mm]
Optics	5 mega-pixel camera with zoom & autofocus
Objectives (optional)	Interchangeable 5X, 10X, 20X (for 75 - 1200x magnification range)
Indenters (optional)	Brinell Balls: 1, 2.5, 5, 10mm Vickers Diamond: 136° Rockwell: Diamond Cone 120°, Balls: 1/16in, 1/8in, 1/4in, 1/2in
Data-out	PC Software
User interface	IPC-touchscreen or PC screen
Camera Software	Options available from basic camera kit to full automatic system. Contact your local Buehler representative for more information
Standards Compliant	ISO 6506, ISO 6507, ISO 6508, ISO 4545, ASTM E18, ASTM E92, ASTM E10 and JIS
Power	100 - 240VAC, 60/50Hz

Part Number	Description
W703411	UH250 version A optical and depth measurement, with standard PC
W703412	UH250 version B optical measurement only, with standard PC
W703414	UH250 version D optical and depth measurement, with touch screen PC

Accessories

W5XLWD	Lens 5x; max 300x magnification
W10XLWD	Lens 10x; max 600x magnification
W20XLWD	Lens 20x; max 1200x magnification
W868098	Auto/measuring module
W741084	Motorised XY-stage incl. Controller hub

UH750/3000 Universal Hardness Tester

- Test Brinell, Vickers and Rockwell with one system
- Extremely fast testing cycles
- High clamping force system for safety testing of both small and large parts
- 8 position modular turret
- 3500kg clamping force

Approx. Weight: 2204.6 lbs [1000kg]

	UH751	UH3001	UH753	UH3003
Hardness scales	Brinell, Vickers, Rockwell (HB, HV, HR)			
Main-load	3 - 750kgf	20 - 3000kgf	3 - 750kgf	20 - 3000kgf
Test cycle type	Electronic closed-loop loadcell			
Spindel	Manual		Motorized	
Vertical test capacity	18.5in [470mm] (570mm with spindle floor hole)		19.7in [500mm]	
Horizontal test capacity	11.8in [300mm]			
Turret	Vertical built-in automatic turret - 8 positions			
Optics	5 mega-pixel camera with zoom & autofocus			
Objectives (optional)	2x for Range 0.48 - 6.0mm 5x for Range 0.19 - 3.0mm 10x for Range 0.10 - 1.5mm			
Indenters (optional)	Brinell Balls: 2.5, 5, 10mm Vickers Diamond: 136° Rockwell: Diamond Cone: 120°, Balls: 1/16in, 1/8in, 1/4in, 1/2in			
Data-out	PC Software			
User interface	IPC-touchscreen or PC screen			
Camera Software	Options available from basic camera kit to fully automatic system. Contact your local Buehler representative for more information			
Standards Compliant	ISO 6506, ISO 6507, ISO 6508, ASTM E18, ASTM E92, ASTM E10, and JIS			
Power	230V, 50/60Hz	400VAC, 50/60Hz, 3 phase	230V, 50/60Hz	400VAC, 50/60Hz, 3 phase

Approx. Weight: 1874 lbs [850kg]

Part Number	Description
703631	Universal tester UH751, manual spindle
703651	Universal tester UH753, motorized Z-axis
703630	Universal tester UH3001, manual spindle
703650	Universal tester UH3003, motorized Z-axis

Accessories

W868098	Auto/measuring module	741193	Indenter Vickers - diamond pyramid 136°
703630720	Objective holder (one per objective)	741194	Indenter Rockwell - Diamond cone 120°
951503	Objective 2x	741195	Indenter Rockwell - Ball 1/16in
951504	Objective 5x	740076	Indenter 2.5mm carbide ball
951805	Objective 10x	740063	Indenter 5.0mm carbide ball
703630650	Indenter holder (one per indenter)	740064	Indenter 10mm carbide ball

See pages I-IV for ordering information or visit www.buehler.com.

BRINELL HARDNESS TESTERS

The Brinell test consists of applying a constant load or force, usually between 62.5 and 3000Kgf, for a specified time (from 10 - 30 seconds) using a 2.5, 5 or 10mm diameter tungsten carbide ball. The load time period is required to ensure that plastic flow of the test material has ceased. Lower forces and smaller diameter balls are sometimes used in specific applications. After removal of the load, the resultant recovered round impression is measured across diagonals at right angles and is usually recorded millimeters using a low-power microscope or an automatic measuring device.

The actual Brinell Hardness Number (BHN) is calculated by factoring the indent size and the test force however it is not necessary to make the actual calculation for each test. The BH3000 tester can calculate Brinell hardness directly by simply typing in the indent size measured using the external measuring microscope. Alternatively, we also offer an automatic PC based measurement system.

Applications:

- Steel
- Cast aluminum or other non-ferrous metals
- Castings
- Flat and cylindrical work pieces
- Automotive industry
- Shop
- Quality or sample testing

BH3000 Brinell Hardness Tester

- High-rigidity, closed-loop load cell system with highly accurate results
- Integrated hardness calculator and conversions
- Heavy duty clamping and protection
- Deep reading microscope *(order separetely)*

Approx. Weight: 550 lbs [250kg]

	BH3000
Hardness scales	HB
Main-load	187.5 - 3000kgf
Test cycle type	Electronic closed-loop loadcell
Vertical test capacity	11.0in [280mm]
Horizontal test capacity	5.0in [130mm]
Optics (optional)	External measuring microscope; mechanical 20x, 40x or 60x, digital King Scan IV PC based measurement system
Indenters (optional)	Brinell Balls: 2.5, 5, 10mm
Data-out	RS232
User interface	Dual-language 4.7in LCD (EN, DE)
Standards Compliant	ISO 6506, ASTM E10, JIS
Power	100 - 240VAC, 60/50Hz

Part Number	Description
WHBH3000	BH3000 main unit

Accessories

Y300013	Brinell microscope 20X with LED light source
Y300015	Brinell microscope 40X with LED light source
Y300017	Brinell microscope 60X with LED light source
WS8314B	King Scan IV - Computer Based Automatic Brinell Measurement System
9110-213	Testing table diameter 235mm
9110-123	indenter 10mm carbide ball with certificate
9110-122	indenter 5mm carbide ball with certificate
9110-121	indenter 2.5mm carbide ball with certificate
900000485 [1]	10mm Tungsten Carbide Ball with NVLAP certificate (qty 2)
900000595 [1]	5mm Tungsten Carbide Ball with NVLAP certificate (qty 2)
900007350 [1]	10mm Ball Retainer, MJ, L, K, KDR, AP, & CLB3

Products available Worldwide unless noted by the following:

1 North & South America

2 Europe, Africa & Middle East

3 Asia

DynaTestor M495 Portable UCI Vickers Hardness Tester

2 3

Portable UCI tester that is suitable for hardness testing on coated and/or very large structures made of fine-grained metals, plastics, and ceramics.

- Displays Vickers, Rockwell and Brinell hardness values
- Easy-to-use menu with full-color LCD
- Exchangeable UCI probes with loads from 10, 20, 30, 49, 98N (select)

	M495
Hardness scales	Vickers HV 10 - 3000 (direct) Rockwell HRC 20 - 68 (conversion) Rockwell HRB 41 - 99.5 (conversion) Brinell HB 76 - 447 (conversion) UTS N/mm2 255 - 2180 (conversion)
Test cycle type	UCI method with vickers diamond (angle 136°)
Operating Time	Up to 8 hours on high-power battery
Data-out	USB-Host, USB-Device, RS232, 10/100 MBit Ethernet
Standards Compliant	ASTM A 1038 and DIN 50159
Power	100 - 240VAC, 60/50Hz + battery

Part Number	Description
M495	M495 Processor/display unit excl. probe

Accessories

M49504	Probe test load 10N	M49512	Probe test load 98N
M49506	Probe test load 20N	YWHV40006	Test anvil for flat samples
M49508	Probe test load 30N	YWHV40009	Test anvil for round samples dia 10-50mm
M49510	Probe test load 49N	YWHV40012	Test anvil for round samples dia 50-250mm

M295 Portable Leeb Hardness Tester

2 3

- For on-site testing in workshops and field operations
- Compact and lightweight
- Direct reading on large LCD
- Interchangeable probe with 6 available probe types

	M295
Hardness scales	HL(X), HRA, HRB, HRC, HV, HB, HS
Test Load Probes	D-type standard, DC, D+15, DL, C, G optional
Test cycle type	Rebound method
Workpiece Minimum Weight	1.5kg on solid support (0.1kg with couplant paste)
Workpiece Maximum Hardness Value	940HV
Workpiece Radius (Convex/Concave)	Rmin = 50mm (with support ring Rmin = 10mm)
Data-out	RS232
Standards Compliant	DIN 50156
Power	2 × AA battery 1.5V (low battery warning)

Part Number	Description
M295	M295 Portable Leeb set, incl. probe & calibration bloc

Accessories

YM295D	Impact device D with cable with connector	YM295C	Impact device C with cable with connector
YM295DC	Impact device DC with cable with connector	YM295G	Impact device G with cable with connector
YM295D+15	Impact device D+15 with cable with connector	YM295CL	Cable for impact devices with Lemo connector
YM295DL	ilpact device DL with cable with connector	YWHV40012	Test anvil for round samples dia 50-250mm

HARDNESS REFERENCE BLOCKS FOR CALIBRATION

High quality Wilson® hardness standardized test blocks from Buehler® are calibrated in compliance with ASTM E384, ASTM E18, ASTM E10, ISO 6507, ISO 6508, or ISO 6506 where appropriate. Rockwell C standardized test blocks are directly NIST traceable. All calibrations and certifications are performed in an ISO/IEC 17025 compliant facility.

Knoop/Vickers Reference Blocks

2 3

Nominal value	*min*	*max*	HV3	HV5	HV10	HV20	HV30
250 HV	*225*	*274*	9500-026	9500-046	9500-066		
300 HV	*275*	*324*	9500-027	9500-047	9500-067	9500-087	9500-107
400 HV	*375*	*424*	9500-029	9500-049	9500-069	9500-089	9500-109
550 HV	*525*	*574*	9500-032	9500-052	9500-072	9500-092	9500-112
600 HV	*575*	*624*	9500-033	9500-053	9500-073	9500-093	9500-113
650 HV	*625*	*674*	9500-034	9500-054	9500-074	9500-094	9500-114
700 HV	*675*	*724*	9500-035	9500-055	9500-075	9500-095	9500-115
750 HV	*725*	*774*	9500-036	9500-056	9500-076	9500-096	9500-116
800 HV	*775*	*824*				9500-097	9500-117
850 HV	*825*	*875*	9500-038	9500-058	9500-078	9500-098	9500-118

Nominal value	*min*	*max*	HV0.1	HV0.3	HV0.5	HV1
250 HV	*225*	*274*	9700-006	9600-046	9600-026	9600-006
300 HV	*275*	*324*	9700-008	9600-047	9600-028	9600-007
400 HV	*375*	*424*	9700-010	9600-048	9600-029	9600-009
550 HV	*525*	*574*	9700-012	9600-052	9600-032	9600-012
600 HV	*575*	*624*	9700-013	9600-053	9600-033	9600-013
650 HV	*625*	*674*	9700-014	9600-054	9600-034	9600-014
700 HV	*675*	*724*	9700-015	9600-055	9600-035	9600-015
750 HV	*725*	*774*	9700-016	9600-056	9600-036	9600-016
850 HV	*825*	*875*	9700-018	9600-058	9600-038	9600-018

1

Vickers Microindentation ¤		Knoop Microindentation ¤		Vickers Macroindentation ¤	Additional Calibration *
HV 0.050-0.499kg 9200202	HV 0.5-1.0kg 9200203	HK 0.010-0.499kg 9200200	HK 0.5-1.0kg 9200201	HV 1-120kg 900020515	HV or HK 900020511

Brinell Reference Blocks

Brinell reference blocks up to 250kgf load

Nominal value	*min*	*max*	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-1875	
350 HBW	*325*	*375*		WH-350HBW-1875	
400 HBW	*375*	*449*		WH-400HBW-1875	
500 HBW	*450*	*525*		WH-500HBW-1875	

Products available Worldwide unless noted by the following:

1 North & South America

2 Europe, Africa & Middle East

3 Asia

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

1mm or 2.5mm ball indenter	5mm or 10mm ball indenter
WHSMLBRIN [1]	WHSPECBRIN [1]

Brinell reference blocks up to 3000kgf load

The Buehler® Hardness Calibration Laboratory is accredited to ISO / IEC 17025 by A2LA
- XL size: 6 x 4.5 x 0.7in [152 x 114 x 18mm]
- Block weight ± 2kg
- Engraved pattern according to NADCAP

All hardness values are nominal values. The delivered values will vary between Min-Max values as indicated.

Nominal value	min	max	HBW2,5/62,5 scale	HBW2,5/187,5 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-325-HBW3000
400 HBW	*375*	*449*	WH-400HBW-750	WH-400HBW-3000
500 HBW	*450*	*525*	WH-500HBW-750	WH-500HBW-3000

Rockwell® Reference Blocks

The Buehler Hardness Calibration Laboratory is accredited to ISO / IEC 17025 by A2LA
- Block size: Ø 60mm x 9mm
- Block weight: ± 0.3kg

All hardness values are nominal values. The delivered values will vary between Min-Max values as indicated.

Rockwell C								
25HRC 9203111	30HRC 9203121	35HRC 9203131	40HRC 9203141	45HRC 9203151	50HRC 9203161	55HRC 9203171	60HRC 9203181	63HRC 9203191
Rockwell B •						Rockwell A		
40HRB 9202050W	50HRB 9202060W	60HRB 9202070W	70HRB 9202080W	80HRB 9202090W	95HRB 9202100W	63HRA 9201110	73HRA 9201150	83HRA 9201190
Rockwell F				Rockwell E •				
63HRF 9206020W	79.5HRF 9206050W	91HRF 9206070W		81HRE 9205050W	87HRE 9205060W	93HRE 9205070W		
Superficial Rockwell 15-N				Superficial Rockwell 15-T •				
72HR15N 9212110	78HR15N 9212130	83HR15N 9212150	91HR15N 9212190		64HR15T 9218020W	73.5HR15T 9218050W	80HR15T 9218070W	86.5HR15T 9218090W
Superficial Rockwell 30-N				Superficial Rockwell 30-T •				
46HR30N 9213110	55HR30N 9213130	64HR30N 9213150	80HR30N 9213190		43HR30T 9219050W	56HR30T 9219070W	70HR30T 9219090W	

¤ *Specify hardness required and load force for certification*
• *Certified using a Tungsten Carbide ball indenter*
* *Specify additional Vickers or Knoop hardness scale and load force for certification*
† *Specify hardness required, load force, and ball indenter size for certification*

See pages I-IV for ordering information or visit www.buehler.com.

Hardness Tester Accessories for Legacy Rockwell® Hardness Testers (MacroMet™ 5100 Series)

1700-1020WC	1/16in WC Penetrator with WC Ball
1700-1021WC	1/8in WC Penetrator with WC Ball
1700-1022WC	1/4in WC Penetrator with WC Ball
1700-1023WC	1/2in WC Penetrator with WC Ball
1700-1024WC	3/4in WC Penetrator with WC Ball
1700-1020	1/16in Steel Ball Penetrator with 50 Steel Balls
1700-1021	1/8in Steel Ball Penetrator with 8 Steel Balls
1700-1022	1/4in Steel Ball Penetrator with 4 Steel Balls
1700-1023	1/2in Steel Ball Penetrator with 4 Steel Balls
1700-1024	3/4in Steel Ball Penetrator with 4 Steel Balls
1800-1005	Rockwell Superficial Diamond Indenter for N Scale on MacroMet 5100 Series
1800-1007	Rockwell Diamond Indenter for A Scale on MacroMet 5100 Series
1800-1009	Rockwell Diamond Indenter for C Scale on MacroMet 5100 Series
1800-1010	Rockwell Diamond Indenter for C, D, A, and N Scales on MacroMet 5100 Series
1800-1015	Rockwell Diamond Indenter for C, D, and A Scales on MacroMet 5100 Series
1700-1043	Anvil, Small V-Shape, 0.39in [10mm] diameter
1700-1044	Anvil, Round Table, 7.9in [200mm] diameter
1700-1046	Anvil, Diamond Spot
1700-1047	Anvil, 0.19in [5mm] Taper Spot
1700-1048	Anvil, V, 3.5in [90mm] diameter
1700-1091	Anvil, Extension Rest
1700-1094	Jack Rest for 1800-5101RA and 1800-5101TA Testers
1700-1095	Jominy Test Fixture
1600-6502	Dot matrix printer for letter size plain paper or 10in roll paper
1600-6503	Kit for connection of 5100 series digital hardness tester to a PC for data download

Vises for Legacy Knoop/Vickers Hardness Testers

1600-2251	Clamping device for thin specimens
1600-2253	Universal vise, 2in [50mm]
1600-2257	Clamping device for vertical specimens
1600-2396	Self Leveling Vise
1600-2410	Standard Self Leveling Vise with 1in, 1.25in, 1.5in and 2in rings
1600-2411	Metric Self Leveling Vise with 25mm, 30mm, 40mm and 50mm rings

Spares for Legacy Testers

Indenters for Legacy Testers:

1600-3200	Vickers for MicroMet™ 5100 Series Testers
1600-3201	Knoop for MicroMet 5100 Series Testers
1600-3202	Light-load Vickers for MicroMet 5114 & 5124
1600-3203	Light-load Knoop for MicroMet 5114 & 5124
1600-1159	Vickers for IndentaMet 1104, 1105 & 1106
1600-1160	Knoop for IndentaMet 1104, 1105 & 1106
1900-3200	Vickers Indenter for 5100 Series Macro & Semi-Macro
1900-3201	Knoop Indenter for 5100 Series Macro & Semi-Macro
1600-3202	Light Load Vickers for MicroMet 5114
1600-3203	Light Load Knoop for MicroMet 5114

Indenters for Legacy Testers with UKAS/United Kingdom certificate:

1600-9100 [2, 3]	Vickers for MicroMet 2100 Series and earlier testers
1600-9101 [2, 3]	Knoop for MicroMet 2100 Series and earlier testers
1600-9200 [2, 3]	Vickers for MicroMet 5100 Series Testers
1600-9201 [2, 3]	Knoop for MicroMet 5100 Series Testers
1600-9120 [2, 3]	Vickers for Semi- and MacroVickers 2100 Series eariler testers
1600-9121 [2, 3]	Knoop for Semi- and MacroVickers 2100 Series eariler testers
1600-9300 [2, 3]	Vickers for Semi- and MacroVickers 5100 Series Testers
1600-9301 [2, 3]	Knoop for Semi- and MacroVickers 5100 Series Testers
1600-1159 [2, 3]	Vickers for IndentaMet™ Microindentation series
1600-1160 [2, 3]	Knoop for IndentaMet Microindentation series
1600-1169 [2, 3]	Vickers for IndentaMet Semi- and MacroVickers series
1600-1170 [2, 3]	Knoop for IndentaMet Semi- and MacroVickers series

Special Indenters for Semi- and MacroVickers 5100 series:

1600-3209 [2, 3]	Brinell indenter with hard metal ball 1mm Ø

Replacement Bulbs

0718-0116	12V/50W bulb for MicroMet™ 5100 Series
1600-1350	MicroMet I Bulb, Indicator Lights
1600-1351	MicroMet I Bulb, Stage Illuminator
1600-1353	6V/10W bulb for MicroMet I, Microscope Illumination
1600-2352	6V/18W bulb for MicroMet II, I, 3, 4 & 2001
1600-2353	4.5V/17W Fiber Optic Illuminator for MicroMet 2003
1600-2354	4.5V/17W Alpha for MicroMet 2000
1600-2355	12V/18W bulb for MicroMet 2100 Series
1700-1051	100V/5W Stage Illuminator Bulb for Rockwell Test

Accessories and Spare Parts for MacroMet™:

1800-1010 [2, 3]	Rockwell® Indenter 120° for C, D, A and N Scales for MacroMet 5100 series
19BAA074 [2, 3]	Rockwell Ball Indenter 1/16in for MacroMet 5100 series (includes sintered carbide ball)
19BAA075 [2, 3]	Rockwell Ball Indenter 1/8in for MacroMet 5100 series (includes sintered carbide ball)
19BAA076 [2, 3]	Rockwell Ball Indenter 1/4in for MacroMet 5100 series (includes sintered carbide ball)
19BAA077 [2, 3]	Rockwell Ball Indenter 1/2in for MacroMet 5100 series (includes sintered carbide ball)
1700-1015 [2, 3]	Rockwell Indenter 120° for MacroMet 3100 series and earlier
1700-1020 [2, 3]	Rockwell Ball Indenter 1/16in for MacroMet 3100 series and earlier

Calibration and Verification

Buehler® is committed to providing a superior range and level of support services to its customers. Buehler, the world's leading manufacturer of hardness testing equipment, has been in the forefront of manufacturing and servicing a comprehensive range of hardness testers manufactured by Wilson Instruments, Wolpert and Reicherter for over 85 years.

Buehler offers an extensive range of calibration and verification services for hardness testing instruments and related quipment. Buehler's factory trained service engineers are uniquely qualified to not only perform accredited calibrations, but to also provide expert preventive maintenance, adjustments and repairs using parts from the factory that meet original equipment specs. This extends the life of your equipment and optimizes its accuracy and reliability.

See pages I-IV for ordering information or visit www.buehler.com.

HARDNESS TESTING - LEGACY WILSON®, WOLPERT, REICHERTER

Reicherter has been founded in 1899 at Esslingen am Neckar, Germany. With more than 40,000 installations Reicherter hardness and spring testing machines have earned the trust of users worldwide. Systems such as Brivisor, Briviskop Briro and are well known in laboratories for quality control, research and development, and testing and measuring laboratories.

Founded in 1920, **Wilson** Hardness is the world leader in the hardness testing industry. Wilson introduced the first Rockwell® tester to the market over 80 years ago. The company then went on to develop the legendary Tukon™ line of micro-indentation testers – the industry standard for Knoop and Vickers testing.

Wolpert, a well-known name in the hardness testing industry, is known for the practical designs which meet the needs of every hardness testing application. Since its founding in 1927 at Ludwigshafen as Otto Wolpert Werke, Wolpert stands for hardness testing machines that are characterized by a stable structure, high test accuracy and ease of use.

Buehler® was founded in 1936 in the USA by Adolph Buehler, a Swiss immigrant who saw a need for metallographic sample preparation equipment and optical inspection instruments for the steel and automotive industries in the USA. He produced world´s first Mounting Press.

In 2012, Buehler, Wilson, Wolpert and Reicherter merged within **ITW Test & Measurement**. Our products are used throughout the world in manufacturing facilities, quality laboratories, and universities to analyze all types of materials, including those used in Aerospace and Defense, Automotive, Medical, Ceramic, Plastics, Composites, Education, Electronics, Energy, Primary Metal and more.

1899 **1920** **1927** **1936** **2006**

For more information, please visit our website on www.buehler.com/Legacy_Testers

Did You Know?

Hardness testing is used in quality and research and development across many industries. Hardness is a material's resistance to permanent deformation, indicated by measurement of the indent induced in a material from a load applied via an indenter of known geometry. A material's hardness can help determine if the material is well matched to the application, properly manufactured and suitably graded. When selecting a hardness tester, consider the size and shape of the sample, conditions of the test area and the volume of tests required.

Several factors may influence the accuracy and precision of microindentation hardness testing.

Instrument Factors
- Accuracy of the applied load
- Inertia effects, speed of loading
- Lateral movement of the indenter or specimen
- Indentation time
- Indenter shape deviations
- Damage to the indenter
- Inadequate spacing between indents or form edges
- Angle of indentation

Measurement Factors
- Calibration of the measurement system
- Numerical aperture of the objective
- Magnification
- Inadequate image quality
- Uniformity of illumination
- Distortion in optics
- Operator's visual acuity
- Focusing of the image

Material Factors
- Heterogenity of the specimen
- Strength of crystallographic texture, if present
- Quality of specimen preparation
- Low reflectivity or transparency
- Creep during indentation
- Fracture during indentation
- Oil, grease or dirt on indenter or specimen

Products available Worldwide unless noted by the following:

1 North & South America

2 Europe, Africa & Middle East

3 Asia