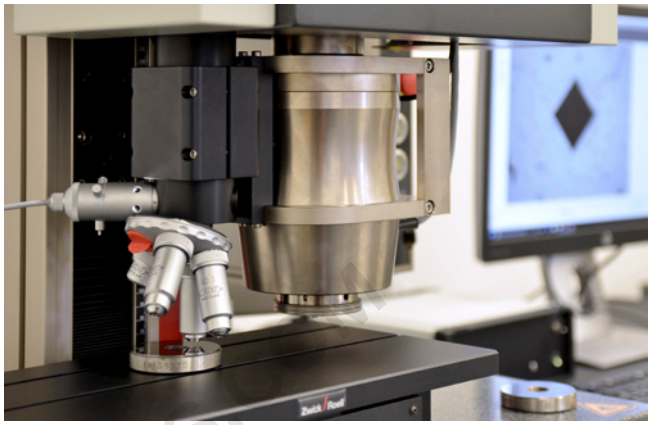
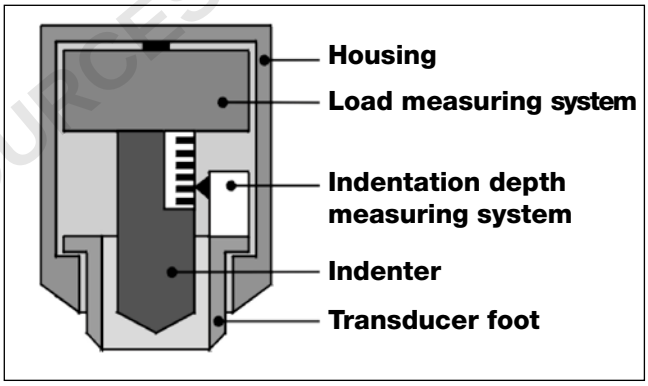
Zwick / Roell

Zwick
Materials Testing

Product Information

Universal hardness testing machine ZHU/zwickiLine+





The hardness measuring head contains a load cell, a digital depth-measurement system (resolution 0.002 µm), an indenter and a sensor foot in complete accordance with the Abbe measurement principle.

Range of application

ZHU/zwickiLine+ universal hardness testing machines can be used for the classical Rockwell, Vickers and Brinell hardness testing methods on metals and for ball indentation hardness on plastics. They are also suitable for standard-compliant testing with the innovative instrumented indentation method (Martens, EN ISO 14577, which is used to determine other material properties in addition to hardness. The ZHU/zwickiLine+ is particularly popular in quality-assurance testing laboratories and in research and development, rapid prototyping and advance development.

ZHU/zwickiLine+

The core components of this precision measuring system are the innovative hardness measuring head, the zwickiLine+ hardness testing machine with state-of-the-art testControl II measurement and control electronics and the intelligent testing software testXpert hardness edition. An add-on unit with measurement optics is optionally available for optical hardness testing methods.

Advantages/Features

- The combination of a zwickiLine+ with the hardness measuring head and testing software testXpert hardness edition results in an innovative test system with a wide range of applications
- Universal application with fully automatic test sequence for practically any hardness testing method, regardless of material
- Automatic display of force-indentation-depth curve regardless of method, for comprehensive materials characterization in instrumented indentation test to ISO 14577
- Multiple use as a hardness testing machine and/or as a testing machine for tensile, compression & bending tests
- High operating comfort with changing test conditions due to fast and precise AC drive and large test area, e.g. for different specimen sizes
- Versatile result presentation: single and statistical values, graphics, on-screen display, and test reports can be varied as required

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Two **hardness measuring heads** are available in test load ranges 2 … 200 N or 5 N … 2500 N for use in:

- instrumented indentation test
- Rockwell hardness test
- Ball indentation hardness test (plastics)

plus Vickers, Knoop and Brinell hardness testing methods (only in combination with 'Optic' add-on unit).

'Optics' add-on unit

The combination of the hardness measuring head plus the optical add-on unit allows all optical hardness test methods to be covered. The optical unit consists of a measuring microscope with up to 4 lenses and a displacement unit designed to allow microscope and loading unit to exchange positions, ensuring that a component under test does not need to be moved.

The following test methods can be covered:

- **Depth measurement methods**
  - Martens hardness, instrumented indentation testing (DIN En ISO 14577)
  - Rockwell hardness HR (scales A to K, N, T, plus HMR5/250), according to EN ISO 6508
  - Rockwell hardness HR (scales R, L, M, E, K, α)
  - Vickers depth measurement HVT
  - Brinell depth measurement HBT and
  - Ball indentation hardness H (for plastics) according to ISO 2039-1
- **Optical methods**
  - Vickers HV, according to EN ISO 6507
  - Brinell HB, according to EN ISO 6506

  (Only in combination with 'Optics' add-on unit)

Advantages of the instrumented indentation test

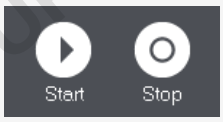
- Standardized test method according to Martens (EN ISO 14577-1/-2/-3)
- Uniform hardness scale for all materials
- The force-indentation curve together with various loading sequences provide additional information on materials:
  - Plastic and elastic percentages of indentation energy
  - Plastic hardness
  - Indentation modulus
  - Creep behavior
  - Relaxation behavior
  - Martens hardness
- Cyclic indentation tests with test data for simulating strength values.

Testing software testXpert hardness edition

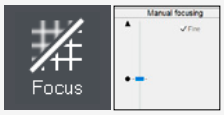
testXpert® hardness edition

Use of testXpert intelligent testing software underpins this innovative testing system in standard testing situations (e.g. quality assurance) and provides demanding research and development specialists with a remarkable range of options.

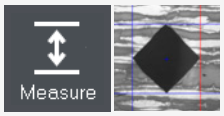
The ZHU/zwickiLine+ can be upgraded to **fully automatic** operation. For this the linear displacement unit of the optical add-on unit is motorized, with completely automatic control by testXpert.



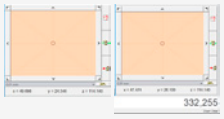
Intuitive one-button operation for starting and fully automatic evaluation of single and sequence testing



Fully automatic focusing on the indentation with option of zooming onto the specimen surface via a scroll bar

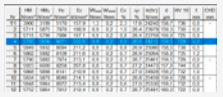


Fully automatic measurement of the indentation in single and sequence testing, with pre-focusing if required



Cross-table control via virtual joystick or using classical incremental method

User-friendly definition of hardness sequence test (also multiple sequences) and storage of own templates



Comprehensive evaluations, statistics and result displays

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zwickiLine+ Z2.5 hardness testing machines

Type	**Z2.5 TN+**
Item number	**1044260**
Max. test load F_N (tensile/compression)	2.5 kN
Crosshead speed	0.0005 ... 3000 mm/min
Travel resolution	0,00095 µm
Dimensions (height x width x depth) [1]	1289 x 585 x 707 mm
Weight [1]	approx. 132 kg
Test area (height x depth)	675 x 105 mm
Electrical connections (adjustable)	100 ... 250 V (PH,N,PE)
Power rating	2.3 kVA

[1] Inclusive optical hardness testing unit. The dimensions of the x-y table with control unit are not considered.

Hardness measurement head

Type	**ZHU2.5/Z2.5**	**ZHU0.2/Z2.5**
Item number	**1044204**	**1044205**
Test load	5 ... 2500 N	2 ... 200 N
Load cell	Accuracy grade 1 accord. to DIN EN ISO 7500-1	
Indentation depth measurement system	Accuracy grade 0.2 accord. to DIN EN ISO 9513	
Standard resolution of depth measurement system	0.002 µm	
Mounting bore for indenter	dia. 6.35^{H7} mm	

Indenters with transducer feet

Description	**Item number**
Indenter Vickers pyramid 136° for hardness tests to Vickers	**318061**
Indenter diamond pyramid to Knoop for hardness tests to Knoop	**318845**
Indenter hard metal ball dia. 1 mm for hardness tests to Brinell	**320900**
Indenter hard metal ball dia. 2.5 mm for hardness tests to Brinell	**320896**
Indenter hard metal ball dia. 5 mm for hardness tests to Brinell	**320894**
Indenter diamond cone 120° for hardness tests to Rockwell	**319408**
Indenter hard metal ball dia. 1/16“ for hardness tests to Rockwell	**320859**
Indenter hard metal ball dia. 1/8“ for hardness tests to Rockwell	**320861**
Indenter hard metal ball dia. 1/4“ for hardness tests to Rockwell	**320863**
Indenter hard metal ball dia. 1/2“ for hardness tests to Rockwell	**320890**
Indenter steel ball dia. 5 mm for ball indentation hardness	**320902**
Transducer foot type 1 for indenters Vickers pyramid, diamond pyramid to Knoop, hard metal ball dia. 1 mm, dia. 2.5 mm, dia. 5 mm, dia. 1/16“, dia. 1/8“ and steel ball dia. 5 mm	**318063/320847[2]**
Transducer foot type 2 for indenters diamond cone 120° and hard metal balls dia. 1/4“, 1/2“	**319410/320849[2]**

[2] Transducer foot with quick-change device, adapter ring 320845 neccessary

X-y tables

Description	**Item number**
Manual x-y table, Fmax 2.5 kN[3], table size 135 x 135 mm	
- travel 25 x 25 mm, manual micrometer screws	**357720**
- travel 25 x 25 mm, digital micrometer screws, digital display and transmission of the position	**357722**
Motorized x-y table, Fmax 2.5 kN[3], control from PC via RS232 interface	
- travel 100 x 50 mm, table size 350 x 192 mm	**016316**
- travel 150 x 50 mm, table size 400 x 192 mm	**016320**
Adapter plate for x-y tables for hardness testers (zwicki, ZHV10)	**375675**

[3] X-y tables with Fmax 500 N on request available

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Testing software testXpert hardness edition

Description	Item number:	German	English
testXpert Master test programm for ZHU/zwickiLine+ hardness tester for determination of hardness acc. depth measurement and optical methods, incl. following options:		**319222**	**319224**
testXpert Option Sequence testing		**353453**	**353475**
testXpert Option Auto measurement		**353455**	**353473**
testXpert Option Auto focussing		**353454**	**353474**
testXpert Option Connection of x-y tables		**353456**	**318788**

'Optics' add-on unit

Type	manual	motorized
Item number	1044206	1044207
Testing method (in combination with hardness measurement head)		
Vickers	HV0.2; HV0.3; HV0.5; HV1; HV2; HV3; HV5; HV10; HV20; HV30; HV50; HV100	
Knoop	HK1	
Brinell	HBW 1/1 ... 1/30; HBW 2.5/5.15 ... 2.5/187.5; HBW 5/25 ... 5/250; HBW 10/100 ... 10/250	
Dimensions (height x width x depth)	400 x 400 x 210 mm	
GigE Camera / resolution	1.4 megapixel, incl. LED illumination	
Also required:	Objective lens (see below)	
	Mains unit for LED illumination (375922)	
	Powerful Graphic card for optical hardness test method (075270)[1]	
	-	Motorized x-y table (see page 3)

[1] Compatibility of the PC card is guaranteed only in conjunction with PCs from Zwick's range with Windows 10.

Objective lenses for 'Optic' add-on unit

Item number		311954	311956	311958	311960	311962
Inherent magnification		5:1	10:1	20:1	40:1	60:1
Standard equipment[2]						
Field of view[3]	horizontal	1760 µm	880 µm	440 µm	220 µm	147 µm
	vertical	1320 µm	660 µm	330 µm	165 µm	110 µm
Picture resolution		1.5 µm/Pixel	0.8 µm/Pixel	0.4 µm/Pixel	0.2 µm/Pixel	0.13 µm/Pixel
Optional equipment[4] (Item number 320406)						
Field of view[5]	horizontal	2720 µm	1360 µm	680 µm	340 µm	227 µm
	vertical	2040 µm	1020 µm	510 µm	255 µm	171 µm
Picture resolution		2.3 µm/Pixel	1.2 µm/Pixel	0.6 µm/Pixel	0.3 µm/Pixel	0.2 µm/Pixel

[2] The standard equipment includes a video adapter with a high inherent magnification that is integrated in the measurement microscope in front of the GigE camera.

[3] The permissible measurement ranges are described in detail in the corresponding test standards. A Vickers indentation should be at least 1/3 of the vertical field of view to be able to achieve a resolution of 0.2 µm (d < 40 µm) or 0.5% of d (d ≥ 40 µm) to, for example, DIN EN ISO 6507-2.

[4] The optional equipment includes an interchangeable video adapter with a low inherent magnification for a higher field of view (compared to the standard equipment). It is integrated in the measurement microscope in front of the GigE camera. This is mandatory for Brinell hardness testing.

[5] The degree of loading to DIN EN ISO 6506-1/2 is to be selected so that it is 0.24 · D < indentation dia. < 0.6 · D. The remaining indentation diameter is therefore within the prescribed limits:

1 mm ball:	0.240 mm	< indentation diameter <	0.6 mm
2.5 mm ball:	0.6 mm	< indentation diameter <	1.5 mm
5 mm ball:	1.2 mm	< indentation diameter <	3 mm

The measurement device should have a scale graduation of 0.5% of d.

All data at ambient temperature.