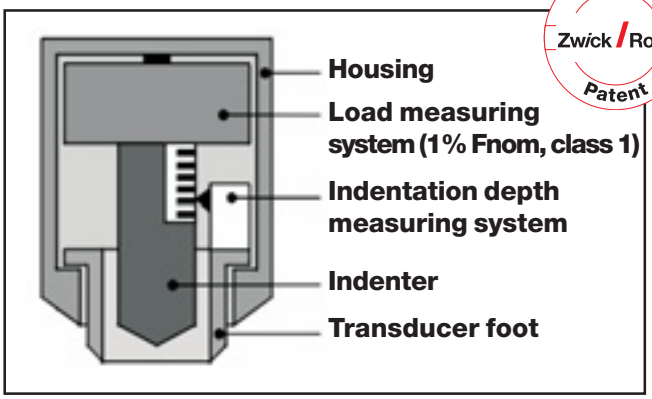
Zwick / Roell

Zwick
Materials Testing

Product Information

Universal hardness testing machine ZHU/zwicki-Line

ZHU/zwicki-Line machines with increased resolution are available with two different crosshead travel lengths:
350 mm or 850 mm.



The patented hardness measuring head contains a load cell, a digital depth-measurement system (resolution 0.02 µm), an indentor and a sensor foot in complete accordance with the Abbe measurement principle.

Range of application

ZHU/zwicki-Line universal hardness testing machines can be used for the classical Rockwell, Vickers, Knoop 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/zwicki-Line is particularly popular in quality-assurance testing laboratories and in research and development, rapid prototyping and advance development.

ZHU/zwicki-Line

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

Advantages/Features

- Universal application for practically any hardness testing method using indentation depth measurement, regardless of material
- Automatic test sequence and evaluation
- Maximum accuracy and optimum reproducibility of measured values
- Additional materials data obtained from force-indentation curve
- Versatile result presentation: single and statistical values, graphics, on-screen display, and test reports can be varied as required
- Multiple curve overlay for direct comparison of series tests
- Configuration of user-specific test sequences
- Very large, variable test area for different specimen sizes
- Ideal for research and development

PI 739 2.0809

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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).

'Optic' 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
  - Knoop HK, according to EN ISO 4545

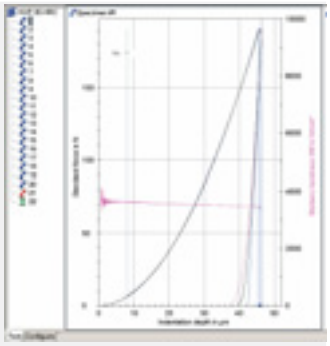
  (Only in combination with 'Optic' add-on unit)

Advantages of the instrumented indetation 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.

Intelligent testing with *testXpert*®

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.



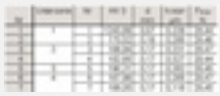
IIntuitive one-button operation for starting and fully automatic evaluation of single and sequence testing

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

The ZHU/zwicki-Line 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*®.

All data at ambient temperature.

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Universal hardness testing machine ZHU/zwicki-Line

Hardness measurement head

Type	ZHU2.5/Z2.5	ZHU0.2/Z2.5	
Item number	**320196**	**320198**	**Unit**
Test load	5 ... 2500	2 ... 200	N
Load cell	Accuracy grade 1 accord. to DIN EN 10002 part 2		
Indentation depth measurement system	Accuracy grade 0.2 accord. to DIN EN 10002 part 4		
Standard resolution of depth measurement system	0.02		µm
Mounting bore for indentor	dia. 6,35^{H7}		mm
Weight	3.9		kg
Temperature range	+ 15 ... + 35		°C

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 hard metal ball dia. 10 mm for hardness tests to Brinell	**320892**
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**
Transducer foot type 2 for indenters diamond cone 120° and hard metal balls dia. 10 mm, 1/4", 1/2"	**319410**
Transducer foot type 1 with quick-change device	**320847**
Transducer foot type 2 with quick-change device	**320849**
Adapter ring for transducer foot with quick-change device	**320845**

X-y tables

Description	Item number
Manual x-y table, Fmax 2.5 kN, 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**
Motorised x-y table, Fmax 2.5 kN, 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**
Manual x-y table, Fmax 500 N, table size 135 x 135 mm	
- travel 50 x 50 mm, manual micrometer screws	**353448**
- travel 25 x 25 mm, digital micrometer screws, digital display and transmission of the position	**353449**
Motorised x-y table, Fmax 500 N, control from PC via RS232 interface	
- travel 100 x 50 mm, table size 350 x 192 mm	**018130**
- travel 150 x 50 mm, table size 400 x 192 mm	**018134**
Adapter plate for x-y tables for hardness testers (zwicki, ZHV10)	**375675**

All data at ambient temperature.

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Universal hardness testing machine ZHU/zwicki-Line

Test software *testXpert*®

Description	Item number:	German	English
testXpert® Master test programm for instrumented indentation tests for determination of hardness (Martens, Rockwell and ball indentation hardness)		**319222**	**319224**

'Optic' add-on unit

Type	manual	motorized
Item number	**320623**	**022243**
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	
CCD Camera / resolution	1/2" Chip / 752 x 582 Pixel	
Also required:	Objective lenses (see below)	
	Electrical connections 230 V (Item number 312130) / 115 V (Item number 312132)	
	Adjustability of the electronics (Item number 004836)	

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[1] (Item number 320623)						
Total magnification[1] (for 17" monitor)		approx. 136-x	approx. 275-x	approx. 550-x	approx. 1100-x	approx. 1600-x
Field of view[2]	horizontal	1760 µm	880 µm	440 µm	220 µm	147 µm
	vertical	1320 µm	660 µm	330 µm	165 µm	110 µm
Picture resolution		2.3 µm/Pixel	1.2 µm/Pixel	0.6 µm/Pixel	0.3 µm/Pixel	0.2 µm/Pixel
Optional equipment[3] (Item number 320406)						
Total magnification (for 17" monitor)		approx. 85-x	approx. 170-x	approx. 340-x	approx. 680-x	approx. 1000-x
Field of view[4]	horizontal	2720 µm	1360 µm	680 µm	340 µm	227 µm
	vertical	2040 µm	1020 µm	510 µm	255 µm	171 µm
Picture resolution		3.6 µm/Pixel	1.8 µm/Pixel	0.9 µm/Pixel	0.45 µm/Pixel	0.3 µm/Pixel

[1] The standard equipment includes a video adapter with a high inherent magnification (approx. 28 fold) that is integrated in the measurement microscope in front of the CCD camera.

[2] 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.

[3] The optional equipment includes an interchangeable video adapter with a low inherent magnification (approx. 17 fold) for a higher field of view (compared to the standard equipment). It is integrated in the measurement microscope in front of the CCD camera. This is mandatory for Brinell hardness testing.

[4] 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.

***testXpert*® Options**

Description	Item number:	German	English
testXpert® Master test programm for optical testing methods		**353451**	**354809**
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**

All data at ambient temperature.