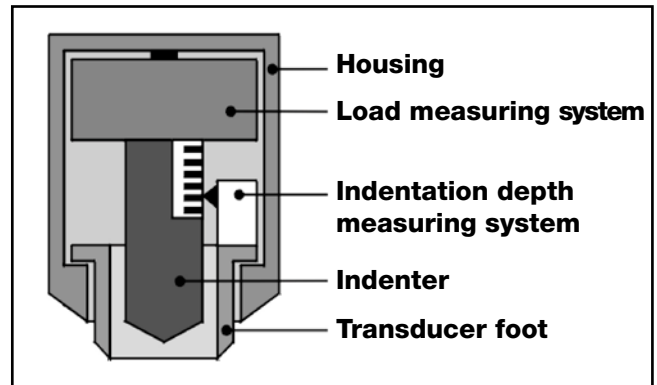


Product Information

Universal hardness testing machine ZHU/zwickiLine



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



The hardness measuring head contains a load cell, a digital depth-measurement system (resolution 0.02 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 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

Product Information

Universal hardness testing machine ZHU/zwickiLine

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

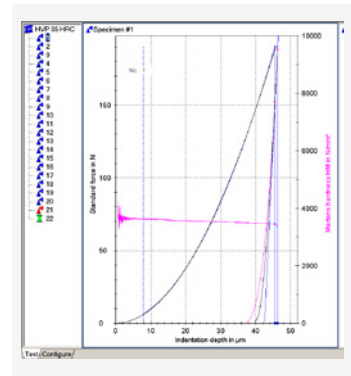
(Only in combination with 'Optic' add-on unit)

Advantages of the instrumented indentation test

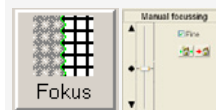
- Standardized test method according to Martens (EN ISO 14577-1/-2/-3)
- Uniform hardness scale for all materials
- The force-indentation curve together with various loading sequences provide additional information on materials:
 - Plastic and elastic percentages of indentation energy
 - Plastic hardness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

Intelligent testing with testXpert

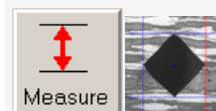
Use of testXpert intelligent testing software underpins this innovative testing system in standard testing situations (e.g. quality assurance) and provides demanding research and development specialists with a remarkable range of options.



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



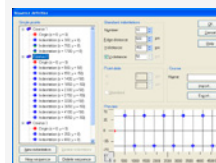
Fully automatic focusing on the indentation with option of zooming onto the specimen surface via a scroll bar



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

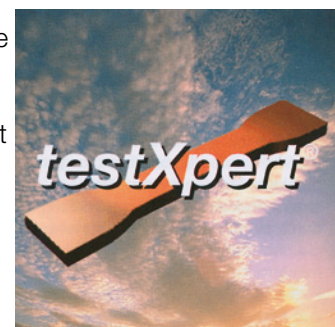


User-friendly definition of hardness sequence test (also multiple sequences) and storage of own templates

No.	Unterzone	Nr.	HV0	d	h	h _{max}	F _{max}
1	1	1	1245.98	0.05	0.028	20.04	
2	2	2	1120.50	0.10	0.086	20.46	
3	3	3	1095.94	0.15	0.095	20.47	
4	4	4	189.98	0.15	0.107	20.44	
5	5	5	186.71	0.15	0.095	20.45	
6	6	6	187.86	0.15	0.088	20.47	
7	7	7	186.05	0.17	0.118	20.45	

Comprehensive evaluations, statistics and result displays

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.



Product Information

Universal hardness testing machine ZHU/zwickiLine

zwickiLine Z2.5 testing machines with higher resolution

Type	Z2.5 TS	Z2.5 TN
Item number	375727	375729
Max. test load F_N (tensile/compression)	2.5 kN	2.5 kN
Crosshead speed	0.1 ... 50 mm/min	0.1 ... 50 mm/min
Positioning, repetition accuracy	$\pm 2 \mu\text{m}$	$\pm 2 \mu\text{m}$
Dimensions (height x width x depth) ⁽¹⁾	779 x 453 x 688 mm	1279 x 453 x 688 mm
Weight	approx. 90 kg	approx. 100 kg
Test area (height x depth)	170 x 99.5 mm	670 x 99.5 mm
Electrical connections (adjustable)	100 ... 250 V (PH,N,PE)	100 ... 250 V (PH,N,PE)
Mains frequency, power rating	50/60 Hz, 0.44 kVA	50/60 Hz, 0.44 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	320196	320198
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	0.02 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 necessary

X-y tables

Description	Item number
Manual x-y table, F_{max} 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, F_{max} 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 F_{max} 500 N on request available

Product Information

Universal hardness testing machine ZHU/zwickiLine

Test software testXpert

Description	Item number:	German	English
testXpert Master test programm for ZHU/zwicki 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

'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	
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) -	Motorized x-y table (see last page)

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 equipment¹					
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	1.5 µm/Pixel	0.8 µm/Pixel	0.4 µm/Pixel	0.2 µm/Pixel	0.13 µm/Pixel
Optional equipment³ (Item number 320406)					
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	2.3 µm/Pixel	1.2 µm/Pixel	0.6 µm/Pixel	0.3 µm/Pixel	0.2 µm/Pixel

¹ 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.

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 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.

⁴ The degree of loading to DIN EN ISO 6506-1/2 is to be selected so that it is $0.24 \cdot D < \text{indentation dia.} < 0.6 \cdot D$. 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.