

INTEGRAL

THE MASTER FOR HARDNESS TESTING



Rockwell, Superficial Rockwell,
Brinell, Vickers, Knoop, Shore
Test loads from 1 to 3000 kgf



Motorized turret 9 positions



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AFFRI INTEGRAL is the master for hardness measurements and is a mile stone beyond every limit. Our hardness testers are the only one you will need.

Auto recognition of the surface to be measured from any starting height. It is possible to insert pieces of any size and shape, the hardness tester will recognize them and measure them one by one, keeping the contact with double stroke and double head.

ONE BUTTON MEASUREMENTS

The measurements are very easy, quick and absolute because you will need to push only one button. The test cycle is fully automatic and motorized in few steps:

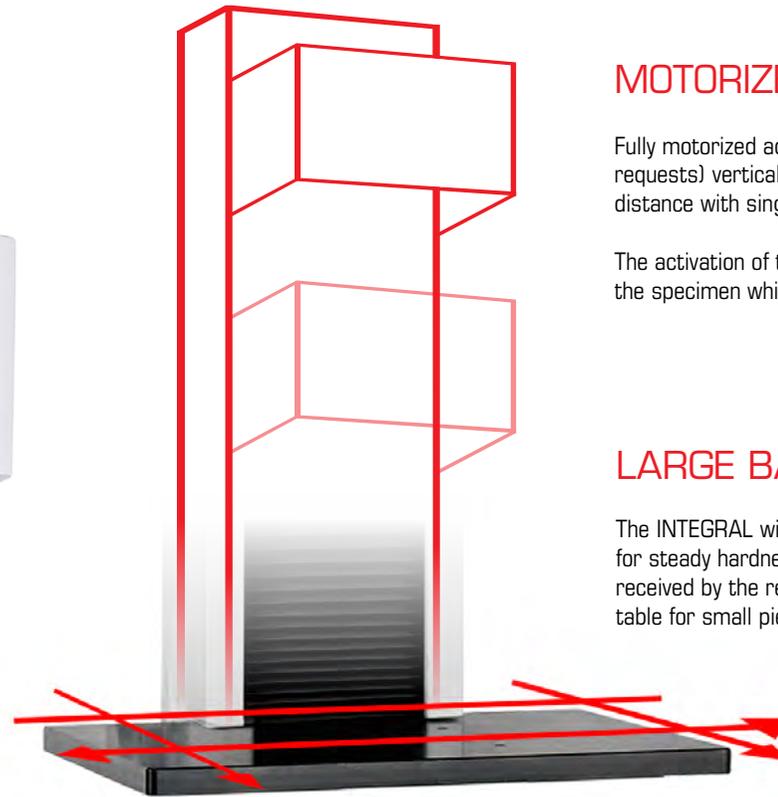
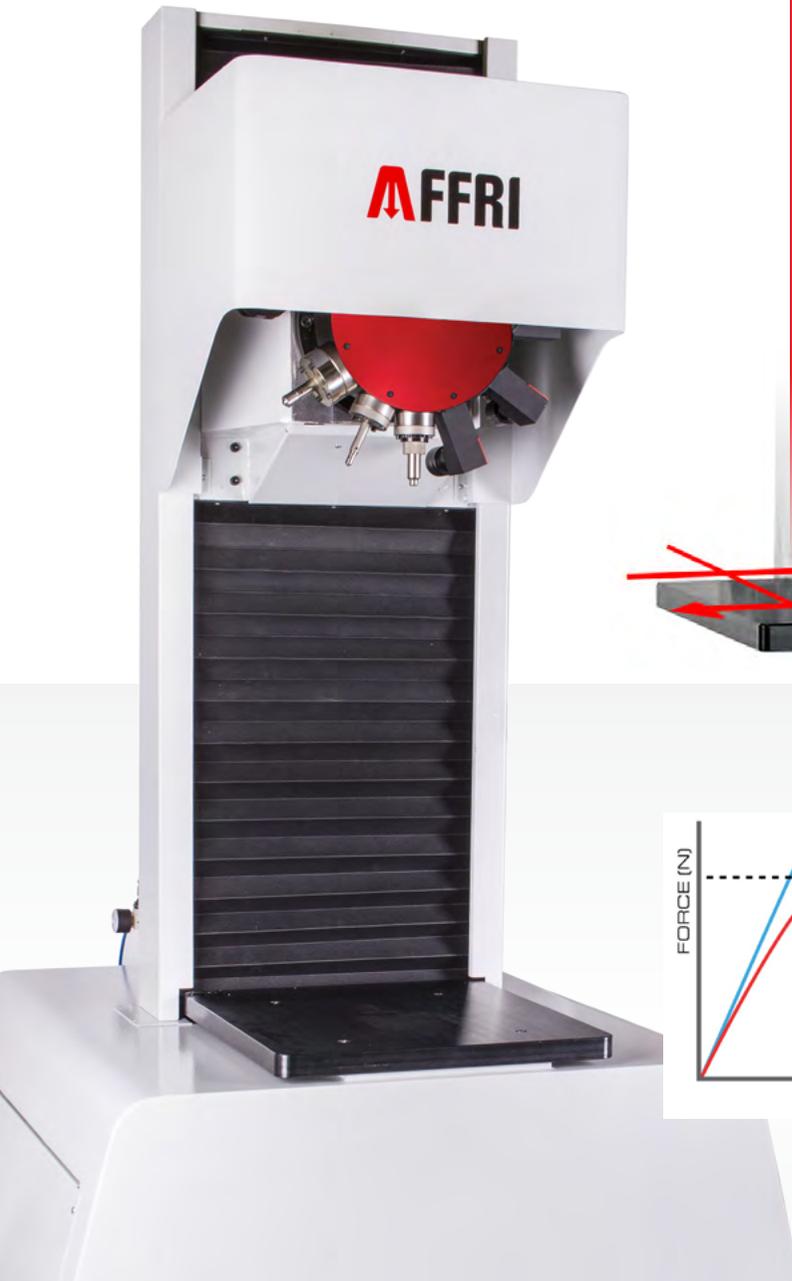
- contact with the specimen
- active sliding clamping
- preloading and loading
- switching to optic lens
- autofocus by image brightness scanning
- measure through camera and automatic return of stroke at the programmed point

These steps of each test cycle with results will automatically appear on a large touch-display.

ABSOLUTE MEASURES

You don't have to make settling tests or to repeat a second test cycle because our hardness testers make perfect measurements with perfect results. All in a safe condition for operators.





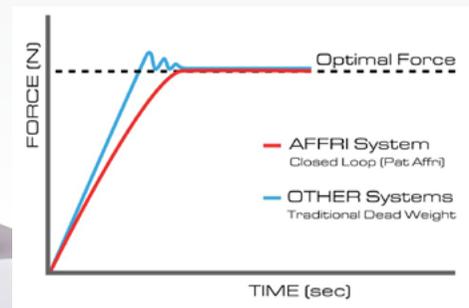
MOTORIZED MEASURING HEAD

Fully motorized adjustable testing stand up to 500 mm / 20" (other options by personal requests) vertical capacity including automatic contact with test surface from every distance with single start input.

The activation of the test cycle is automatic, it starts when the head makes contact with the specimen which is automatically recognized at any position within the vertical stroke.

LARGE BASE

The INTEGRAL wide work table is capable of bearing masses up to 3000 kg which allows for steady hardness measurements on bulky or irregular pieces which cannot be easily received by the regular bench hardness tester. Also, it offers a comfortable wide working table for small pieces.



CLOSED LOOP and AFFRI SYSTEM

Affri System consists on load cell connected directly with the indenter and automatic recognizing the test surface from any distance. One single initial input will get start the test cycle and all in Closed Loop.

Load forces are applied through load cells and electronically controlled in "Closed Loop" (Pat. AFFRI) with a frequency of 1 kHz. Each load force is automatically programmed and controlled assuring perfect linearity in every range eliminating the problems associated with traditional dead weight system testers. Results are not affected by any structural deflection, misalignment or external vibration.

Accurate measurements, even on the first test, eliminate the need for multiple tests. There is no need to perform a second test, the first one is absolutely precise. The R&R (repeatability and reproducibility) data is at the top of its class.

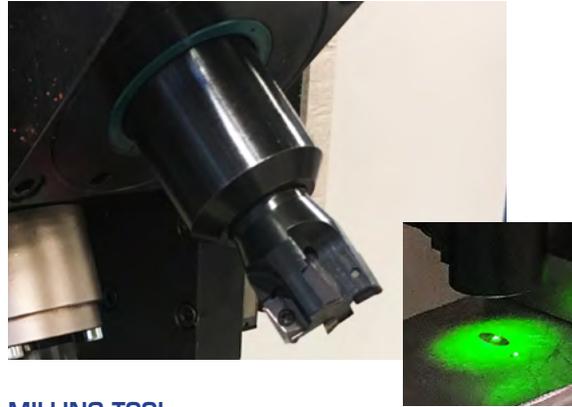
9 SLOTS MOTORIZED ROTATING TURRET

Automatic and pneumatic turret for multi objectives and multi indenters up to 9 positions rotating in front of the machine for 360° including milling surface preparation tool. Motorized rotating head with multiples indenters for different hardness test methods. Multiple optics for a perfect image zoom quality on different indent diameters. After the indentation the turret automatically switch to the right optic auto-centering the indentation.



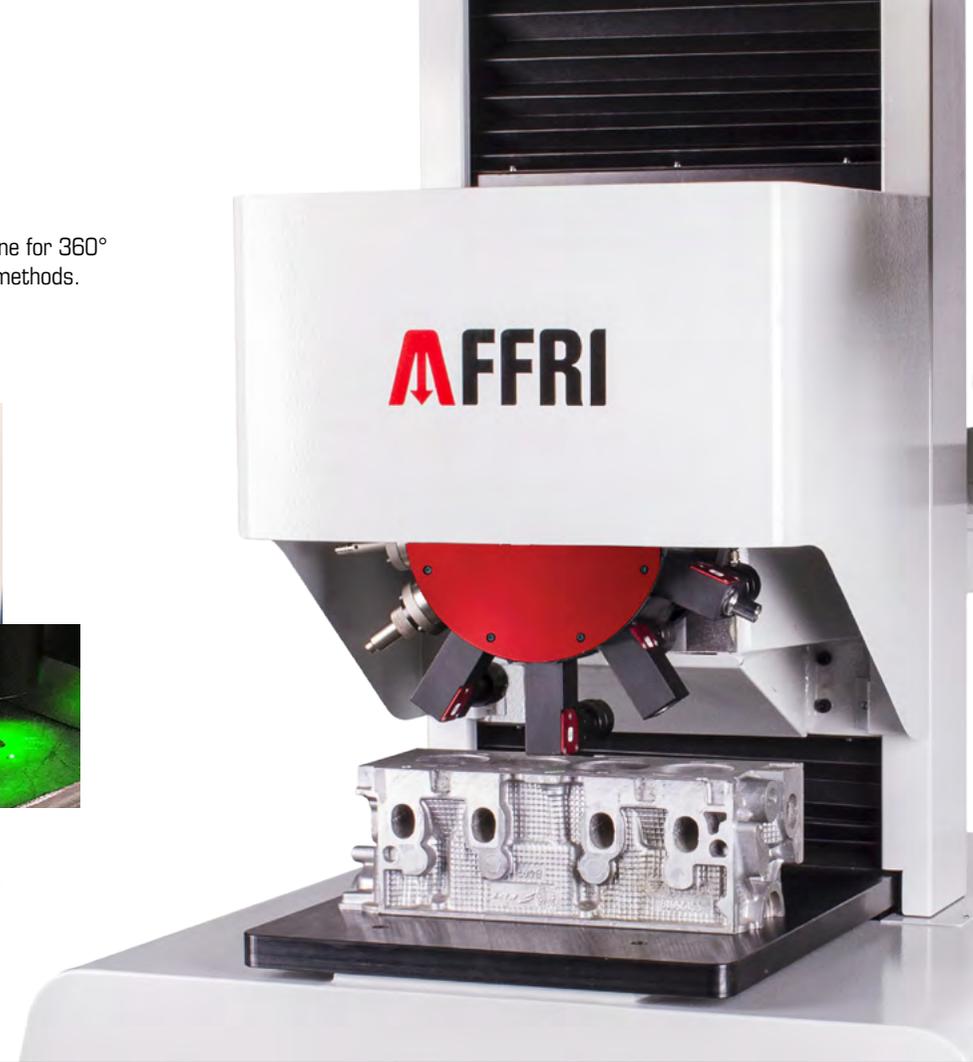
L.I.S.A.

Exclusive application which allows ultra-precise test positioning. The laser pointing system helps to define the indentation area before the contact between the indenter and the specimen. Reach extreme points with lack of illumination, edges of gear teeth or sides of cutting tools and blades. (This application is optional)



MILLING TOOL

Automatic milling tool for oxidation removing and surface preparation before indenting. Programmable milling thickness for fully automatic process.



Milling



Indenting



Reading

OPEN SPACE

Open test area to accommodate pieces of any shape and size and easy insertion even with means of transport.

Automatic search of the test surface reduces the test cycle and increases accuracy operated by a single start command for quick and easy use.



ANY TEST POINT

The Integral hardness tester can reach any testing position from really small area like cutting tools to the inside of holes or tubes. The indenter length or geometry can be customized on different needs. Indenter's extension assures easy testing on difficult test areas with high accuracy. The indenter is always protected and the measure is always accurate.



CLAMPING SYSTEM

Secure contact with the specimen is always maintained, even in the unlikely event of any specimen movement during the operation cycle. Sliding clamping piece for 500 mm for constant pressure programmable by air compressed power. The clamping system moves with the head for the whole vertical stroke generating a constant pressure when the specimen is clamped.

The clamping system assures perfect stability of any test piece throughout the test cycle. No additional accessories are required.

MOTORIZED INDENTER STROKE

The hardness tester is equipped with an additional motor which moves the indenter and the clamping hood for a stroke of 50 mm / 2".

This is a stand-alone extra stroke which works separately from the total head stroke.

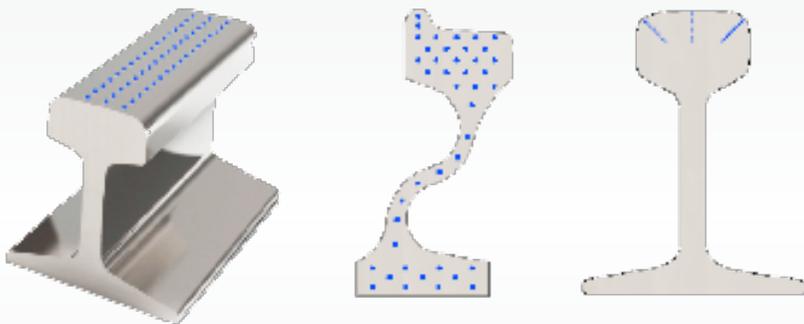
When testing unstable samples or deflective parts, the measuring head follows the sample without losing contact.

The top surface referencing design minimizes errors caused by problems associated with dirt or scale.

This reduces sample preparation time and increases both accuracy and speed.

XY MOTORIZED STAGE

Motorized X-Y axis table 200 x 100mm division 0.01 mm combined to automatic start test cycle for hardness case depth. Supported weight 3000kg. (Other dimensions at request)



FULLY AUTOMATIC MULTI-INDENTATION CYCLES

The software is designed for an intuitive and simple use. It provides added precision when positioning indents thanks to its integrated macro view technique and layout tools.

By visualizing the complete sample or a single sample, traverses and/or patterns can now be mapped out with unequalled precision.

Reference points for indentation patterns can be positioned precisely where they are required. The table allows automatic multi-indentation test cycles and CHD on multiple samples with perfect positioning on the entire area, no matter the indentations amount.

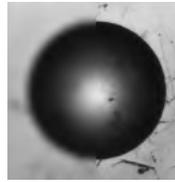
DUAL COMMANDS

By real push buttons and by touch screen.

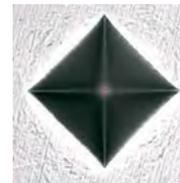
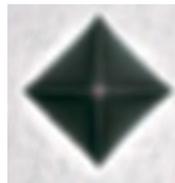


MASTER IN IMAGE RESOLUTION

Afri uses the same technology adopted for the manufacture of reference machines at National Primary Laboratories. Our continuous research and development offers the most modern scientific solutions for viewing and analyzing images without shadows or reflections on the vertices of the high contrast impression. For Brinell, Vickers measurements. The combination of different lighting methods with sophisticated algorithms achieve the perfection of measurement analysis with an accuracy 10 times higher than normal standards. The 360 ° and 3D analysis at ratio of 1 millisecond feedback offers absolute precision measurements. Optics at infinite focus and LED light at infinite and intelligence control assure the best combination for the top quality of the image even on light, dark surfaces hard, soft metals. No shadows and perfect sharp for easy and comfortable vision and accurate measure. Our standard CCD 1/2" at 1.2 Mpixels assure 10 time accuracy more than ISO ASTM standard requirement. Infinite pixel camera choose from 1.2Mp to 20 Mp and beyond according to the evolution of science up to infinite values are available at your desire.



The Auto Focus performs an automatic focus adjustment for the selected optic with precise positioning at any magnification by mean of real image scanning brightness. This system assures high reading accuracy and reduces reading time.



AUTOFOCUS

Motorized focus is always at the right linear quote.

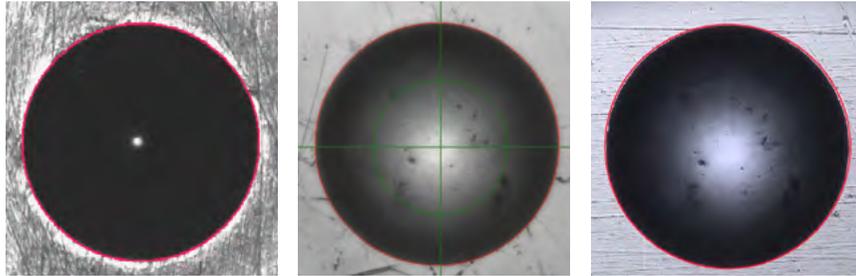
TEST DATA IMPORT AND EXPORT

Data enter via code bar scanning. Test cycles or sample drawings can be loaded directly from a central system by means of a bar code scanner. This hardness tester gets all the information fully automatically. After running the test, the bar code data are added with results and immediately returned to the order management system. File import and export is freely configurable and therefore individually adaptable. USB and LAN outputs. Connect to database networks, PCs and printers. Other upon request.



AUTO MEASURE ON CRITICAL SURFACES

From perfectly polished to rough & etched samples, the software will automatically measure indents on any sample surface.



REAL MAGNIFICATION

Tanks to the motorized turret with multi-objectives, different lenses can be selected with a simple click. Digital magnification zoom is also available.

AUTO-LIGHTING

Automatic light regulation on any surface.

DYNAMIC RESULTS - Color highlighted results and live statistics.

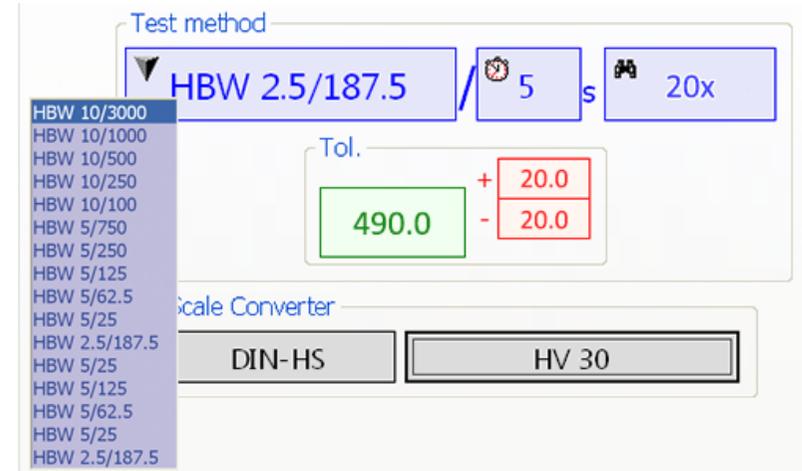
Watch result list and edit or modify single tests.

Print results from template or save and import tests cycles from archive.



TEST METHOD SELECTION

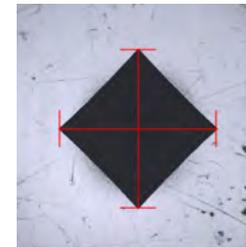
Only one window for the selection of everything you need for the test.



| GO /Slot | Installed | Required |
|----------|--------------|-------------|
| 1 | Pyramid 136° | Ball 2.5 mm |
| 2 | 0.4x /F25 | |
| 3 | 1.5x /F25 | |
| 4 | 20x | |
| 5 | Ball 5 mm | |

TOOLS

Check if the installed tool is correct for the selected hardness scale.



MANUAL MEASURE

Manual indent evaluation.

INTEGRAL

ANVILS

- A013.0.000 - Fix anvil support
- A014.0.001 - Flat anvil $\varnothing 60$ mm
- A014.0.002 - Flat anvil $\varnothing 150$ mm
- A014.0.003 - V face anvil $\varnothing 60$ mm for diameters from 8 to 220mm
- A014.0.004 - Double Spot anvil $\varnothing 25$ mm flat + V for diameters from 5 to 30 mm
- A009.0.005 - V Support H 50mm
- A009.0.006 - V Support H 100 mm
- A014.0.005 - Ball Anvil reclining self aligning
- A014.0.006 - Diamond spot anvil for thinplate

EXTRA ACCESSORIES

- Q22.0.3.009 - Fix Clamping piece
- A049.1.001 - Adjustable vice from 0 to 50mm
- A009.0.001 - Manual table 100x100mm with 10 μ m step
- A.000.0.CNC - CNC control system to program X Y table movement
- A017.4.001 - Self identify the border of test sample trough optic system vision
- A022.0.002 - AUTO START command trough pedal for series tests
- A115.1.002 - Automatic start cycle connectable to PLC control
- A055.0.001 - Motorized stage 300x200mm. Range 200x100mm div. 0,5 μ m
- A055.0.002 - Motorized stage 150x150mm. Range 100x60mm. Div.0,5 μ /step
- A095.0.001 - Objective 1x (6 mm). HB 25 to 3000 Kg, ball 10mm and 5mm
- A095.0.002 - Objective 2x (3 mm) HB 6,25 to 187,5 Kg, ball 2,5mm - HV50, HV100
- A095.0.004 - Objective 5x (1,2 mm) HB 2 to 30 Kg, ball 1mm - HV20, HV30
- A095.0.008 - Objective 10x (0,5 mm) HV5 and HV10

TEST BLOCKS

- 600.0.0.003 - HBW 2.5/62.5
- 601.0.0.005 - HBW 2.5/187.5
- 600.0.0.001 - HBW 5/125
- 600.0.0.010 - HBW 5/250
- 600.0.0.009 - HBW 5/750
- 600.0.0.008 - HBW 10/250
- 600.0.0.007 - HBW 10/500
- 600.0.0.006 - HBW 10/1000
- 600.0.0.005 - HBW 10/1500
- 600.0.0.004 - HBW 10/3000
- 602.0.0.003 - HV10
- 602.0.0.004 - HV30
- 601.0.0.001 - HRA
- 601.0.0.002 - HRB
- 601.0.0.003 - HRC
- 601.0.0.004 - HRD
- 601.0.0.010 - HR15N
- 601.0.0.011 - HR30N
- 601.0.0.012 - HR45N
- 601.0.0.020 - HR15T
- 601.0.0.021 - HR30T
- 601.0.0.022 - HR45T

INDENTERS

- 033.0.2.550 - Diamond 120° HR
- 033.0.2.551 - Diamond 136° HV
- 033.0.2.553 - Ball W $\varnothing 1$ mm
- 033.0.2.554 - Ball W $\varnothing 2.5$ mm
- 033.0.2.555 - Ball W $\varnothing 5$ mm
- 033.0.2.556 - Ball W $\varnothing 10$ mm
- 033.0.2.552 - Ball W $\varnothing 1/16$ "
- 033.0.2.557 - Ball W $\varnothing 1/8$ "
- 033.0.2.558 - Ball W $\varnothing 1/4$ "
- 033.0.2.559 - Ball W $\varnothing 1/2$ "



ACCESSORIES

Affri provides a large variety of accessories to fulfil any purpose of test. Customized solution based on client needs can be made for perfect tests on rough pieces. A series of different anvils is available to test every size of test piece. Variety of accessories to facilitate testing on small or oddly shaped items. Large variety of high quality indenters with certificate. Ball, cone, tungsten or diamond indenters for each hardness scale Rockwell, Vickers, Brinell, Knoop and Shore. Test blocks for the hardness tester periodic calibration with UKAS/ACCREDIA certificate, for any hardness scale and value.

All AFFRI accessories are customizable according to customers specifications, depending on dimensions and geometry of the samples and finished products.

REAL TIME SUPPORT

Real Time Support. Connect your hardness tester to Internet, so that we can remotely diagnose any technical issue, provide additional operator training and update software version.

Connect to www.affri.com for more details.



INTEGRAL SOLUTIONS



MAXIINTEGRAL XY

on cylinders and bottles.
Built-in programmable milling.



INTEGRAL SPRINGS

on cylinders and bottles.
Built-in programmable milling.



MAXIINTEGRAL

on cylinders and bottles.
Built-in programmable milling.



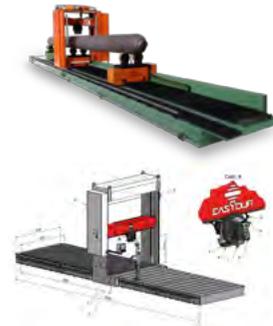
INTEGRAL BOTTLE

Brinell up to 3000kgf. Fully automatic multi-indentation cycles on cylinders and bottles. Built-in programmable milling.



EASYFLAG:

Rockwell and Brinell up to 3000kgf - Fully automatic with no limit of weight and dimension of the sample. Built-in programmable milling.



PORTALE:

CNC portal for Brinell tests up to 3000kgf, 14 m, 4 axes with programmable milling included and automatic test cycle with image analysis.



INTEGRAL

INTEGRAL1: Brinell DIN EN ISO 6506 / ASTM E-10 from **15.6 to 3000 kgf**.

INTEGRAL2: Rockwell, Brinell, Vickers DIN EN ISO 6506 6507 6508 / ASTM E-10 E-18 E-384 from **1 to 250 kgf**

INTEGRAL3: Rockwell, Brinell, Vickers DIN EN ISO 6506 6507 6508 / ASTM E-10 E-18 E-384 from **3 to 1000 kgf**

INTEGRAL5: Rockwell, Brinell, Vickers DIN EN ISO 6506 6507 6508 / ASTM E-10 E-18 E-384 from **10 to 3000 kgf**

FORCE RANGE

| | |
|----------------------------|--|
| Rockwell / Superficial R.: | Preload: 29.4 - 98.1 N (3 - 10 kgf) / Rockwell: 588.4 - 980.7 - 1471 N (60 - 100 - 150 kgf) / Superficial Rockwell: 147.1 - 294.2 - 441.3 N (15 - 30 - 45 kgf) |
| Brinell: | 9.807 - 24.52 - 49.03 - 61.29 - 98.07 - 153.2 - 245.2 - 294.2 - 306.5 - 612.9 - 1226 - 1839 - 2452 - 4903 - 7355 - 9870 - 29421N (1 - 2.5 - 5 - 6.25 - 10 - 15.625 - 25 - 30 - 31.2 - 62.5 - 125 - 187.5 - 250 - 500 - 750 - 1000 - 3000kg) |
| Vickers/Knoop: | 9.807 - 29.42 - 49.03 - 98.07 - 147.1 - 196 - 294.2 - 490.35 - 980.7 N (1 - 3 - 5 - 10 - 15 - 20 - 30 - 50 - 100 kgf) |
| Optional tests: | Test loads can be extended from 0,3 kgf when using the 7 position motorized turret. 49 - 132 - 358 - 961 N (for plastic and rubber as per EN-ISO 2039) |

FEASIBLE TESTS - Depending on the models

| | |
|-----------------------|--|
| Rockwell: | HRA - HRB - HRC - HRD - HRE - HRF - HRG - HRH - HRK - HRL - HRM - HRP - HRR - HRS - HRV |
| Superficial Rockwell: | HR15N - HR30N - HR45N - HR15T - HR30T - HR45T - HR15S - HR30S - HR45S - HR15W - HR30W - HR45W - HR15X - HR30X - HR45X - HR15Y - HR30Y - HR45Y |
| Brinell HBW: | 1/1 - 1/2.5 - 1/5 - 1/10 - 1/30 - 2.5/6.25 - 2.5/15.625 - 2.5/31.25 - 2.5/62.5 - 2.5/187.5 - 5/25 - 5/31.25 - 5/62.5 - 5/125 - 5/250 - 5/750 - 10/100 - 10/125 - 10/250 - 10/500 - 10/1000 - 10/1500 - 10/3000 |
| Brinell HBTW: | 1/30 - 2.5/15.6 - 2.5/31.5 - 5/125(3) (Aluminum and its alloys) - 2.5/62.5(2) (Aluminum and its alloys) - 2.5/187.5(6) (Aluminum and its alloys) - 2.5/187.5(5) (Carbon steel) - 2.5/187.5(1) (Cast iron) - 5/125 - 5/250 - 5/750 - 10/500 - 10/1000 - 10/1500 - 10/3000 |
| Vickers/Knoop: | HV 1 - HV 2 - HV 3 - HV 5 - HV 10 - HV 20 - HV 30 - HV 50 - HV 100 |
| CHD: | Automatic Case depth measure with non-destructive process HDT method tracing case depth curve. Range till 1.5 mm / 0.06" |
| Temperature: | Measure range from - 40.0 to + 80.0 °C |
| Optional: | ISO 2039, Shore A and D hardness scales for plastic |

TECHNICAL DATA

| | |
|-----------------------------|---|
| Conformity Standards: | EN-ISO 6506-2 / EN-ISO 6507-2 / EN-ISO 6508-2 / EN-ISO 2039 / ISO 868 / ASTM-E10 / ASTM-E18 / ASTM-E103 / ASTM 2240 / ASTM-E384 / JIS |
| Load accuracy: | Better than 0.05 % |
| Head Stroke: | Fully motorized 500mm / 20" |
| Height / Depth Capacity: | Height: 500 mm / 20" (As option can be extended) - Depth: 170 mm /6.5" (As option can be extended) |
| Tolerable Weight: | 2000kg |
| Turret: | Motorized and pneumatic automatic turret. Self-switching 1 indenter + 1 objective (optional 5-7 steps) |
| Camera / Lighting: | Firewire included / LED |
| Temperature Range: | From 10 °C to 35 °C |
| Power supply / Data Output: | 110 or 220 V / 50÷60 Hz - Pneumatic Air - RS 232 C (USB as option) |
| Software: | Affri - Easydur |
| Principle of Operation: | Load Cell and Closed Loop (Affri patent) |
| Fields Of Use | For all metals: iron, steel, tempered steel, cast iron, brass, aluminum, copper and metal alloys. Heat treatment, hardening, nitriding, cementation and hardfacing. Hard and soft plastics. |
| Packing: | 160 x 130 x 230 cm / 62 x 51 x 90" - 600kg |



2 positions



7+ positions



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