

Serie 206.RTD - 206.RTSD  
RT2D - RTDEX/RTSDEX

## **USER'S GUIDE**



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BREVETTI®

**AFFRI®**

sono marchi registrati.



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## Technical data

MODEL	206 RTD	206RTSD
Preload	10 Kgf (98,07) N	3 Kgf (29,4) N
Test loads	60-100-150 Rockwell (588-980-1471) N 62,5-125-187,5 Brinell (612-1226-1839) N	15-30-45 Rockwell (147-294-441) N 15,6-31,2 Brinell (153-306) N
Mode of operation	manual	manual
Working	lever with rack	lever with rack
Test possible	Rockwell HRC A-D-B-F-G-L-M-R-N, Brinell	Rockwell sup. HRN + HRT, Brinell
Digital read out	Rockwell R N/mm <sup>2</sup>	Superficial Rockwell
Accuracy of result	0,1 HR	0,1 HR
Total height capacity	160 mm (215 without bellows)	160 mm (215 without bellows)
Total depth capacity	190 mm	190 mm
Max load of piece	1000 Kg	1000 Kg
RS 232 C output	included	included
Electrical power supply	220V 50 Hz 40 VA	220V 50 Hz 40 VA
Field of application	For all metals steel, hard steel, cast iron bronze, aluminium over 0,6 mm	As RSD serie with depth less than 0,6 mm and nitriding, cementatio, hard facing
Net weight	68 Kg	68 Kg
Packing weight	88 Kg	88 Kg
Packing measurements	37x60xH102 cm	37x60xH102 cm
Precision	in compliance with ISO 716 norm	in compliance with ISO 1079 norm

MODEL	RT2D	RTDEX/RTSDEX
Pre-load	10 Kgf (98,07) N, 3 Kgf (29,4) N	Available only for Rockwell and Super Rockwell measurements
Test loads	60-100-150 Rockwell (588-980-1471) N 15-30-45 Rockwell (147-294-441) N 62,5-125 Brinell (612-1226) N 15,6-31,2 Brinell (153-306) N	
Mode of operation	manual	
Working	lever with rack	
Test possible	Rockwell HRC A-D-B-F-G-L-M-R-N - Brinell Rockwell sup. HRN + HRT	
Digital read out	Rockwell R N/mm <sup>2</sup> , Rockwell superficiale/Brinell	
Accuracy of result	0,1 HR	
Floating head	160 mm (215 without bellows)	
Total depth capacity	190 mm	
Max load of piece	1000 Kg	
RS 232 C output	di serie	
Electrical power supply	220V 50 Hz 40 VA	
Field of application	For all metals iron, steel, tempered steel, cast iron, bronze, aluminium, copper, metal alloys, with thickness greather then 0,6 mm For thickness less than 0.6 mm and cemented layers, nitriding	
Net weight	68 Kg	
Gross weight	88 Kg	
Packing measurements	37x60xH102 cm	
Precision	in compliance with ISO 716 norm, in compliance with ISO 1079 norm	

	<i>SERIAL N°:</i>
_____	
_____	
_____	<i>CALIBRATION CODES:</i>

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External items of the kit:  
 n° 1 - hard board showing the conversion of all hardness  
 n° 1 - dust cover for the hardness tester when not in use

n° 1 - instruction manual and calibration certificate  
 n° 3 - anvils for round and flat pieces  
 n° 1 - hexagonal wrench for test loads selection  
 n° 2 - calibration test samples (HRC and HRB)

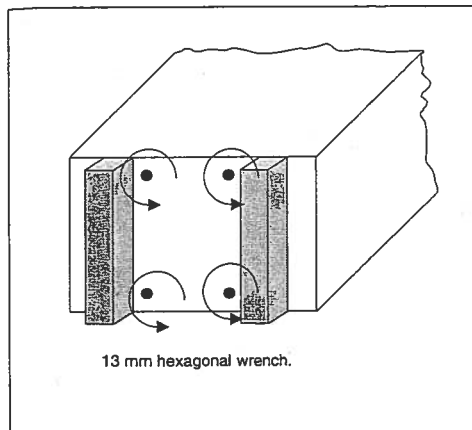
iron, aluminium and non ferrous metal  
 n° 1 - 1/16" penetrator for Rockwell on annealed steel, cast  
 100, 60 Kgf  
 n° 1 - 120° penetrator for Rockwell on hardened steel at 150,

**Contents of the accessories kit (standard version):**

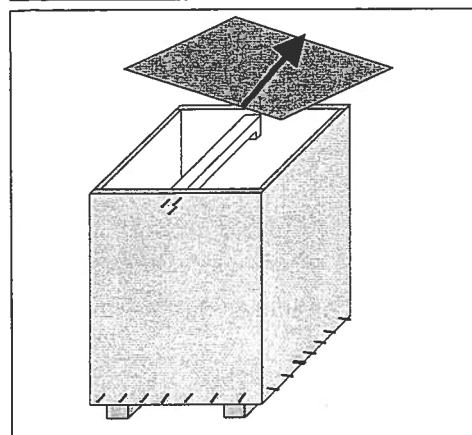




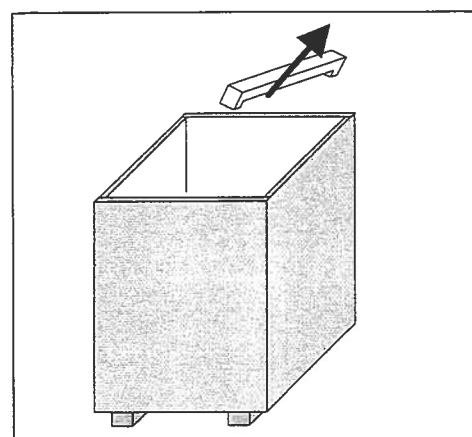
## 1 Unpacking



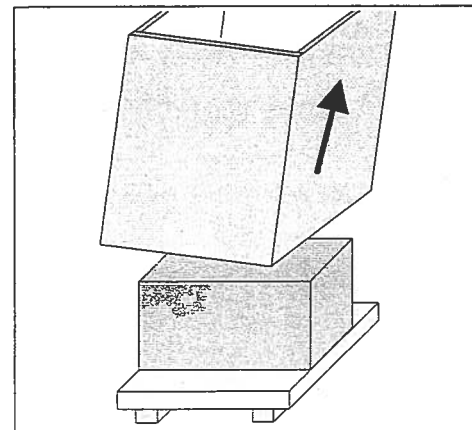
- Unscrew the bolts on the bottom of the box



- Remove the lid
- Pull the rivets out of the bottom part of the walls



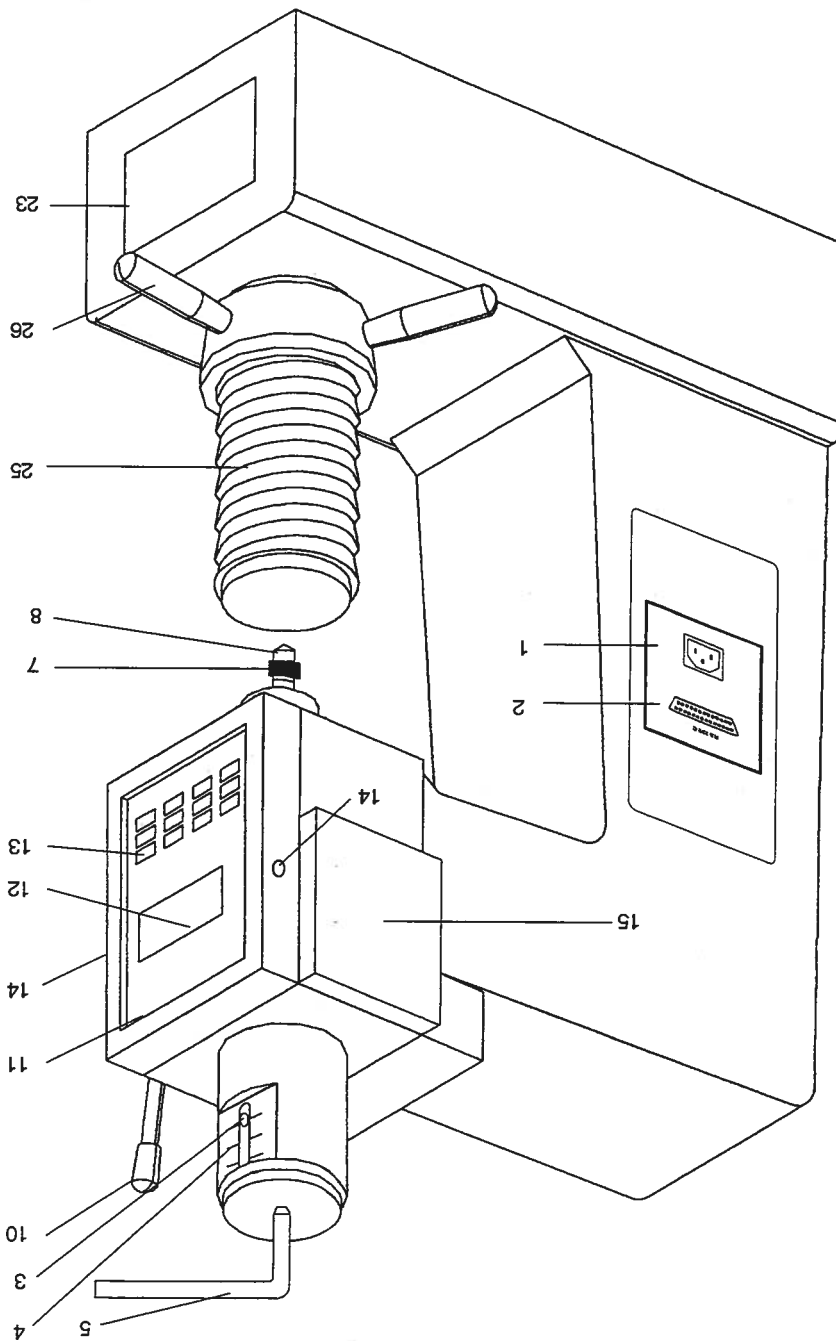
- Remove the horizontal stay on the hardness tester

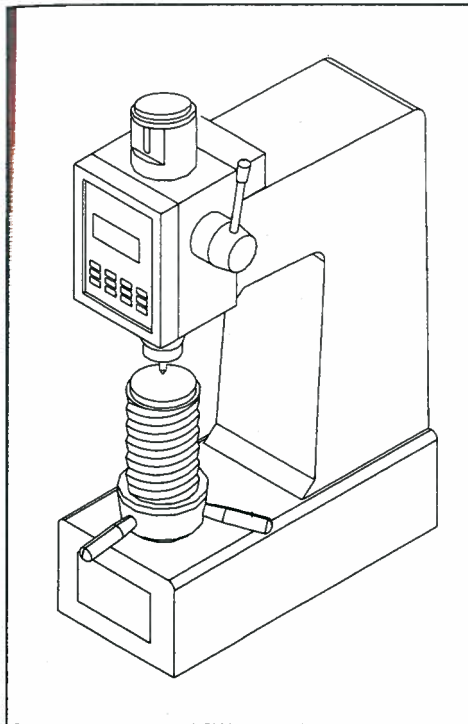


- Remove the container
- Put the instrument on the table with a central hole of about 80-90 mm to allow for the passage of the screw required for lifting piece
- Degrease the metallic parts with petrol **(don't use solvent)**

Mod. 206 parts references

- 1 Feeding connector
- 2 RS232C data output
- 3 Test load mobile selector
- 4 Available loads scale
- 5 Wrench to select tested loads
- 7 Ring nut to fix the penetrator
- 8 Penetrator
- 10 Test lever
- 11 Electronic unit
- 12 Display
- 13 Programming keyboard
- 14 Electronic unit anchor screws
- 15 Synchronism cover
- 23 Instrument identification plate
- 25 Anvil holder screw
- 26 Handwheel to regulate the rising screw



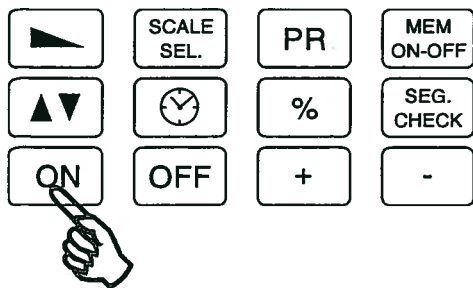


## 2 Electronic connection

Fit the electrical power supply cable to connect the rear socket of the hardness tester to an electrical outlet and verify the voltage indicated on the instruments:

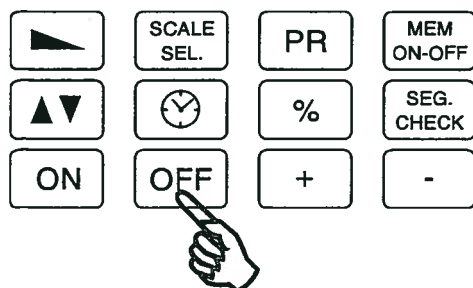
- 220 Volt 50/60 Hz
- 110 Volt 60 Hz

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### 2.1 Switch on

When starting the machine by pressing the **ON** button, the green light on the control panel located next to the display shall flash and the display shall show the symbol of the memorized scale.







### 2.2 Switch off

Press the **OFF** button on the keyboard. The display switches off. In this way the checking card is cut off from the power supply. To avoid overheating when the instruments not in use, it is advisable to unplug the feeder.


The numbers shall scroll rapidly, and the green light shall flash.



In order to speed up the scrolling of the two numbers on the display, press the button  while pressing  or .


To change it, push the  or  buttons to obtain the desired value.

Press the  button: a number appears and the lower yellow light  lights up. This is the minimum acceptable entered value.


### 3.4 Setting of allowance parameters

The time is displayed in tenths of a second. After setting the value, press the  button again to confirm it.


To change it, press the  or  buttons until the required time appears (see the suggested times table on page 17).

Press the  button, a numbers appear, corresponding to the seconds which the head presses on the load.

### 3.3 Time setting of load application

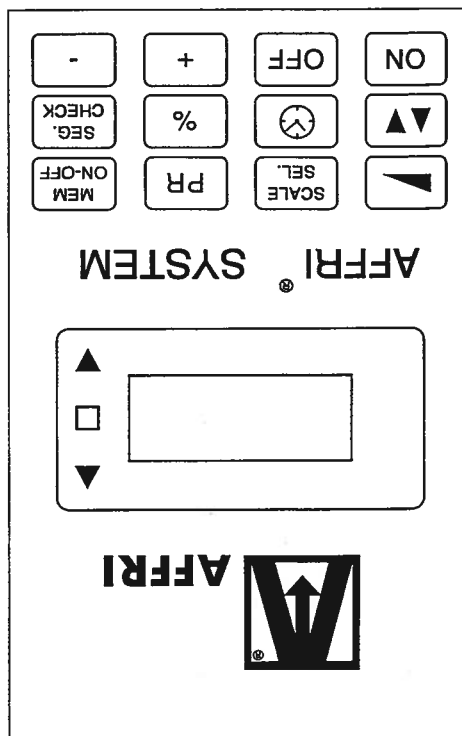
Press the  button several times: you will obtain the reading scales variation; their abbreviation will be displayed (see page 17).

### 3.2 Reading scale setting




To activate the instrument circuit, press the  button, then it will be possible to start the programming.




### 3.1 Programming of test parameters


## 3 Programming



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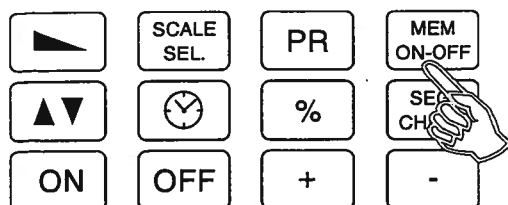
Press the  button again, a number appears and the upper ▲ red light lights up. This is the maximum acceptable limit, to change it, push  or  buttons.

In order to speed up the scrolling of the two numbers on the display, press the button  while pressing  or .

Then press the  again to confirm the setting values and the hardness scale will appear.

**Warning**


*The setting values are useful only on the programmed scale.*



**3.5 Storing data**



To store data, press  once. Storage capacity will hold about 300 tests.

**3.5.1 Re-examing measurements - Calculating the mean**




Stored measurements may be re-examined by pressing the key .

They will all reappear in sequence. The mean of all the measurements will also appear and will remain displayed until the next test.

**3.5.2 Canceling data**

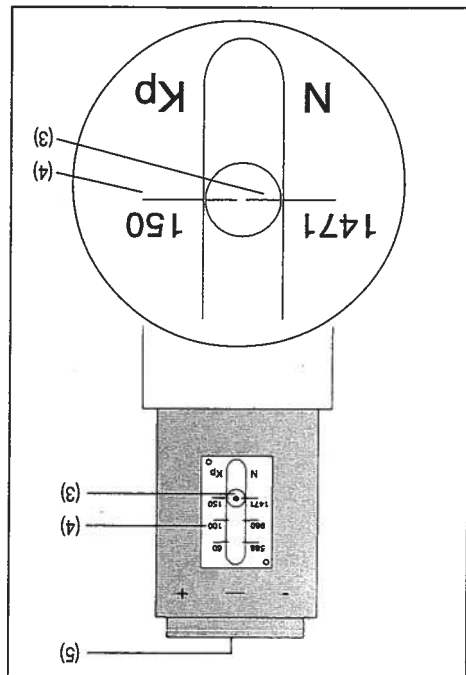
To cancel the last test carried out, press  before calling up the list of the tests with .

**3.5.3 Canceling the memory**

To delete the entire memory press the key . Press the keys  and  holding them down simultaneously. The red and yellow leds will light up and an acoustic signal will be heard. All stored data will be canceled.

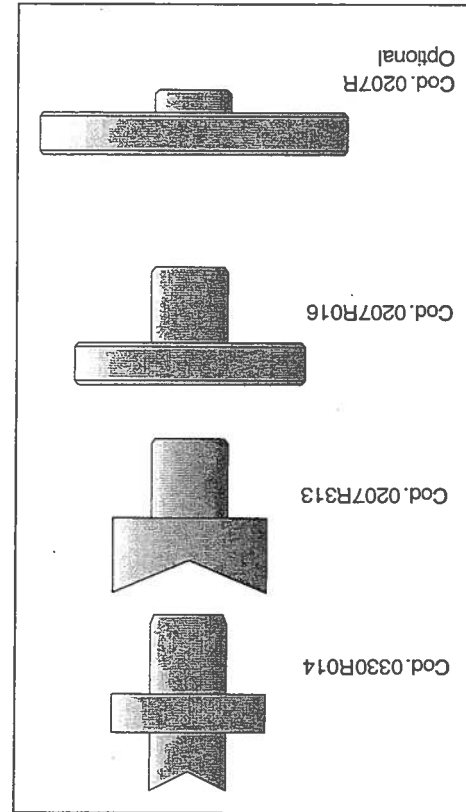


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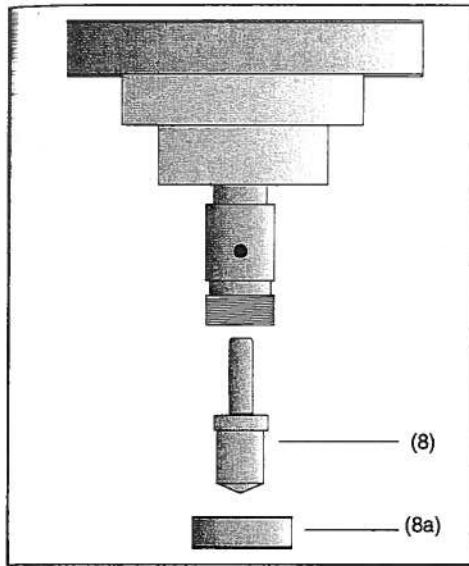
**3.6 Change of loads**

Turn the wrench(5) till the mobile indicator (3) coincides with the load required on the graduated scale (4).  
 By turning the wrench anti clockwise, the loads will increase (+).  
 By turning the wrench clockwise, the loads will decrease (-).  
 The Rockwell loads are on the right. The loads on the left are Newton values of Rockwell loads. In some versions, they can also stand for Brinell loads.



**3.7 How to change the anvil**

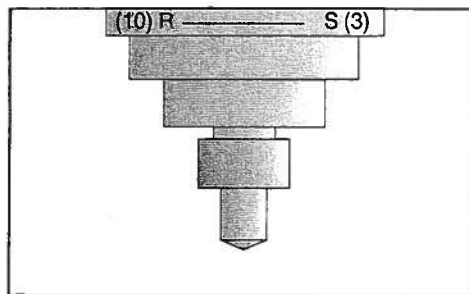
The standard kit is provided with 3 anvils:  
 the first can be used on 2 sides: it has a small rectified table on one and a V groove to hold little round pieces on the other.  
 The other two are one with a 60 mm table and one with a 60 mm V groove.  
 Choose the most appropriate one according to the shape of the piece degrease it and insert it into the anvil hole.  
 After use, grease the anvil and put it away in the kit box provided.  
 For tests on calibration test samples, use the anvil with the smallest top, code 0330R014.



### 3.8 Substitution of the penetrator

Loosen the ring nut (8a) and replace the penetrator (8) with a more suitable one. The first test made after each replacement should not be considered valid; it serves only to adjust the penetrator.

(For selecting the penetrator, see the table "Field of Utilisation")



### 3.9 Changing the pre-load

The RT2D version is equipped with a pre-load converter of 3 Kg for Super Rockwell testing  
10 Kg for Rockwell testing.

Before beginning the tests, select the pre-load from the model on page 17 and pages 22-23.

Screw the ring nut in all the way (in a clockwise direction) to stroke-end to obtain 3 Kg. To obtain 10 Kg, unscrew the ring nut (in a counterclockwise direction) until it is free.

#### 4 Linking the tester to a data printer

The AFFRI durometers, Digitronic series, are provided with a data transmission connector RS 232C, permitting interaction with all printers suitable for this connection.

The signals are available on standard connector with 25 poles.

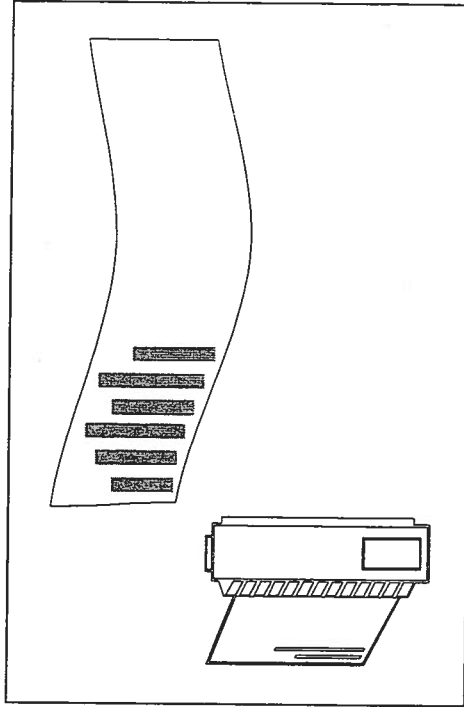
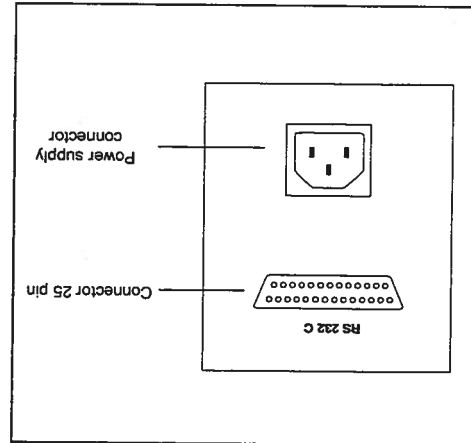
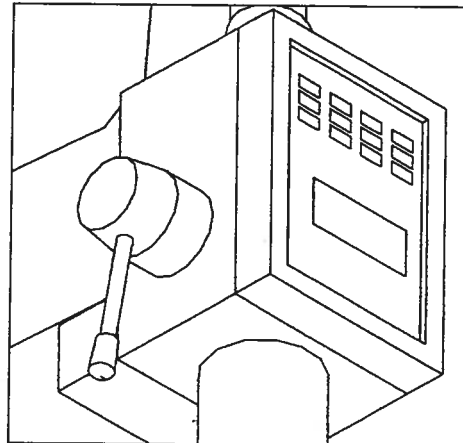
##### Transmission data code:

Baudrate 1200  
 1 BIT Stop  
 1 BIT Start  
 NO Parity  
 8 BIT Dat

Pin	Function
2	TXT Dato Trasnesso
5	CTS Busy
7	GND Ground Massa

##### Starting text at every reset:

AFFRI  
 Toler. 58.0 62.0  
 TEST # 01 HRC 59.2 HI  
 TEST # 02 HRC 59.0 HI  
 Mean Value HRC 59.1 HI  
 AFFRI



#### 4.1 Printing of stored values

Insert a serial link cable from the printer to the connector placed on the back of the command panel (verify the connections).  
 Set the printer OFF/LINE to store the testing results and operate as described in section 3.5.

Position the printer in ON/LINE.  
 Press the **PR** button; only the last stored data will be printed.  
 Press the **%** button to print the stored data list and the average of the values.

#### 4.2 Deletion of stored data

If you want to delete the last found value, press the **-** button. This operation must be performed before printing the values.



TAB 1

PROGRAMMING TABLE for direct reading								
DISPLAY SYMBOL	TEST	READING SCALE	PENETRATOR	PRE-LOAD	LOAD Kgf	NEWTON	APPLICATION FIELD	TIME SUGGESTED
<i>hrA</i>	Rockwell	HRA	diamond 120°	10	60	588,6	Cemented steel > 0,7 mm	3
<i>hrB</i>	Rockwell	HRB	ball 1/16"	10	100	981	Soft steel and non ferrous metals	3/6 *
<i>hrC</i>	Rockwell	HRC	diamond 120°	10	150	1471,5	Hardened steel > 1,2 mm	3
<i>hrD</i>	Rockwell	HRD	diamond 120°	10	100	981	Hardened steel > 1 mm	3
<i>hrE</i>	Rockwell	HRE	ball 1/8"	10	100	981	Soft steel and non ferrous metals	3/6 *
<i>hrF</i>	Rockwell	HRF	ball 1/16"	10	60	588,6	Soft steel and non ferrous metals	3/6 *
<i>hrG</i>	Rockwell	HRG	ball 1/16"	10	150	1471,5	Soft steel and non ferrous metals	3/6 *
<i>hrL</i>	Rockwell	HRL	ball 1/4"	10	60	588,6	Plastic	3/6 *
<i>hrM</i>	Rockwell	HRM	ball 1/4"	10	100	981	Plastic	3/6 *
<i>15n</i>	Rockwell	HRN(15)	diamond 120°	3	15	147	Hardened steel > 0,2 mm	3
<i>30n</i>	Rockwell	HRN(30)	diamond 120°	3	30	294	Hardened steel > 0,35 mm	3
<i>45n</i>	Rockwell	HRN(45)	diamond 120°	3	45	441	Hardened steel > 0,5 mm	3
<i>15t</i>	Rockwell	HRT(15)	ball 1/16"	3	15	147	All soft metals > 0,2 mm	3/6 *
<i>30t</i>	Rockwell	HRT(30)	ball 1/16"	3	30	294	All soft metals > 0,35 mm	3/6 *
<i>45t</i>	Rockwell	HRT(45)	ball 1/16"	3	45	441	All soft metals > 0,5 mm	3/6 *
<i>Hb30</i>	Brinell	HB30	ball 2,5 mm.	10	187,5	1839,37	Cast iron	3/6 *
<i>Hb30</i>	Brinell	HB30	ball 2,5 mm.	10	187,5	1839,37	Carbon steel	3/6 *
<i>Hb10</i>	Brinell	HB10	ball 2,5 mm.	10	62,5	613,12	Light alloy, bronze copper	3/6 *
DIRECT CONVERSION								
<i>b hrB</i>	Rockwell <sup>(1)</sup>	Brinell	ball 1/16"	10	100	981	Hardened steel 226-500 HBS	3/6 *
<i>b hrC</i>	Rockwell <sup>(1)</sup>	Brinell	diamond 120°	10	150	1471,5	Hard steel 226-450 HBS	3
<i>b:hrC</i>	Rockwell <sup>(1)</sup>	Brinell	diamond 120°	10	150	1471,5	Hard steel over 450 HBW	3
<i>u hrC</i>	Rockwell <sup>(1)</sup>	Vickers	diamond 120°	10	150	1471,5	All steel 238-940 HV	3
<i>Hu</i>	S. Rockwell <sup>(1)</sup>	Vickers	diamond 120°	3	15	147,15	Hardened steel	3
<i>r</i>	Rockwell <sup>(1)</sup>	R. N mm <sup>2</sup>	ball 1/16"	10	100	981	Soft steel and brass	3/6 *
<i>c 15n</i>	Rockwell <sup>(1)</sup>	HRC	diamond 120°	3	15	147	Hardened steel	3
<i>c 30n</i>	Rockwell <sup>(1)</sup>	HRC	diamond 120°	3	30	294	Hardened steel	3
<i>c 45n</i>	Rockwell <sup>(1)</sup>	HRC	diamond 120°	3	45	441	Hardened steel	3
<i>b 15t</i>	Rockwell <sup>(1)</sup>	HRB	ball 1/16"	3	15	147	Soft steel and ferrous metals	3/6 *
<i>b 30t</i>	Rockwell <sup>(1)</sup>	HRB	ball 1/16"	3	30	294	Soft steel and ferrous metals	3/6 *
<i>b 45t</i>	Rockwell <sup>(1)</sup>	HRB	ball 1/16"	3	45	441	Soft steel and ferrous metals	3/6 *

**Note:**

- \* Use 3 seconds for high hardness materials
- Use 6 seconds for low hardness materials

- (1) You can convert Rockwell and Super Rockwell measurements to the required scale as follows:  
When the value of the measurement appears on the display, press the button **SCALE SEL.** to select the conversion scale.

Then press **PR** The converted value will appear on the scale selected. Conversion is automatically shown for subsequent measurements. To set a new scale, select it using **SCALE SEL.**

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## 5 Using the machine

Check to see that the lever (10) is turned until it comes to a standstill, towards the operator (towards the front of the instrument). Set the piece to be examined on the anvil.

Turn the handwheel (26) to raise the test sample until it comes in contact with the penetrator (8).

As soon as the display shows the value 9 and the yellow ▲ led lights up, continue turning the handwheel (26) slowly until the value 0 appears on the display and the green led ■ lights up. If the red led ▼ lights, this means that the handwheel (26) has been raised too high. Turn the wheel (26) in the opposite direction to free the test sample. Shift the test sample a few millimetres and repeat the operation.

Push the lever (10) in a clockwise direction (towards the back of the machine). The word STOP will appear and will remain displayed for the pre-set time. After that, the red led ▼ will flash intermittently and you will hear an acoustic signal.

At this point, pull the lever (10) in a counterclockwise direction (to a front position) until it stops.  
Read the hardness value on the comparator.

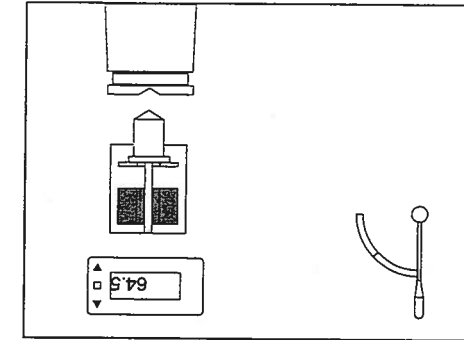
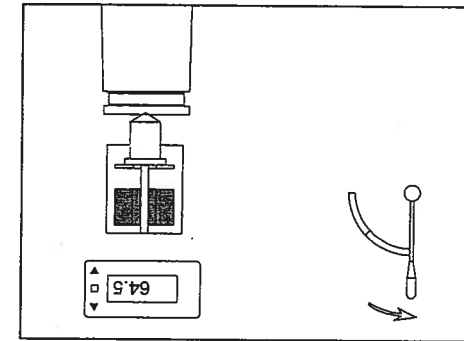
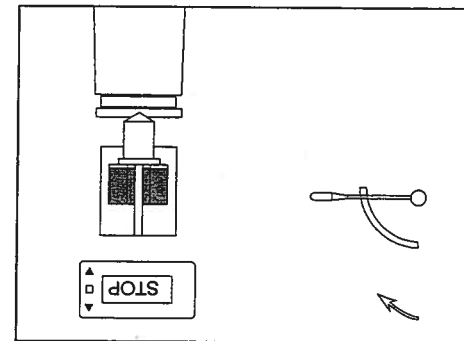
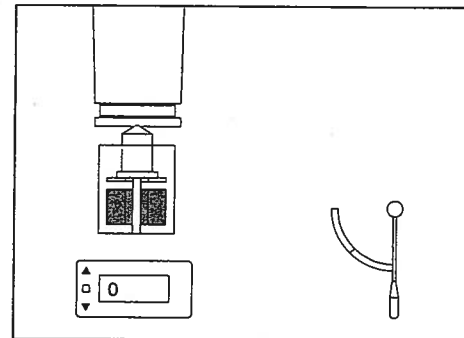
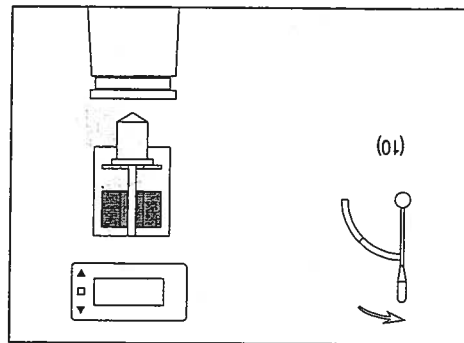
The test is finished: unscrew the handwheel (26) to free the test sample and remove it.

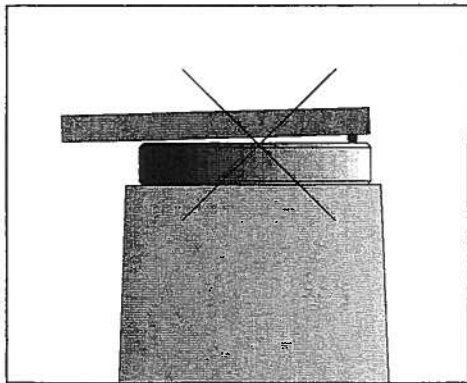
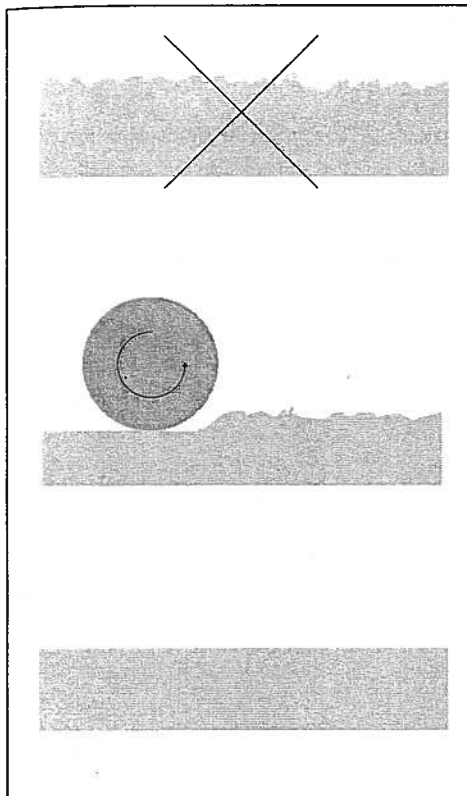
The three leds indicate:

Red led ▼ illuminated: the result is over tolerance limits

Yellow red ▲ illuminated: the result is under tolerance limits

Green led ■ illuminated: the result falls within the pre-set tolerance limits.





## 6 Preparation of the surface to be tested

The accuracy of the measurement depends mainly on the roughness of the surface under examination.

The better the finish of the piece, the greater the reading accuracy will be. The best roughness is  $Ra < 0,3 \mu m$ .

**Never** carry out tests on raw surfaces as in this way, only the scale will be tested and not the material, and there is the risk of damaging the penetrator.

If possible, either grind the surface, or smooth the surface with tools taking care not to overheat the metal, then by using emery cloth, polish the side to be tested.

A few square millimetres, where the penetrator and piece presser guide lay, will be enough.

If the piece cannot be polished, so as not to damage the surface, carry out at least 3 tests, then average.

Vickers and Brinell tests need a bright surface.

The distance among the tests should be enough (2/3 mm. for loads up to 150 Kg). For greater loads, the distance must be 5 mm minimum.

The surface under test must be parallel with that opposite. During the test the piece must lie still, otherwise, repeat the test taking care that the piece is steady enough.

Accurately clean the surface under test by removing oil, grease and rust. Every 1000 tests clean the penetrator, and if a ball penetrator is used, replace it.

## 7 Selection of the testing load, (according to the thickness of the piece)

A proper load is necessary to obtain valid and precise results.  
To find them, follow this simple rule:

- 1° measure the thickness of the piece to be tested
- 2° estimate the approximate hardness of the piece.

*N.B. You must evaluate the thickness of the piece-testing part.  
Should the piece have been treated or hardened, the surface  
thickness considered is that of the tested part, not of the whole  
piece.*

If the piece has been tempered, consider the thickness of the  
whole piece.

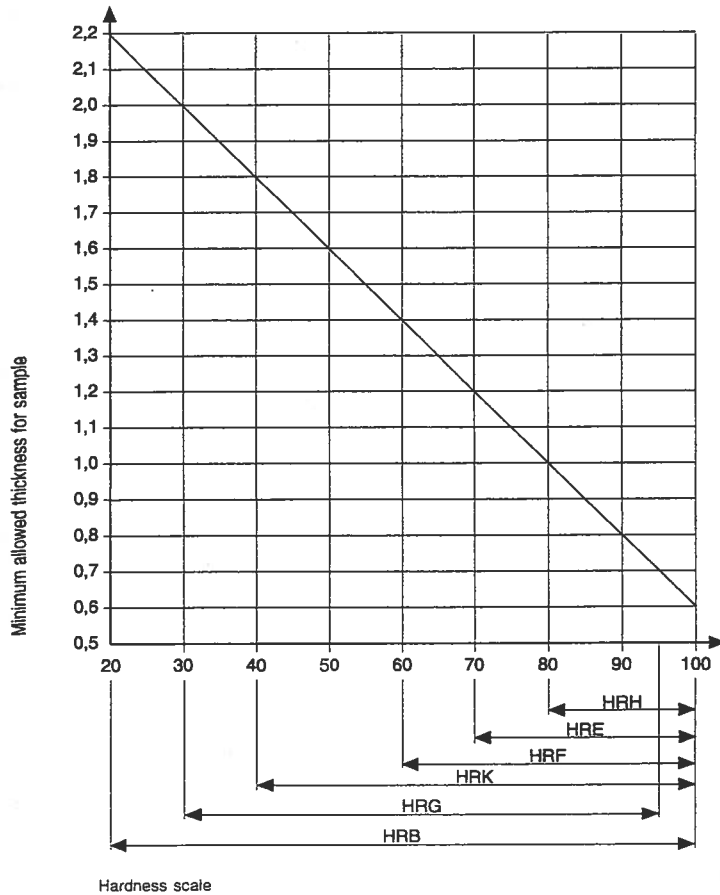
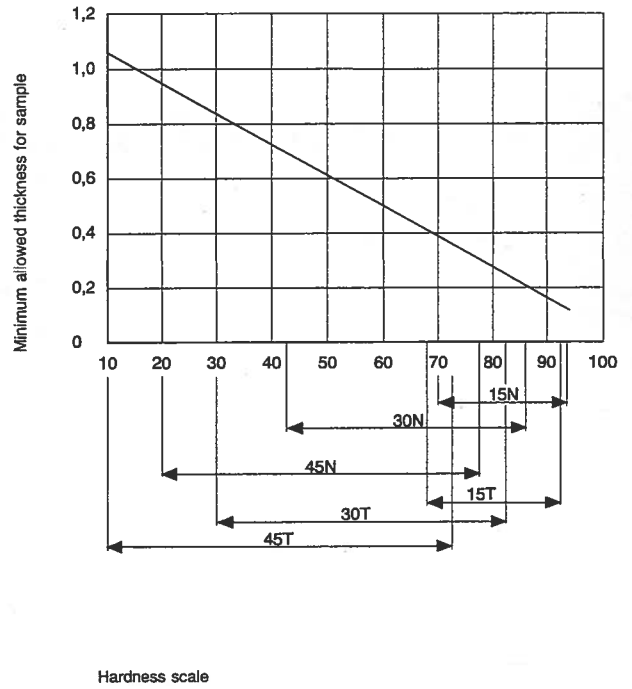
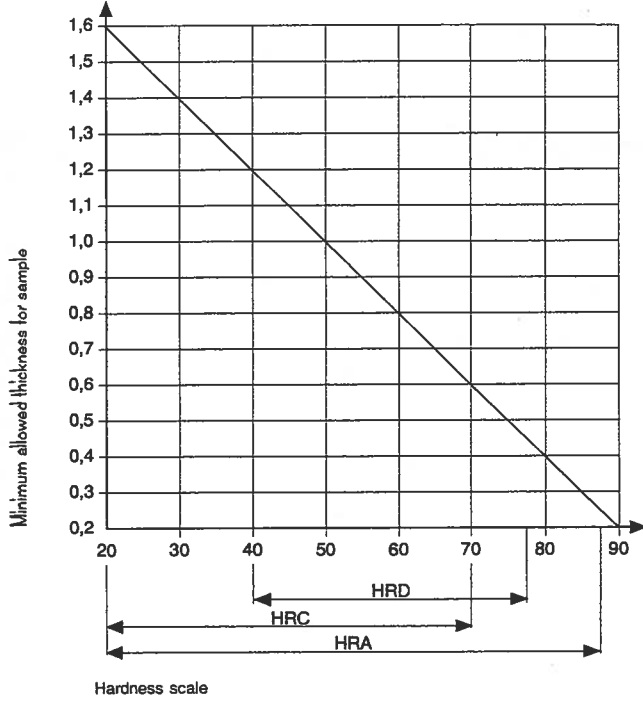
In the following tables you will find some diagrams, each of  
them corresponding to a different kind of test.

Example:

The test sample has a thickness of 1 mm and an approximate  
hardness of 60 HRC. If you look for the crossing between HRC  
values and mm, you will find out that your test is valid since the  
minimum allowed thickness is 0,8 mm.



## DIAGRAM OF MINIMUM ALLOWED THICKNESS FOR HARDNESS MEASUREMENT



ENGLISH

Some tests which may be carry out  
Digital RT series HARDNESS TESTER



TAB 2

INSTRUMENT PREPARING FOR EVERY READING SCALE		APPLICATION FIELD	
HARNES SCALE	PRE-LOAD	LOAD	PENETRATOR
Rockwell			
HRC *	10	150	Diamond 120°
HRD *	10	100	Diamond 120°
HRA *	10	60	Diamond 120°
HRB *	10	100	Ball Ø 1/16"
HRF *	10	60	Ball Ø 1/16"
HRG *	10	150	Ball Ø 1/16"
Brinell			
HB 30 *	10	187,5	Ball Ø 2,5 mm
HB 30 *	10	187,5	Ball Ø 2,5 mm
HB 10 *	10	62,5	Ball Ø 2,5 mm
HB 5	10	125	Ball Ø 5 mm
Vickers			
HV 60	10	60	Diamond 136°

(\*) AFFRI Digitronic hardness scales (other measurement scales, shown on page 17, may be supplied upon request).  
Any other scale is found using the microscope.  
When the utilization field is identical, choose the suitable load according to the thickness of the piece to be tested. See minimum thickness diagram.

Some tests which may be carry out  
Digitronic 206 RTSD - 206RT2D

TAB 2.1

INSTRUMENT PREPARING FOR EVERY READING SCALE				APPLICATION FIELD
HARDNESS SCALE	PRE-LOAD	LOAD KFG	PENETRATOR	
<b>Rockwell</b>				
HR 15 N *	3	15	Diamond 120°	Hardened steel > 0,2 mm.
HR 30 N *	3	30	Diamond 120°	Hardened steel > 0,35 mm.
HR 45 N *	3	45	Diamond 120°	Hardened steel > 0,5 mm.
HR 15 T *	3	15	Ball Ø 1/16"	For all soft metals > 0,2 mm.
HR 30 T *	3	30	Ball Ø 1/16"	For all soft metals > 0,35 mm.
HR 45 T *	3	45	Ball Ø 1/16"	For all soft metals > 0,5 mm.
<b>Brinell</b>				
HB 30	3	30	Ball Ø 1 mm.	For soft ferrous metals > 0,8 mm.
HB 5	3	31,2	Ball Ø 2,5 mm.	For aluminium copper bronze
HB 2,5	3	15,6	Ball Ø 2,5 mm.	For pure aluminium, soft material
<b>Vickers</b>				
HV 15	3	15	Diamond 136°	For hardened metals > 0,8 mm.

(\*) AFFRI Digitronic hardness scales (other measurement scales, shown on page 17, may be supplied upon request).

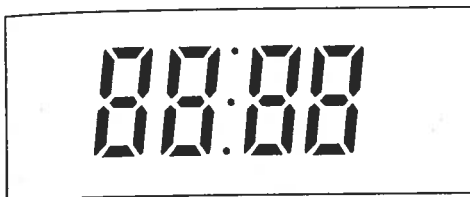
Any other scale is found using the microscope.

When the utilization field is identical, choose the suitable load according to the thickness of the piece to be tested. See minimum thickness diagram.


## 8 Notes for correct hardness-tester operation

- Be sure the test piece is tightly fixed on the anvil and its surface is perpendicular to the penetrator.
- Be sure the piece is parallel to the holding base.  
(See table, pages 14, 18-19).
- Clean the surface of the piece removing oil, rust and any trace of roughness. The upper surface to be examined must be as smooth as possible. The best would be a roughness of  $<Ra\ 0,3\ \mu m$ . (the hardness tester measures the penetration depth so if the surface to be measured is rough this can influence the test).
- Clean all the surfaces of the calibration test, the anvil and the penetrator carefully. You should use a cloth dampened with petrol or alcohol removing oil or grease. Be sure the surface has no indentation on it, or the test results won't be correct.
- Use the calibration test only on the engraved surface. Each test must distance the previous mark by at least 3 times and 3 mm. from the sample edges.
- Should the measurements not be known for certain, carry out some tests on the test sample supplied as equipment. Should the measurements be incorrect, carry out tests with another scale, test sample and penetrator, and if in this case the rates obtained are correct, replace the penetrator of the first scale. Request the spare part from the factory.
- The penetrator must always be in good condition in order to obtain the best results, carry out some tests on the samples supplied. Should the measurements be incorrect, ask for a new original penetrator. You will avoid damaging your instrument!
- Never use the hardness tester without the piece press, unless it has already been set up for this function.
- Do not vary the testing load to correct the calibration.





### 8.1 Display segments check control

By pressing the  button, all segments shall appear as showed below. If some segments do not appear, please contact our technical service for repair.

## 9 Calibration

- Check the tester calibration by the checking sample provided. 2 or 3 tests will be sufficient. The hardness tester is calibrated when the results don't exceed the tolerance of the INTERNATIONAL CALIBRATIONS VALUE TABLE RATES. If this is not the case, replace the penetrator - always ask for original parts if you want to avoid damaging the internal components of your instrument and to obtain precise and guaranteed values.

## Maintenance

AFFRI hardness testers don't require any special care. Nevertheless you must follow the listed precautions in order to obtain precise and reliable tests:

- Check the hardness tester calibration every 500 tests. Carry out some tests on the test sample.
- Check the penetrator every 500 tests, looking carefully through it with a magnifying lens. If you find any irregularity, it will be necessary to return the penetrator to our company to regrind it.
- Clean the penetrator and its guide every 500 tests using a cloth.
- Put the sample tests away in their supplied boxes.
- Keep the anvils clean; eliminate any traces of oxide and remove any dents on the surface

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# **USER'S GUIDE**

## Hardness information



## AFFRI Hardness testers

Affri's durometers comply with the international 6508 ISO standard for establishing hardness according to the Rockwell method. It also can generate Brinell and Vickers print in compliance with 6506 ISO and 6507 ISO standard.

### Rockwell

The Rockwell method is the most used for its speed in determining the result, which is obtained directly on the display in the Digitronic-version, and on a mechanic dial in the RT and RS versions.

### Brinell

This method is limited to soft materials (i.e. not hardened) and requires a more accurate preparation of the surface under examination. The reading is possible through a microscope, which enlarges the print obtained. On the other hand, AFFRI's durometer allows quick Brinell measures to be taken without the need of the microscope. For its use, follow the instructions given.

### Vickers

This method is more complicated than the Brinell method as the surface under examination has to be perfectly polished. The hardness test is obtained through a microscope-reading of the square-based print diagonals left by the 136° diamond penetrator. No other ways of obtaining these ratings are possible.

For additional information on test methods, consult the standards:

ISO 6506	for Brinell tests
ISO 6508	for Rockwell tests
ISO 1024	for superficial Rockwell tests
ISO 6507	for Vickers tests

## Rockwell

The Rockwell method is suitable for all metals

Hardened and case-hardened steels

Use 120° diamond penetrator:

150 Kg.	for HRC	thickness < 1.2 mm
100 Kg.	for HRD	thickness < 1 mm
60 Kg.	for HRA	thickness < 0.7 mm

15 Kg.	for HR15 N	for thin thickness > 0.2 mm
30 Kg.	for HR30 N	for thin thickness > 0.35 mm
45 Kg.	for HR45 N	for thin thickness > 0.5 mm

Soft steels, iron, annealed metals, cast irons, aluminum, bronze, copper

Use 1/16" ball penetrator; test load

100 Kg.	for HRB	for soft steels, annealed steel, iron > 2 mm
60 Kg.	for HRF	for pure aluminum, soft metals > 1.2 mm
150 Kg.	for HRG	for cast iron and hard bronze > 1.8 mm

15 Kg.	for HR15 T	for thin thickness > 0.2 mm
30 Kg.	for HR30 T	for thin thickness > 0.35 mm
45 Kg.	for HR45 T	for thin thickness > 0.5 mm

HRA/HRB/HRC/HRD/HRF/HRG/HRN/HRT/these are the reading scales according to the presetting of the durometer

Any hardness rating which has been read can be easily changed to another hardness scale by following the hardness conversion table supplied for the use of every instrument.

For example, if the figure is 30 on the HRC scale, this corresponds to 65.5 of the HRA scale, or 298 on Brinell's scale.

Indication of obtained results.

In compliance with international ISO 6507 standards, you must indicate the results of your test as following:

ISO 6508

HRC 60 = Rockwell hardness 60, under a load of 150 Kg.

ISO 1024

HR15N90 = Rockwell surface hardness, under a load of 15 Kg and diamond penetrator 120°.

## Brinell

**The Brinell method is suitable for soft metals, non ferrous metals and cast irons**

Some AFFRI durometer versions are also preset for direct **Brinell's** measurement. (The test loads: 15.6 - 31.2 - 30 - 125 - 187.5 are supplied according to the model chosen)  
Simply equip the instrument with a 1 mm or 2.5 mm penetrator with its suitable calibration sample and the 1216 microscope.  
After having set up both the penetrator and the sample, see 2 and 2.1 tables.

Test the piece and measure the print diagonal using our 1216 microscope. Consult the Brinell tests table to convert the obtained value into Brinell figures.

For quick and comparative measurements, some models are provided with commonly used scales which can be obtained in digital versions:

HB 30 with 187.5 load  
HB 10 with 62.5 load

### Cast irons

Use 2.5 ball penetrator with load:

187.5 K g. for HB30

### Non ferrous metals (aluminium, bronze, brass)

Use 2.5 ball penetrator with load:

62.5 Kg for HB 10

On dial versions read the scales on the black dial from 0 to 100 as in the Rockwell test convert, then, the obtained value in Brinell figures, carrying out the direct reading of the Brinell tables.

**Very soft non ferrous metals (pure aluminium)**

Use 5 ball penetrator with load:

125 Kg. for HB 5

For example, if we use a 62.5 Kg. load 2.5 mm penetrators the figure on the comparator will be 40, which corresponds to 50.2 Brinell HB10. Some tables are shown below, one for each type of material.

HB5 - HB10 - HB30: these are Brinell's hardness scales which show the Brinell ratio.

Indication of obtained results.

In compliance with international ISO 6507 standards, you must indicate the results of your test as following:

ISO 6506  
 HBW 2,5 - 187,5 - 200 HB Brinell hardness  
 Test load 187,5  
 Wida ball Ø W 2,5  
 Obtained value = 200.



## Vickers

### Use Vickers method only when indispensable

For the Vicker's method only one penetrator is required.

136° pyramidal diamond for all types of metals: both hardened and soft.

This diamond can be used with a large range of loads: 1 gr to 120 Kg. according to the thickness of the piece being tested and its estimated hardness.

In order to protect the sharp corners of the diamond penetrator, exercise the greatest care when carrying out the test, and using a lapping machine or a diamond paste, carefully smooth the surface.

By using our hardness tester with the loads supplied, **Vickers'** prints can be obtained.

With special equipment prepare the surface under examination. If tests with loads exceeding 45 Kg be carried out. the surface can be prepared with emery cloth of varying grains and a 500 grain emery cloth has to be used for the final polishing, until the surface is smooth, that is, without pits.

After making the print on the material being tested, a print survey must be made.

Our MIBRI 1216 microscope has a micrometric scale with more than 90° rotation for reading the two opposite diagonals of the Vickers's print.

The light supplied with the microscope will remove any marks from the test piece and will enhance the definition of the indentation.

#### Indication of obtained results

In compliance with international ISO 6507 standards, you must indicate the results of your test as following:

200 HV30 = Vickers hardness 200 with 294.3 N testing load (30 Kg).

Each one of these must be used with the appropriate loads, which are calculated with a formula and according to the thickness of the piece to be examined.  
The ball must have a preset ratio with the test load of 2.5 - 5 - 10 - 30 square D. (D is the square ball diameter).

- Ø 10 mm BALL
- Ø 5 mm BALL
- Ø 2.5 mm BALL
- Ø 1 mm BALL

**Brinell method uses the following penetrators:**

These devices can be used with test loads of 15 - 30 - 45 - 60 - 100 - 150 Kgf. The first form superficial Rockwell scales (namely: Super Rockwell scale), while the 60 - 100 - 150 loads form the STANDARD ROCKWELL SCALES.

- 120° CONIC DIAMOND for all hardened steels
- 1/16" BALLS for nearly all soft metals, annealed steels, cast irons, aluminium alloy, bronze, etc.
- 1/8" BALL for plastic materials
- 1/4" BALL for plastic materials
- 1/2" BALL for plastic materials

**With the Rockwell method the following penetrators are used:**

These are manufactured in different sizes and shapes, each one of which is type-tested according to these different test methods: Rockwell, Brinell, Vickers. They are fixed to the instrument by a thread.

The penetrator is a point with the shape and size designed to indent the material under examination by applying a load.

**Penetrator**

**Glossary**

**ENGLISH**



### Test load

This is the force applied to the penetrator which allows penetration in the material being tested.

### Reading scale

These are the hardness degrees obtained after penetrating the material by means of a penetrator and a test load.

### Anvil

The piece-holder can be of different sizes and shapes: "V" shapes for round pieces; flat, for flat pieces.

### Handwheel

This is used for lowering or raising the anvil-holder screw which changes the serviceable part and brings the piece being tested to the penetrator.

### Calibration test sample

This is the reference mark for checking the machine's perfect calibration: it is manufactured with a special alloy submitted to special treatment. Regulations forbid regrinding used, pitted surfaces or taking measurements on the side opposite the pitted surface.

On Rockwell samples the distance between tests must at least be 2 mm. On Brinell samples it must at least be as big as the previous print diameter.

When the samples are full of marks, ask our firm for new original ones.

### How to find defects and eliminate them

Defect	Probable cause	Correction
--------	----------------	------------

Pushing  button on the display does not light up  
 Electrical power supply defective  
 Check the power line. Check the input connector to the hardness tester

During a measurement, the number on the display doesn't change  
 Test data is not confirmed  
 Push  and  buttons.

During the test the word STOP is not displayed  
 Check to see that the lever is working correctly (10)  
 Repeat the operation, following the instruction

Repeat the operation, making sure that the lever runs through its entire range until it reaches the stroke-end stops.

During measurement the value 100 appears under HRC scale or the value 130 appears under HRB  
 Out of scale  
 The hardness of the piece is higher than the maximum value of the scale. (See employment field table and repeat the test)

The penetrator has not been inserted correctly  
 (See assembling of penetrator on the User's guide)

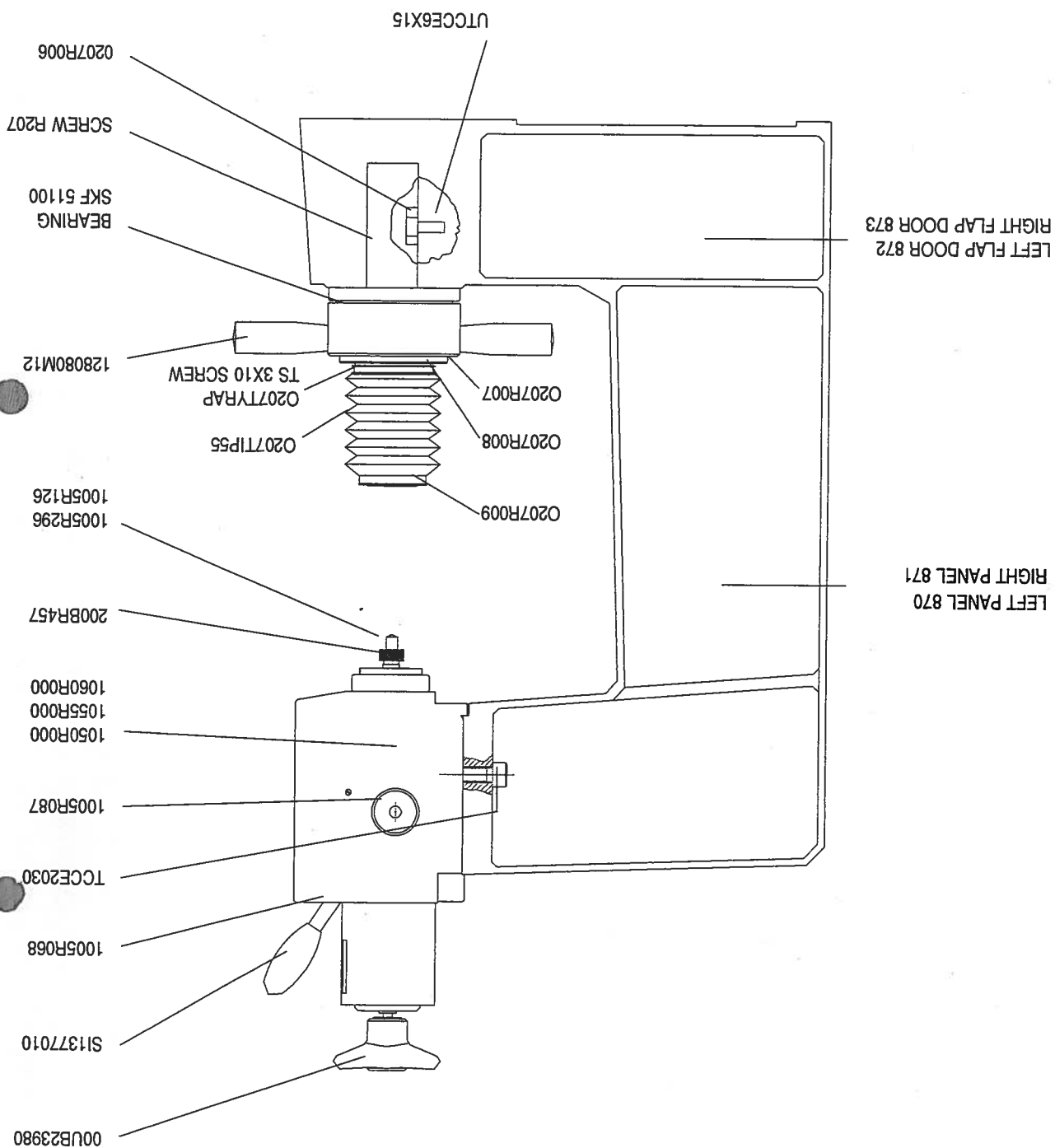
Incorrect operation of the lever  
 Repeat the operation, making sure that the lever runs through its entire range until it reaches the stroke-end stops.

The value 999.9 appears under Brinell scale  
 Out of scale  
 The hardness of the piece is higher than the maximum value of the scale. (See employment field table on the User's guide and repeat the test)

Defect in the reading scale  
 Ask our technician assistance

Defect	Probable cause	Correction
<p>Diamond penetrator breaks easily</p>	<p>Wide stroke of the floating head</p>	<p>Check the handwheel (17), it could be unscrewed. (See this manual)</p>
	<p>Penetrator misalignment to the round surface to be examined</p>	<p>Check the penetrator centering. (See Assembling of anvil base in the User's guide)</p>
	<p>The piece is not correctly positioned on the base or on the anvil</p>	<p>Verify that the piece face is flat and eliminate any indentation of metal shaving. In case of tests close to edges, stirrup the piece before the measurement</p>
<p>The results are not up to expectations</p>	<p>The instrument is not correctly used</p>	<p>See the User's guide and make sure that all elements are correctly used (scale, load, penetrator, pre-load, testing time)</p>
	<p>The penetrator could be worn</p>	<p>Carry out 3 tests on test piece. If the values are always different, the penetrator must be replaced. Always use original spare parts to maintain the validity of the warranty!</p>
	<p>Using an anvil which is too large</p>	<p>Use a smaller anvil</p>

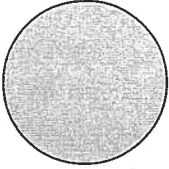
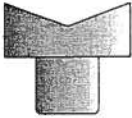



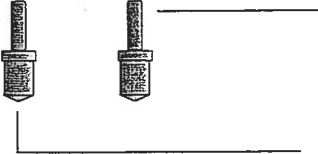

ENGLISH



Spare parts list mod. 206

ENGLISH

80  
10  
8  
30  
7  
7  
2  
207

OPTIONS	CODE	DESCRIPTION
	0207R010 0207R012 0207R017 0207R018	HRC TEST BLOCK HRB TEST BLOCK HR 30N TEST BLOCK HR 30T TEST BLOCK
	0207R313	"V" ANVIL
	0207R014	COMBINED SPOT FLAT + "V" ANVIL
	0207R015	FLAT ANVIL
	0207R329	LARGE FLAT ANVIL (OPTIONAL)
	1005R296  1005R126	ROCKWELL BALL W 1/16" PENETRATOR  ROCKWELL DIAMOND PENETRATOR
	200BR457	RING NUT FOR ATTACHING PENETRATOR

ENGLISH

