

**DIGIROCK-RBOV-M**  
DIGITAL MOTORISED ROCKWELL,  
BRINELL & VICKERS  
*HARDNESS TESTER WITH TOUCH SCREEN*



OPERATIONAL MANUAL

**BMS Bulut Makina Sanayi ve Ticaret Ltd. Şti.**

Kocaeli KOBİ Organize Sanayi Bölgesi

Köseler Mahallesi, 6.Cadde No: 20/2 Dilovası / KOCAELİ / **TURKEY**

Phone: +90 262 502 97 73-76 / +90 262 503 06 51

web site : [www.bulutmak.com](http://www.bulutmak.com) e-mail : [bms@bulutmak.com](mailto:bms@bulutmak.com)

1	Technical Features.....	3
2	Standard Accessories.....	3
2.1	Optional Accessories.....	3
3	Unpacking Of Equipment.....	5
4	Setting Into Operation for Rockwell Hardness Testing.....	5
5	Rockwell Hardness Testing (EN 6508-1, ASTM E18).....	5
6	Brinell Hardness Testing (EN 6506-1, ASTM E10).....	6
6.1	Setting Into Operation for Brinell Hardness Testing.....	6
6.2	Sample of Reading Indentation.....	6
7	Vickers Hardness Testing (EN-6507-1, ASTM E-92).....	6
8	Test Methods.....	7
9	Prior to Test.....	8
10	Choosing the Test Load.....	8
10.1	Main Screen.....	9
11	Testing.....	9
12	Test Method.....	9
13	Brinell Test.....	9
14	Vickers Test.....	9
15	Records.....	9
16	Settings.....	10
17	Calibration.....	15

# 1 Technical Features

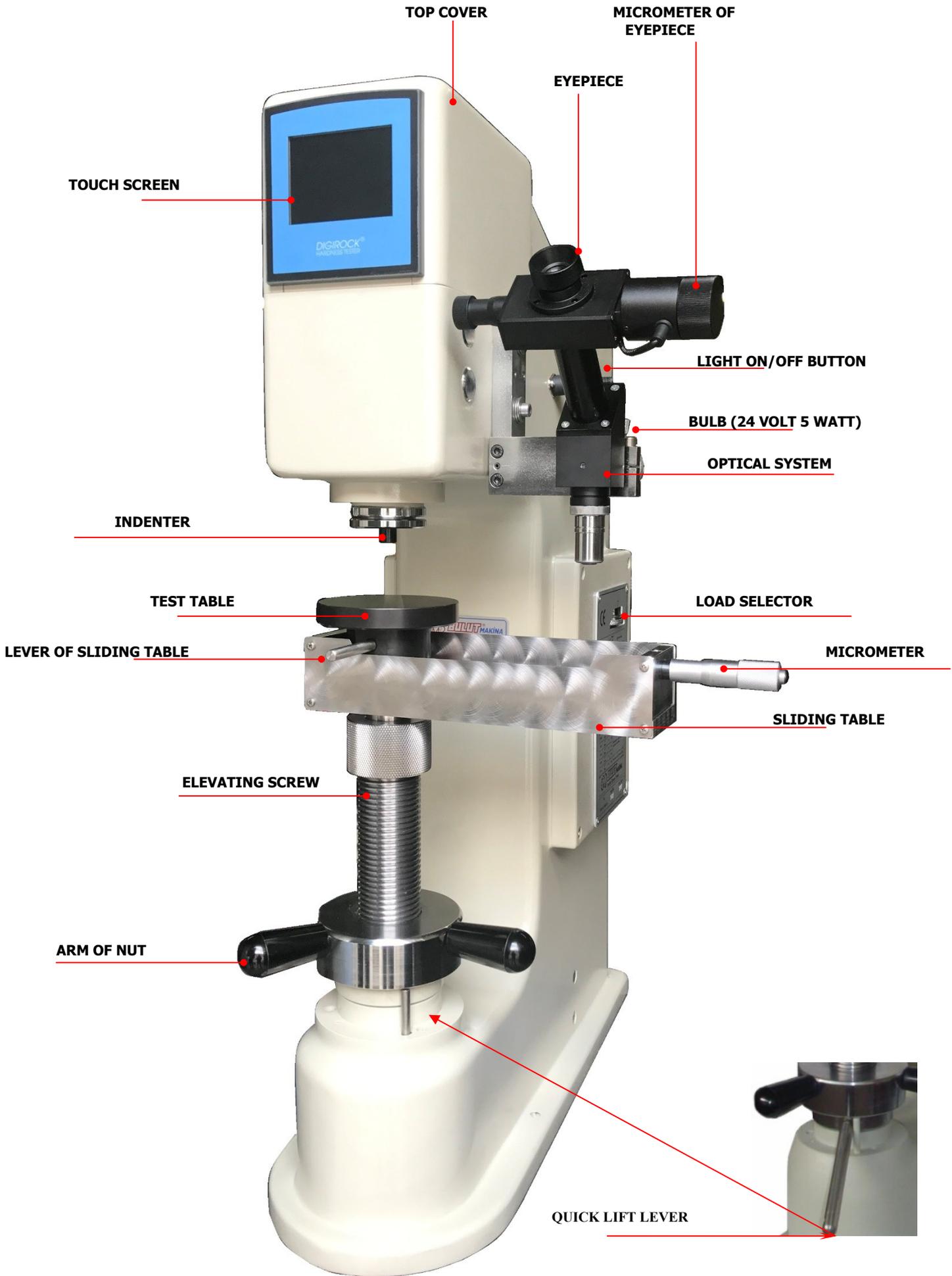
<b>Pre-load ( kgf )</b>	10
<b>Loads (kgf )</b>	60;100;150 Rockwell 62.5;187.5 Brinell 30 Vickers
<b>Load selection</b>	Load Selector
<b>Test methods</b>	Rockwell,Brinell & Vickers
<b>Load application</b>	Motorised
<b>Max. testing height</b>	With sliding table 140 mm, without sliding table 240 mm
<b>Throat</b>	145 mm
<b>Machine dimensions</b>	780X500X360 mm
<b>Case dimensions</b>	950x700x350 mm
<b>Weight (net/gross)</b>	95 / 125 kg
<b>Optical system</b>	75X magnification for Brinell 150X magnification for Vickers
<b>Power</b>	220 V, 50Hz

## 2 Standard Accessories

Rockwell Diamond cone indenter  
Vickers Diamond pyramide indenter  
1/16" ball indenter  
2.5mm ball indenter  
HRC test block  
HRB test block  
HB 2.5 / 187.5 Brinell test block  
Flat testing table  
V anvil for round parts  
Hardness Conversion Table  
Wooden case for accessories  
Cover  
Allen spanners  
Operational Manual  
Calibration Certificate

### 2.1 Optional Accessories

1/8" , 1/4" , 1/2" ball indenters  
250, 200, 130, 100 mm test tables  
Spot testing anvil  
Spring loaded clamping device



### 3 Unpacking Of Equipment

Unscrew fixing steel sheet plates of upper side to wooden base of case and hold up upper side of wooden case by means of carrying handles. Take out two M8 bolts fastening equipment to lower wooden case. Locate equipment on a special table & and fasten two M8 bolts by means of eye bull putting on flat testing table. Open left cover. Take out wooden safety parts. Take out also 3 off M6 bolts of top cover by means of 5 mm special alen key which is in accessory box. Hold top cover up with care.

### 4 Setting Into Operation for Rockwell Hardness Testing

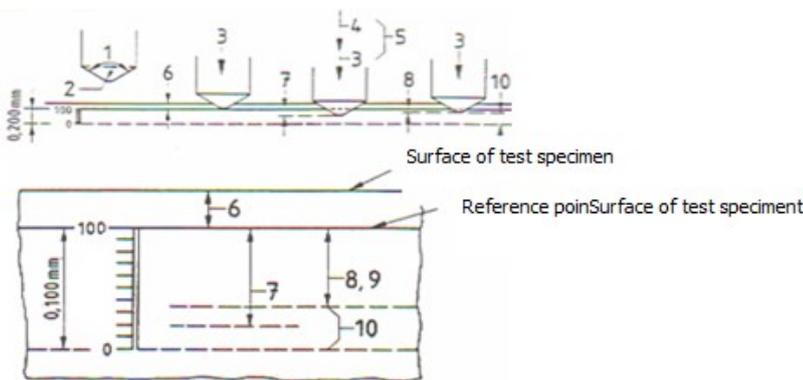
Before starting to test, load application lever has to be in starting position (see drawing and picture). Locate part to be tested on testing table, insert indenter to holder and choose load by means of load selector disc (according to testing method in attached table)

### 5 Rockwell Hardness Testing (EN 6508-1, ASTM E18)

Rockwell Hardness testing method is evaluated from penetration depth of 120° diamond cone or ball indenter with different dias (please refer to table 2)

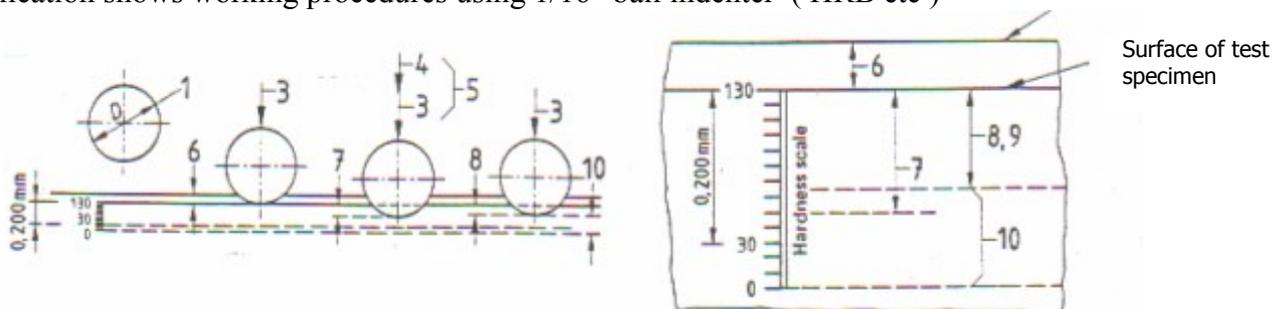
Below application shows working procedures using Rockwell diamond cone (HRC-HRA etc )

*Apply pre-load carefully and follow movement of bargraph on touch screen until it comes to final position As soon as pre-load position is reached, automatic load application will start. When it is over, unloading will start automaticly & machine will come back to pre-load position. Then, value will be shown on the screen.*



Nr	Symbol	Description
1	0	120 ° Diamond cone
2	0	Radius of diamond tip= 0,2 mm
3	F0	Pre-Load
4	F1	Additional Load
5	F	Total load F0+ F1
6	t0	Depth of penetration under pre-load, mm
7	t1	Depth of penetration under additional load, mm
8	Tb	Increase in depth of penetration from F1 to F0, mm
9	E	Equality as of 0,002 mm increase of depth of penetration $e = tb / 0,002$
10	HRC/ HRA	Rockwell hardness = 100-e

Below application shows working procedures using 1/16" ball indenter ( HRB etc )



Nr	Symbol	Description
1	D	Ball dia=1/16 “ =1,5875 mm
3	F0	Pre-load
4	F1	Additional load
5	F	Total load =F0+F1
6	t0	Depth of penetration under pre-load, mm
7	t1	Depth of penetration under additional load, mm
8	Tb	Increase in depth of penetration from F1 to F0, mm
9	E	Equality as of 0,002 mm increase of depth of penetration $e= tb / 0,002$
10	HRB/HRF	Rockwell hardness= 130-e

## 6 Brinell Hardness Testing (EN 6506-1, ASTM E10)

Brinell Hardness testing method is made by different size of balls depending on material type, thickness and loads applied. Diameters of ball indentations can be evaluated by optical system built-in hardness tester. Relations with thickness of specimen, ball dia and material shown in related the table.

Thickness of material (mm)	Ball dia(mm)	P=30D2 Steel,iron, cast iron	P=10D2 Brass, Bronze,Copper, Aluminium	P=D2 Soft copper	P=5D2 Lead
6 mm and up	10	3.000 kgf	1.000 kgf	500 kgf	250 kgf
3 mm and up	5	750 kgf	250 kgf	125 kgf	62,5 kgf
1,2 mm and up	2,5	187,5 kgf	62,5 kgf	31,25 kgf	15,625 kgf
0,5 mm and up	1	30 kgf	10 kgf	5 kgf	-

### 6.1 Setting Into Operation for Brinell Hardness Testing

Locate 5X objective on optical system, before starting to test, load application lever has to be in starting position (see drawing and picture) Locate part to be tested on testing table **Moving lever of sliding table to the left, assure testing table to touch stoping bolt.**

Insert 2,5 mm ball indenter to indenter holder.

**IMPORTANT: For Brinell and Vickers tests quick lift lever always must be on right side position touching the stoping bolt.**

*Apply pre-load carefully and follow movement of bargraph on touch screen until it comes to final position, as soon as pre-load position is reached, automatic load application will start. When it is over,unloading will start automaticly & machine will come back to pre-laod position.Then,value will be shown on the screen.*

*Move quick lift lever from right to left until it touches stoping pin. (in this case indenter to be separated from the surface of the part to be tested)In this case, move the lever of sliding table to the right carefully until testing table touches micrometer. Observe, ball indentation as per shown in eyepiece of microscope*

### 6.2 Sample of Reading Indentation

Adjust, mesuring moving line by means of micrometer of eyepiece until it touches leftest side of indentation. Then, move, measuring line from left to right until it touches rightest side of indentation. Than calculate value.

Every single line is 100 unit. (In Brinell testing total magnification is 75X when 5X objective is used) Read ball indentation & push button on eyepiece for D1.Then read D2 values & push button on eyepiece. Brinell value directly shown on the PLC panel.

## 7 Vickers Hardness Testing (EN-6507-1, ASTM E-92)

Vickers Hardness testing method is made by 136° Vickers pyramid indenter.

Locate 10X objective on optical system

**Assure all points same as Brinell test before start to operation.**

Insert Vickers diamond indenter to indenter holder and choose suitable test method from the related menu of main screen.

**Actuate Vickers test using same steps as per mentioned for Brinell test**

## 8 Test Methods

Test Method	Indentor	Pre-load (kgf)	Total load (kgf)	Field of application
HRA	Diamond cone	10	60	Surface hardened parts with thin cases ( $\geq 0,4$ mm)
HRB	1/16" ball	10	100	Non ferrous metals, unhardened steels
HRC	Diamond cone	10	150	Hardened steels
HRD	Diamond cone	10	100	Surface hardened parts with medium cases
HRE	1/8" ball	10	100	Aluminium amd magnesium alloys, antifricition metals, synetic metals
HRF	1/16" ball	10	60	Annealed cupper alloys, thin sheet metals ( $\geq 0,6$ mm)
HRG	1/16" ball	10	150	Phospor-bronze, bmelleable iron of medium hardness
HRH	1/8" ball	10	60	Aluminium, zinc, lead, grinding stones
HRK	1/8" ball	10	150	Antifricition and other metals of very low hardness
HRL	1/4" ball	10	60	As HRK and hard rubber
HRM	1/4" ball	10	100	As HRK and HRL, laminated wood
HRP	1/4" ball	10	150	HRK, HRL or HRM and syntetic materials
HRR	1/2" ball	10	60	
HRS	1/2" ball	10	100	
HRV	1/2" ball	10	150	As HRK, HRL, HRM, HRP, HRR or HRS
HR 15 N HR 30 N HR 45 N	Diamond cone	3	15 30 45	As HRA, HRC or HRD, but especially thin case depth ( $\geq 0,18$ mm )
HR15T HR30T HR45T	1/16" ball	3	15 30 45	As HRB, HRF or HRG but especially for thin sheet metals ( $\geq 0,25$ mm )
HR15W HR30W HR45W	1/8" ball	3	15 30 45	For metals with very low hardness and for very thin cases, for example thin linings of antifricition metals,HRX and HRY especially for sintered metals
HR15X HR30X HR45X	1/4" ball	3	15 30 45	
HR15Y HR30Y HR45Y	1/2" ball	3	15 30 45	

Table 2

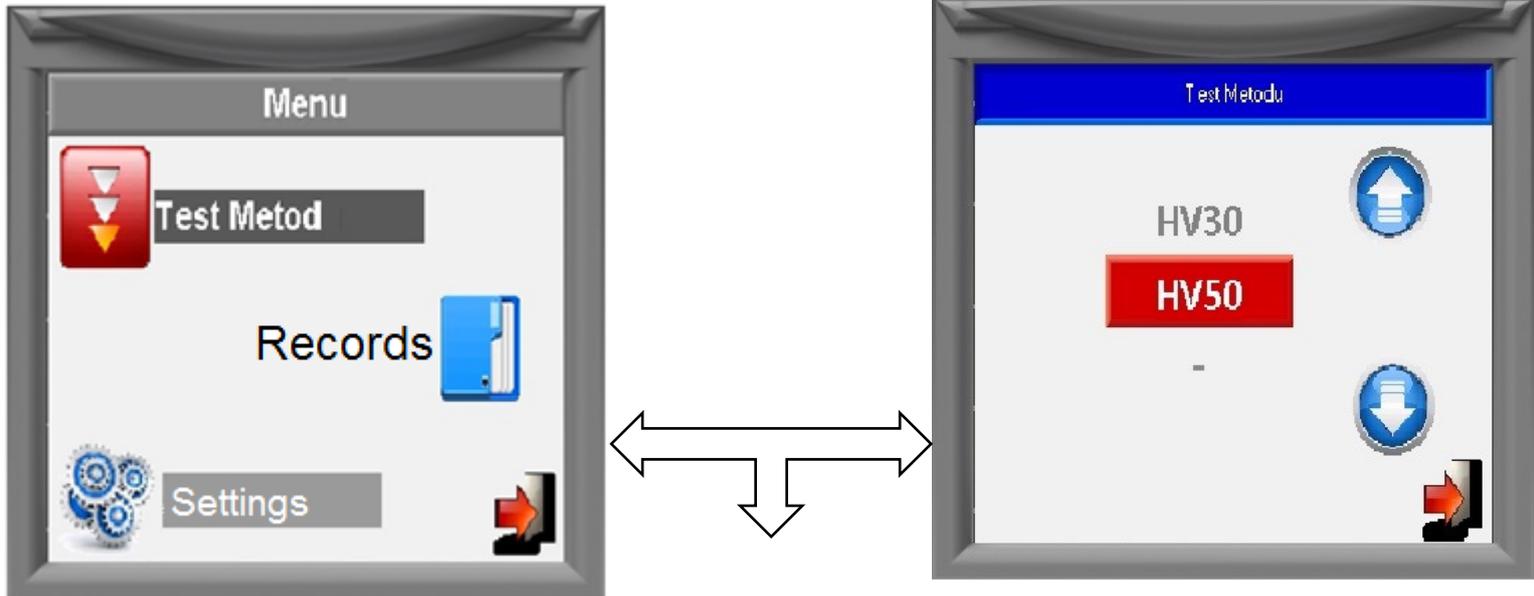
## 9 Prior to Test

Using table, choose suitable indenter according to test method to be applied. Locate indenter on holder carefully and gently tighten allen screw using allen key.



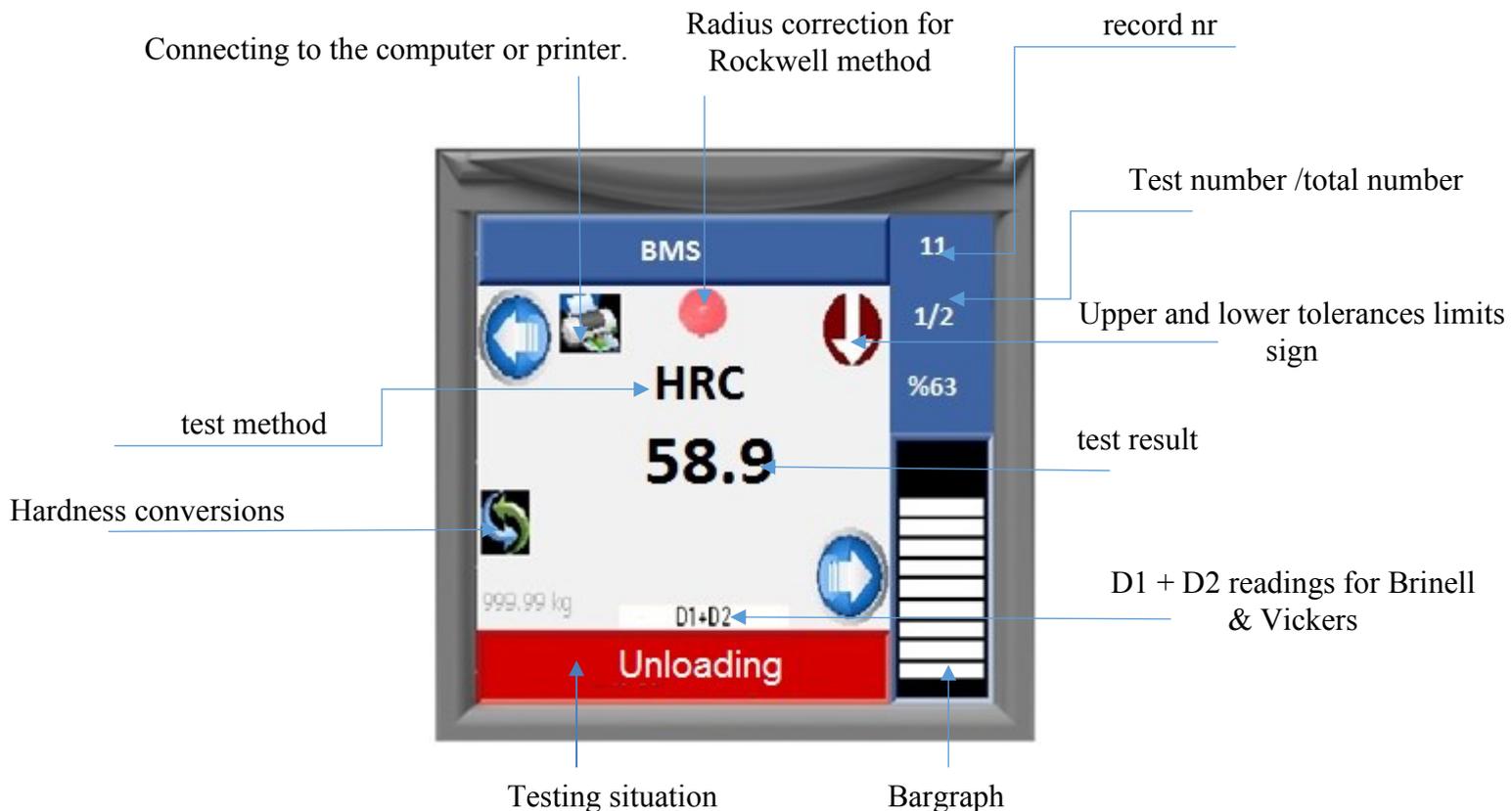
## 10 Choosing the Test Load

Choose suitable test load on LCD screen in related menu, according to table locate part to be tested on testing anvil.



When you push test method on touch screen, test load will be adjusted automatically. Using upper and lower arrows, other test methods can be selected easily. Then, when required method reached, by pushing it can be actuated.

## 10.1 Main Screen



## 11 Testing

Switch on equipment by ON/ OFF button.

Apply pre-load carefully and follow movement of bargraph until it comes to final position. As soon as pre-load position is reached %100 position automatic load application will start. When it is over, unloading will start automatically & machine will come back to pre-load position. Then, value will be shown on the screen.

## 12 Test Method

Using buttons, TEST METHOD menu obtained. And pressing the buttons required test method can be reached.

## 13 Brinell Test

For optical reading, press button for D1 then, press button again for D2 write value shown on eyepiece once. Then Brinell value will be shown. Before the optical measurement for the first time must use the RESET button after lines are got closer

**For Brinell tests 5X magn. objective to be used.**

## 14 Vickers Test

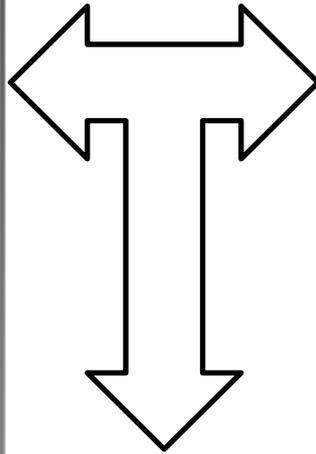
For optical reading, press button for D1 then, press button again for D2 write value shown on eyepiece once. Then Vickers value will be shown. Before the optical measurement for the first time must use the RESET button after lines are got closer

**For Vickers tests 10X magn. objective to be used.**

## 15 Records

RECORDS section, **registration number, name, min, max, mean, standard deviation**, can be seen. When you entered the stored value in the memory, values can be transferred to micro printer or computer.

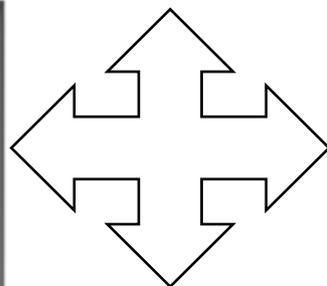
**NOTE: The total memory capacity of the device, along with 50 pieces of data below 100 separate entries, a total of 5000 pieces.**



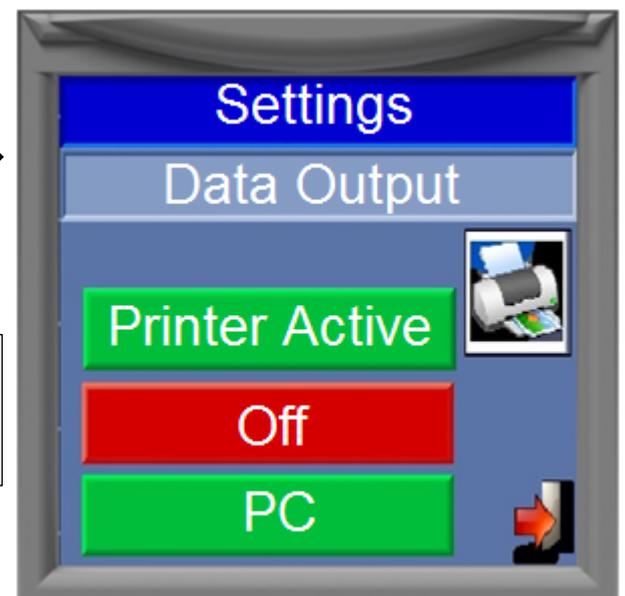
You can see the test records on the main menu, you can delete and transfer saved datas to the printer or computer.

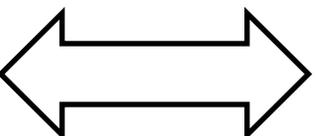
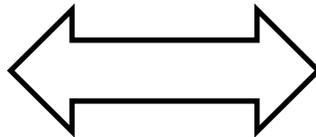
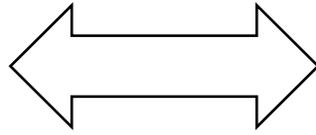
## 16 Settings

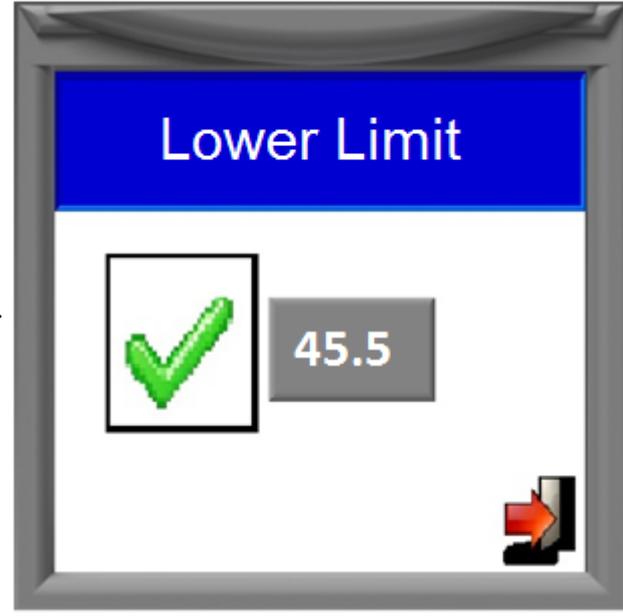
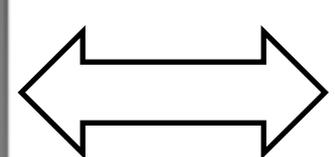
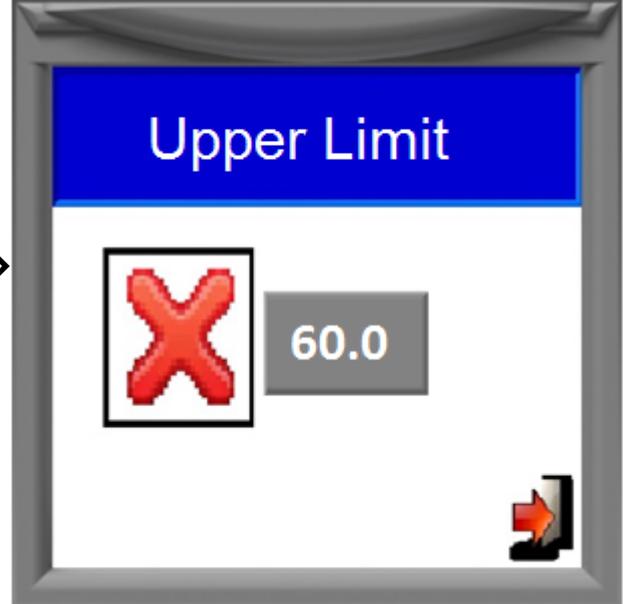
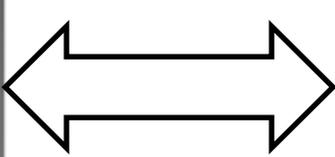
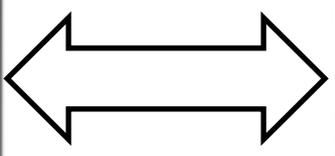
The point to settings, **printer**, **date / time average number of test time**, **the factory setting**, **test the lower limit**, **upper limit test sets such as language selection**, are entered using the function keys.



You can edit the following options from the Settings

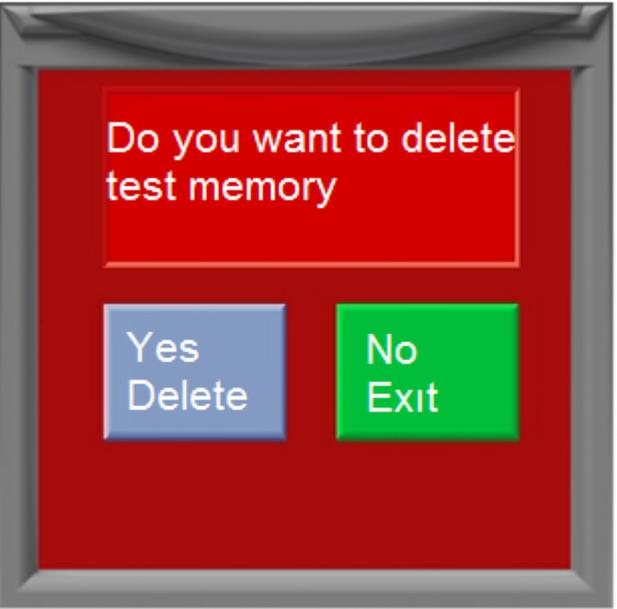
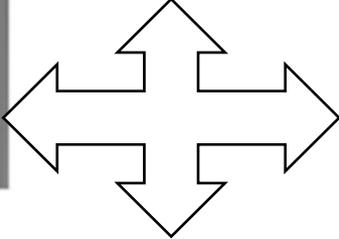




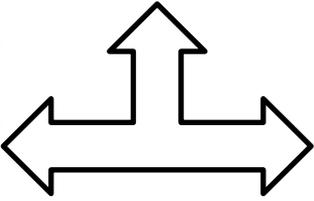




During the pre-load, if overload occurs or wrong application applied related messages shown.

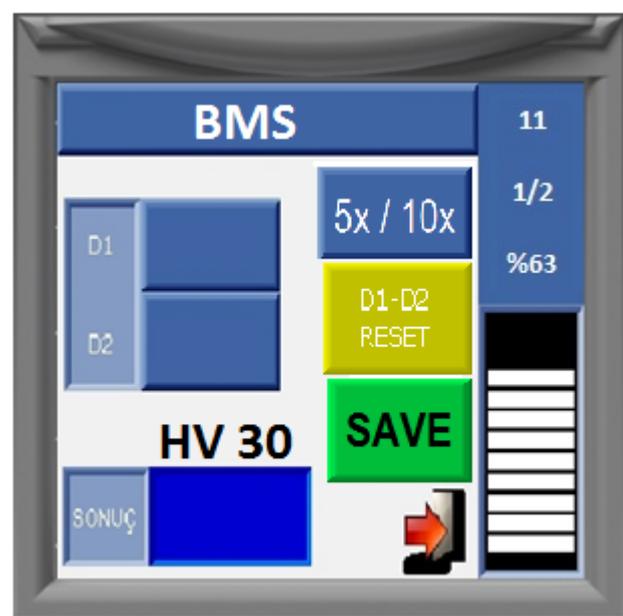
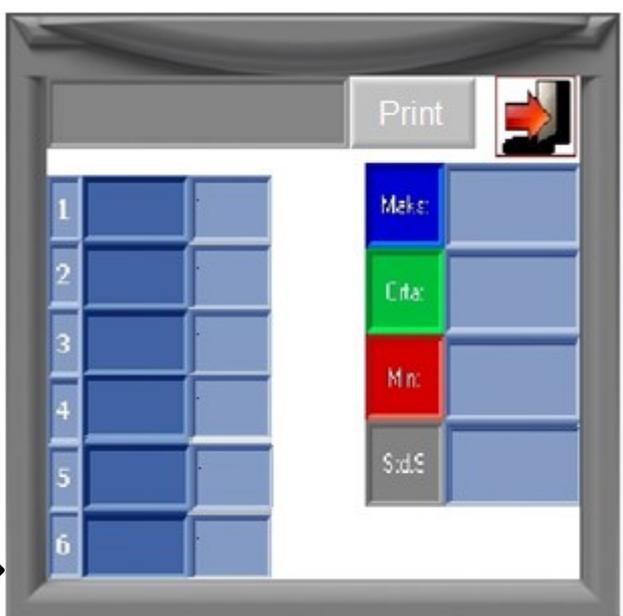


Each of the 100 data capacity, 50 memory zones available. Total data capacity is 5.000

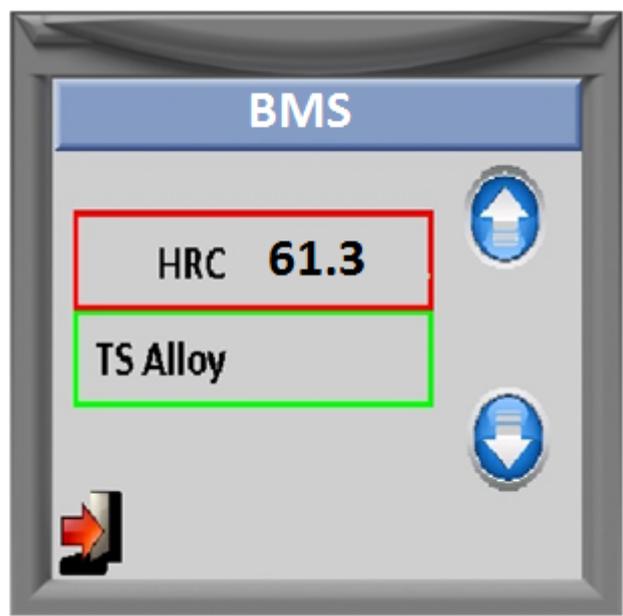




Zones in the memory can easily be registrated & you can examine the results of tests

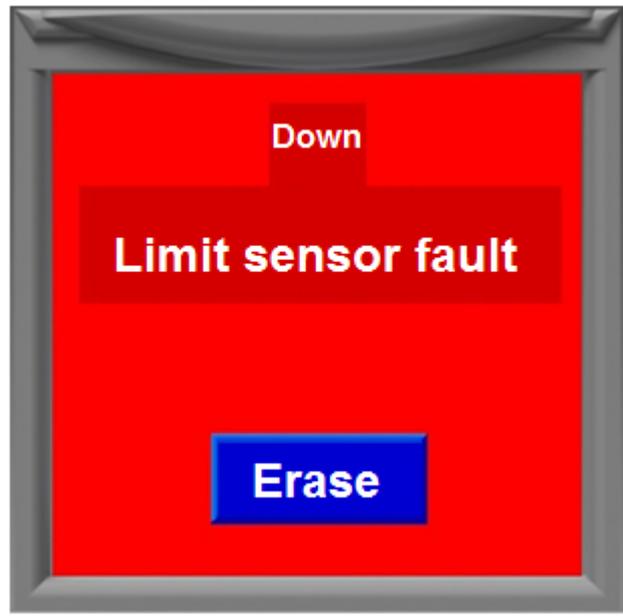


For Brinell & Vickers tests result, PLC show directly after press the button on the right side of eyepiece for D1&D2, then related hardness values is shown as of result.



Hardness conversions

In case of sensor failure warning sign will be shown on the right



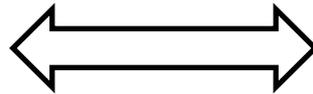


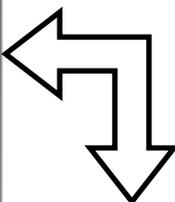
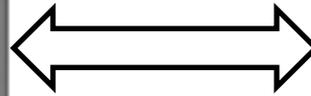
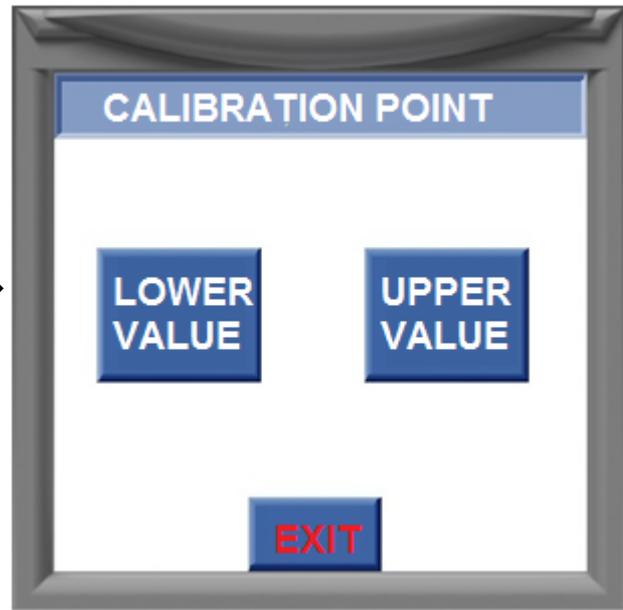
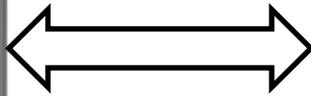
## 17 Calibration

**Important Notice:** During calibration, 2 point calibration system used. Therefore, for each calibration, uppest and lowest test blocks must be choosen according to test meethods. For example, for HRC method, uppest block value 62-65 HRC, lowest block value 22-25 HRC arasında can be choosen.

**Your equipment is calibrated under related EN norms. You do not need to calibrate the equipment again.**

*But, if required, calibration can be made using EN norms by expert persons under suitable conditions. In case of making mistakes during calibration, we recommend to go SETTINGS menu and use FACTORY SEETINGS fonction. Then, you can return original calibrated values.*





You can add correction values for Brinell methods



To save the calibration values as the factory settings registration password should be requested from our company.  
 NOTE: If you done a wrong calibrations as the factory the calibration must be repeated.