OPERATION MANUAL

DIGIROCK-LC-RBOV

DIGITAL ROCKWELL, ROCKWELL SUPERFICIAL, BRINELL & VICKERS *HARDNESS TESTER*

WITH TOUCH SCREEN & CLOSED LOOP TECHNOLOGY

BMS Bulut Makina Sanayi Ve Ticaret Ltd. Şti.

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1 *Technical Features*

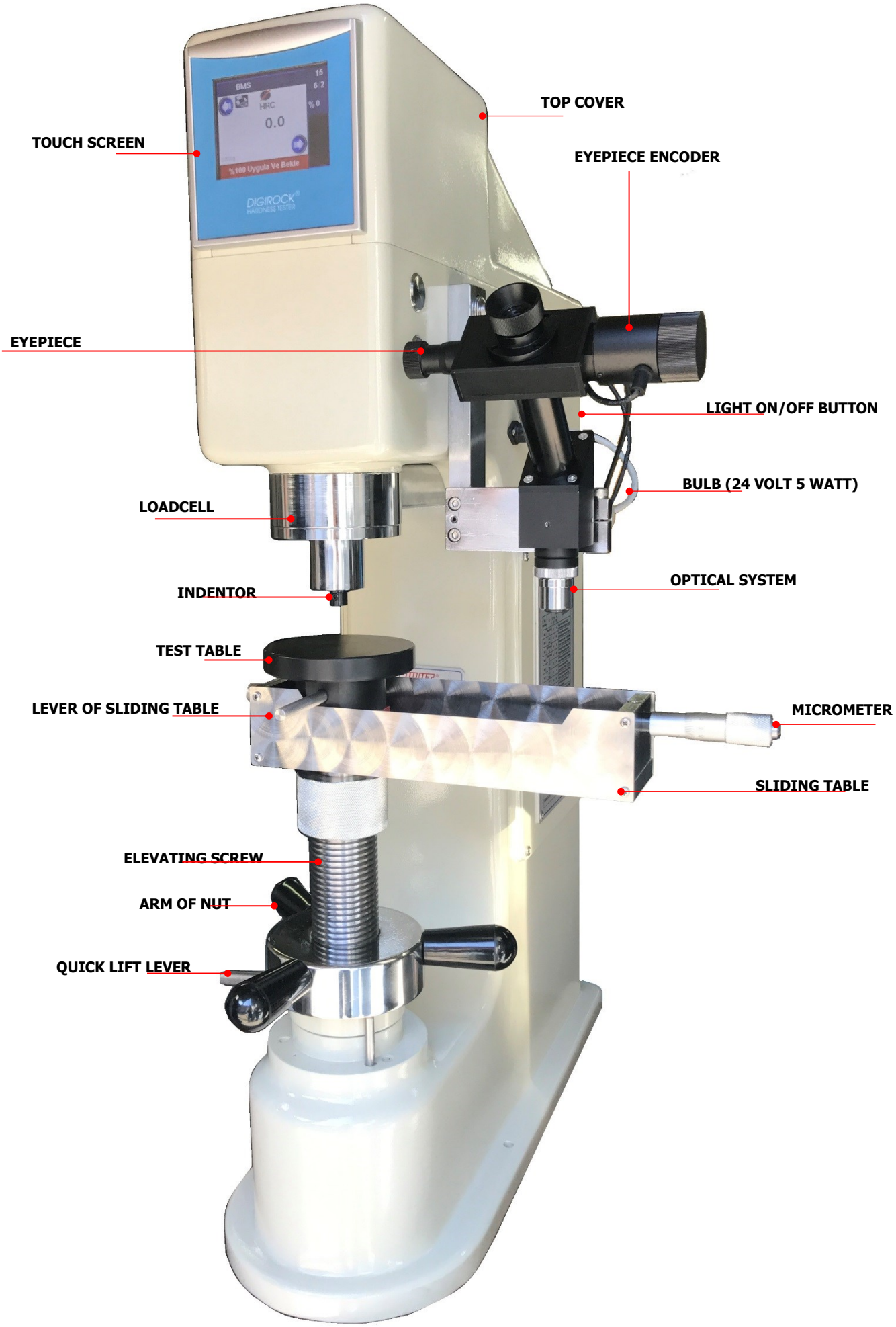
Pre-load (kgf)	3 / 10
Loads (kgf)	15;30;45 Rockwell Superficial 60;100;150 Rockwell 15,625;31;25;62.5;187.5;250 Brinell 3;5;10;20;30;100 Vickers
Load selection	Automatic on touch screen
Test methods	Rockwell, Rockwell Superficial, Brinell & Vickers
Load application	Automatic by stepping motor
Max. testing height	With sliding table 140 mm, without sliding table 240 mm
Throat	145 mm
Machine dimensions	780X500X360 mm
Case dimensions	950x700x350 mm
Weight (net/gross)	95 / 125 kg
Optical system	75X magnification for Brinell 150X magnification for Vickers
Power	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


TOP COVER
TOUCH SCREEN
EYEPIECE ENCODER
EYEPIECE
LIGHT ON/OFF BUTTON
BULB (24 VOLT 5 WATT)
LOADCELL
OPTICAL SYSTEM
INDENTOR
TEST TABLE
LEVER OF SLIDING TABLE
MICROMETER
SLIDING TABLE
ELEVATING SCREW
ARM OF NUT
QUICK LIFT LEVER

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 alyen key which is in accessory box.Hold top cover up with care.

4 *Setting Into Operation For Rockwell Hardness Testing*

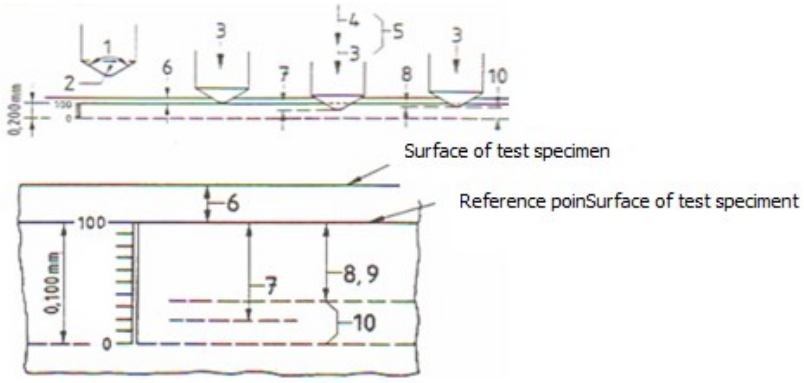
Before starting to test, load aplication lever has to be in starting position (see drawing and picture). Locate part to be tested on testing table, insert indenter to holder and choose load by means of load selector disc (according to testing method in attached table)

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

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

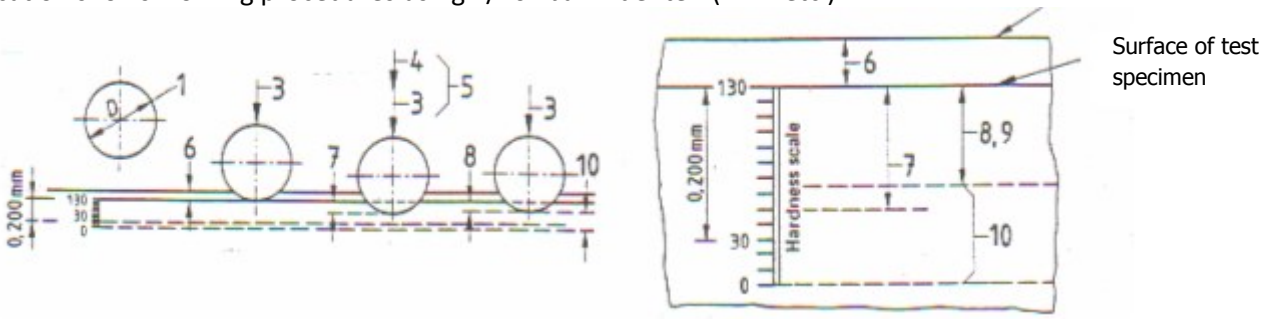
Below application shows working procedures using Rockwell diamond cone (HRC-HRA etc)

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 automaticely & machine will come back to pre-laod 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 evaulated 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, Cupper, Aluminium	P=D2 Soft cupper	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 aplication 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 (7) always must be in forward 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 automaticely & 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 touchs stoping pin. (in this case indentor 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 touchs 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 touchs leftest side of indentation. Then, move, measuring line from left to right until it touchs rightest side of indentation.
After see the indentation by eyepiece press the button of ocular for the D1-D2 values, than the result will show on the PLC panel directly.

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

Vickers Hardness testing method is made by 136° Vickers pyramid indenter. Vickers indentation can be evaulated by optical system built-in hardness tester.

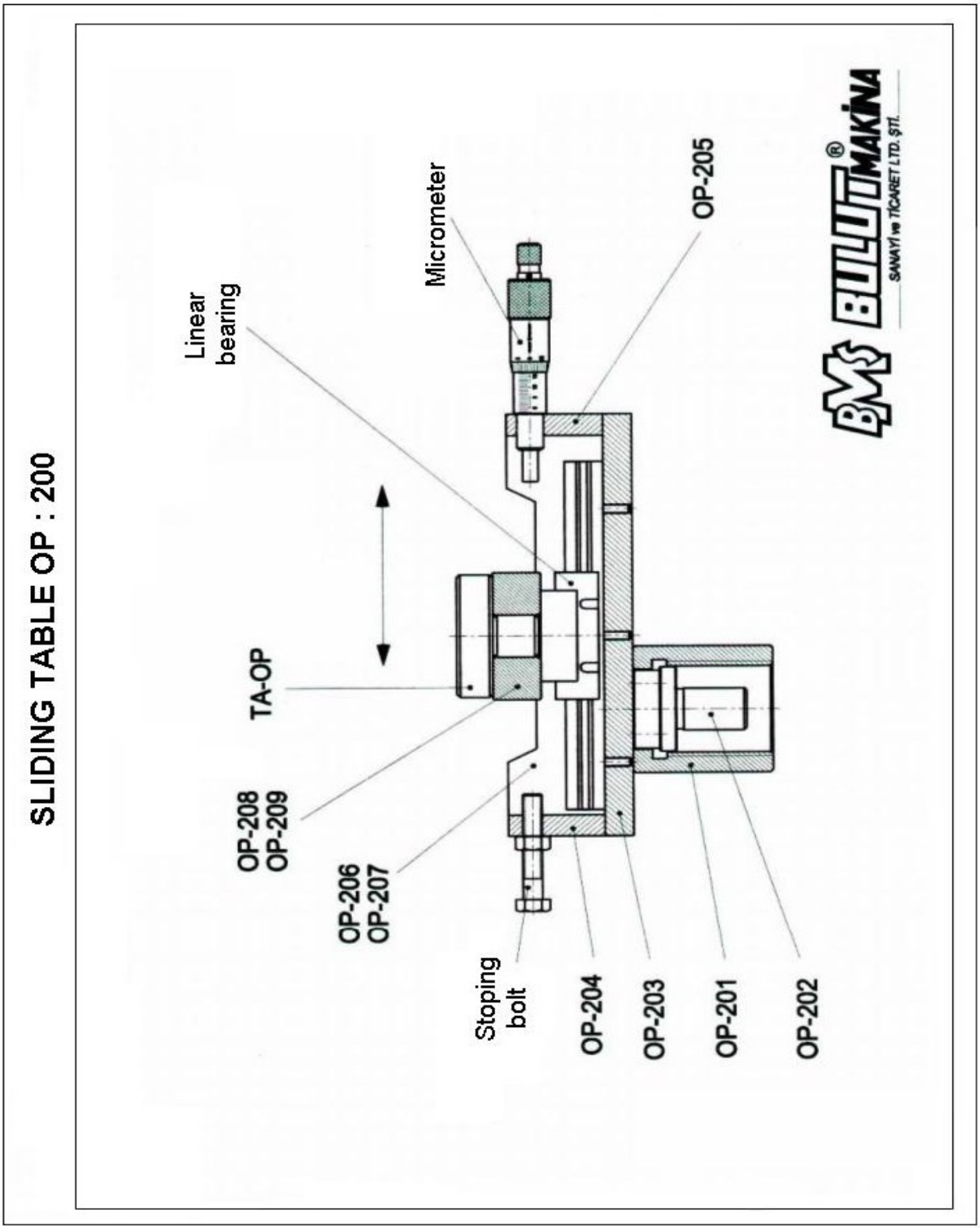
7.1 Setting Into Operation For Vickers Hardness Testing

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.
Observe, pyramid indentation as per shown in eyepiece of microscope

7.2 Sample Of Reading Indentation

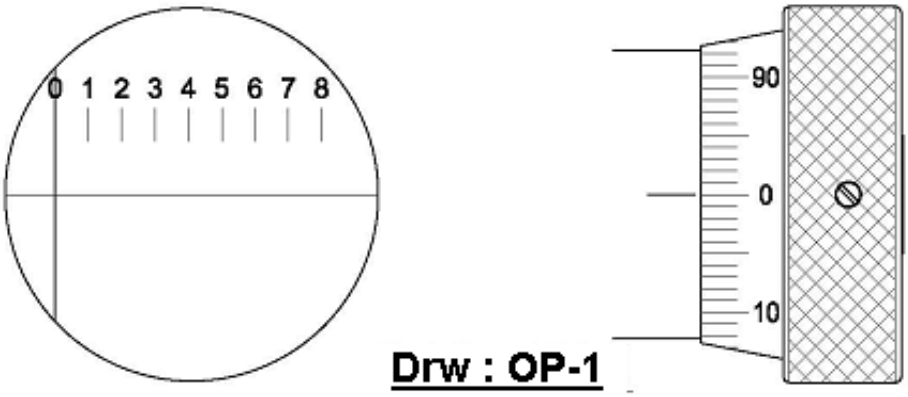
Adjust, measuring moving line by means of micrometer of eyepiece until it touches leftist side of indentation. Then, move, measuring line from left to right until it touches rightest side of indentation. Than calculate value.
After see the indentation by eyepiece press the button of ocular for the D1-D2 values, than the result will show on the PLC panel directly.

8 *Optical System: Sliding Table OP: 200*

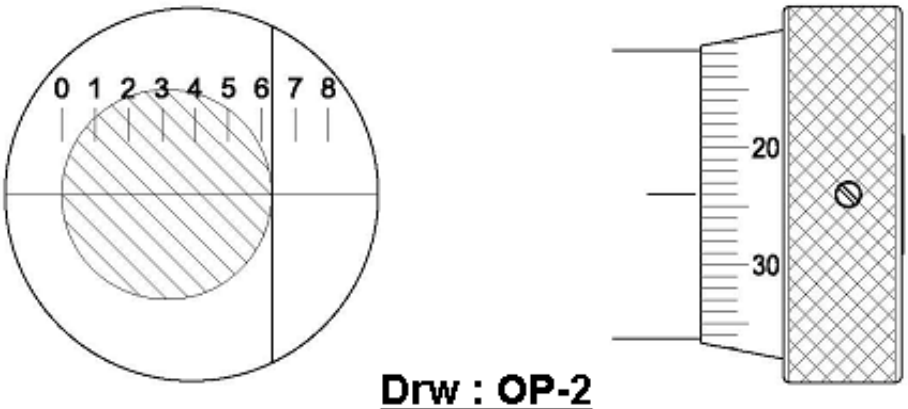


9 *Optical System: Samples of Readings*

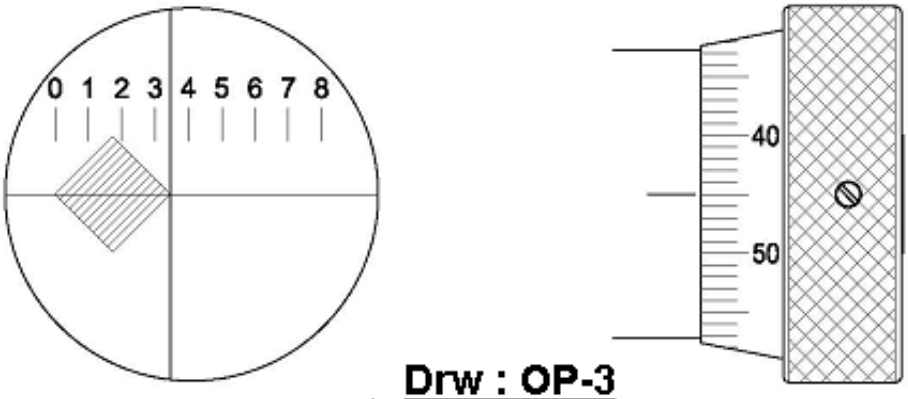
SAMPLES OF READINGS



Drw : OP-1



Drw : OP-2



Drw : OP-3

10 *Test Method*

Test Method	Indentor	Pre-load (kgf	Total load (kgf)	Field of application
HRA	Diamond cone	10	60	Surface hardened parts with thin cases (≥0,4 mm)
HRB	1/16" ball	10	100	Non ferrous metals, unhardened steels
HRC	Diamond cone	10	150	Hardnened steels
HRD	Diamond cone	10	100	Surface hardnened parts with medium cases
HRE	1/8" ball	10	100	Aluminium amd magnesium alloys, antifriction metals, synetic metals
HRF	1/16" ball	10	60	Annealed cupper alloys, thin sheet metals (≥ 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	Antifriction 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 (≥ 0,18 mm)
HR15T HR30T HR45T	1/16" ball	3	15 30 45	As HRB, HRF or HRG but especially for thin sheet metals (≥ 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 antifriction 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	

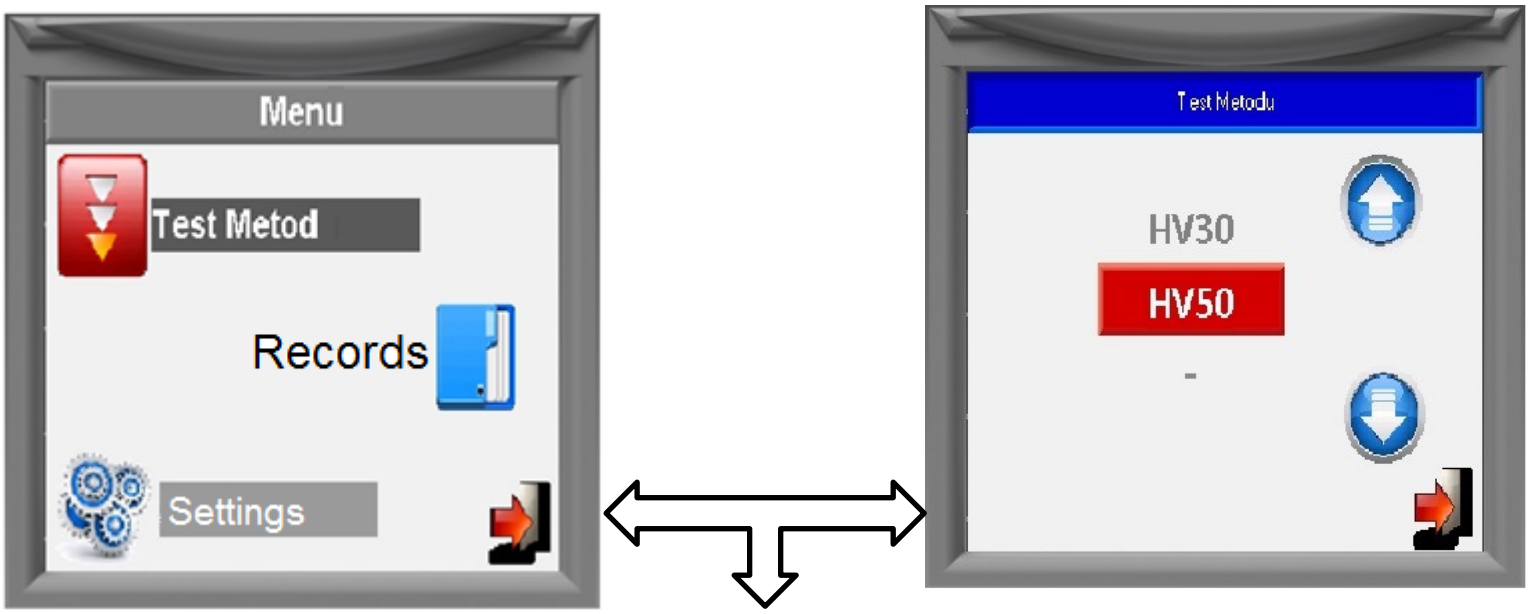
Table 2

11 *Prior to Test*

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

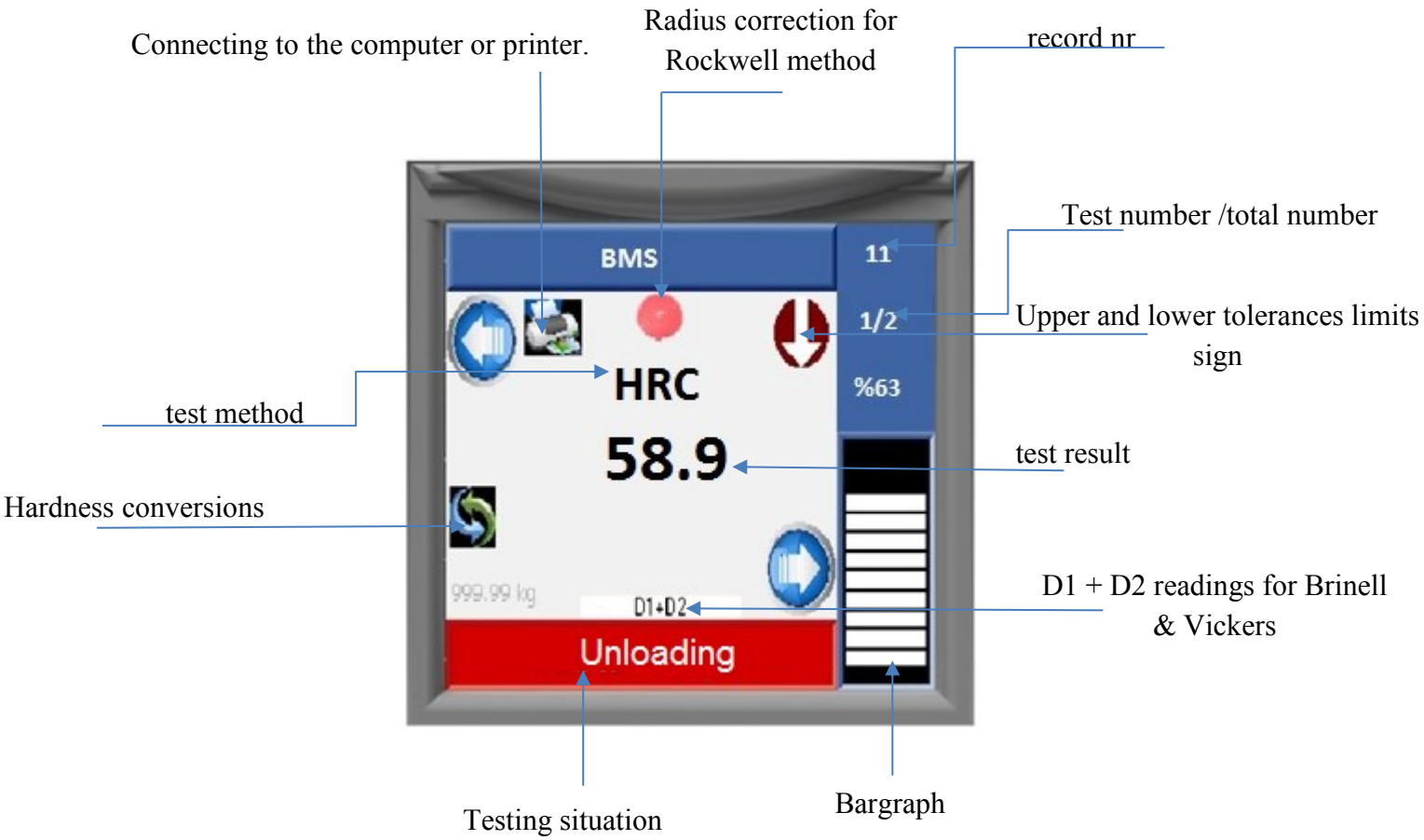
12 *Choosing the Test Load*

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.

12.1 Main Screen



13 *Testing*

Swich 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 automaticely & machine will come back to pre-laod position. Then, value will be shown on the screen.

14 *Test Metod*

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

15 *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.

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

16 *Vickers Test*

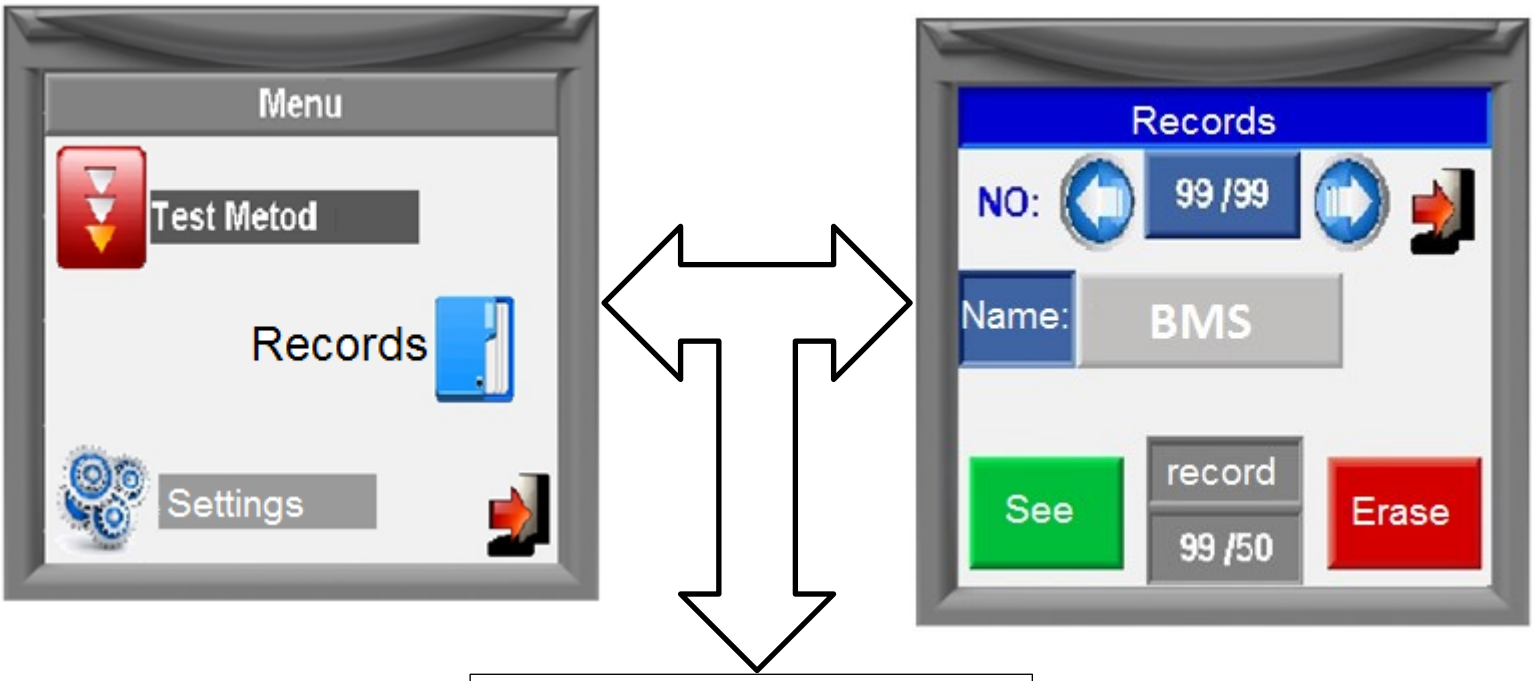
For optical reading, press button for D1 then, press button again for D2 write value shown on eyepiece once. Then Vickers value will be shown.

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

17 *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.

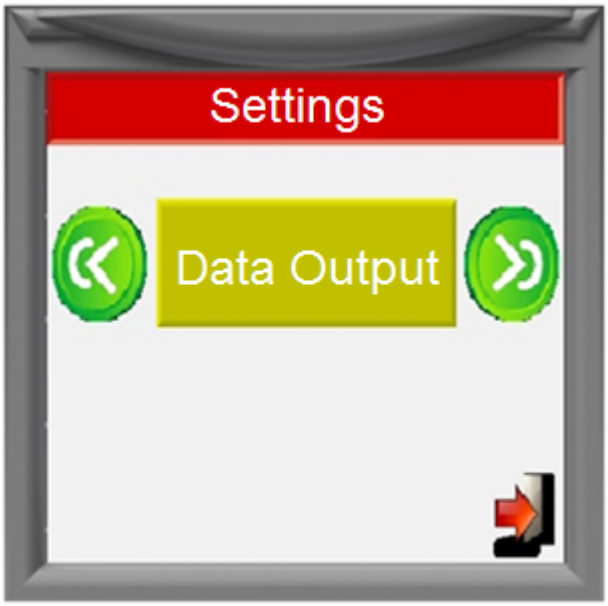
NOTE: **The total memory capacity of the device, along with 50 pieces of data below 100 separate entries, a total of 5000 pieces.**



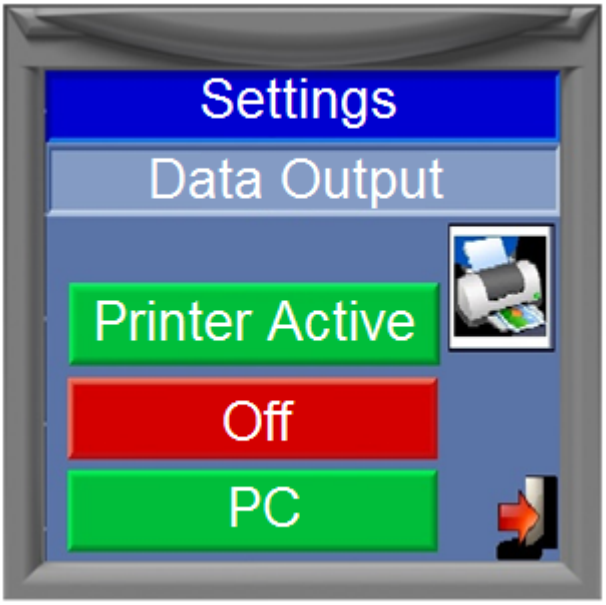
You can see the test records on the main menu, you can delete and transfer saved datas to the printer or computer.

18 *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

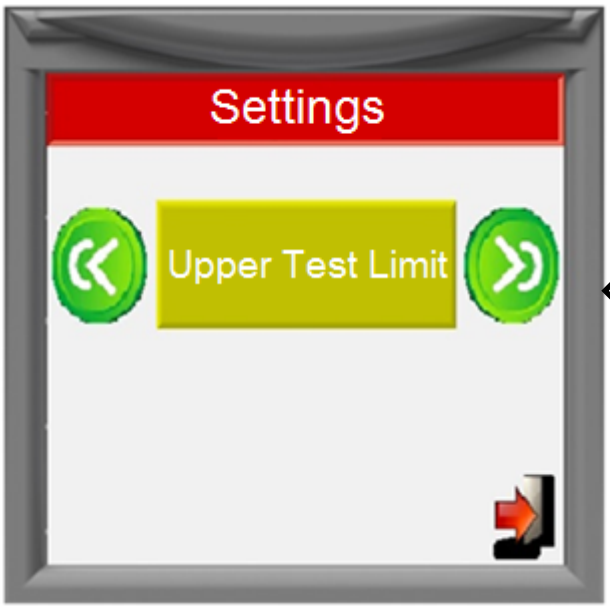


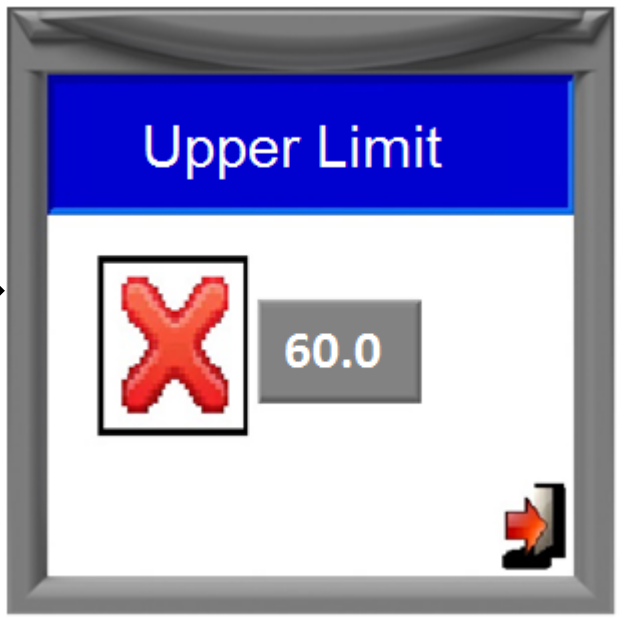

Settings
Factory Settings

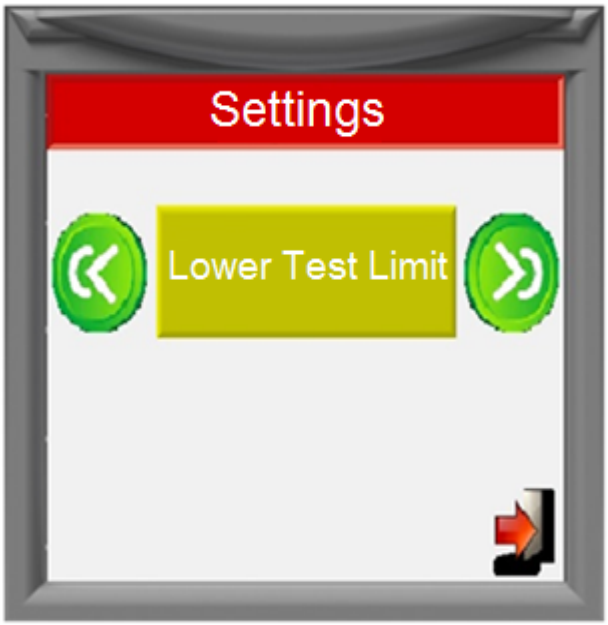

Factory Settings
Press for 3 sec. for factory settings

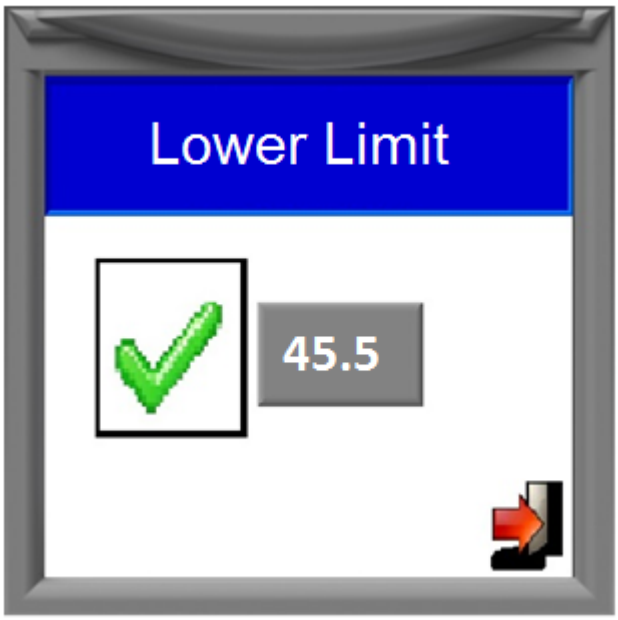

Settings
Dil/Lang.


Dil/Lang.
English
Türkçe
Russia
Fransçais
italiann
Deutsch

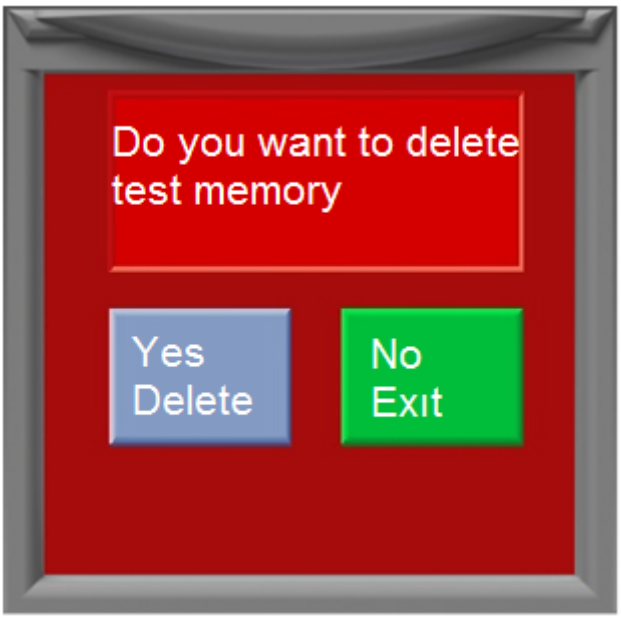

Settings
Upper Test Limit


Upper Limit
60.0

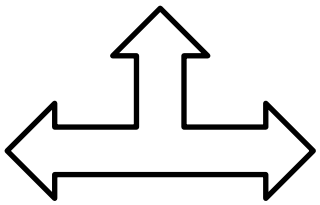




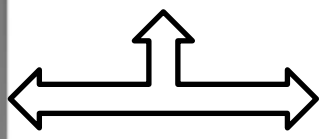
During the pre-load, if overload occurs or wrong application apllied related messages shown.

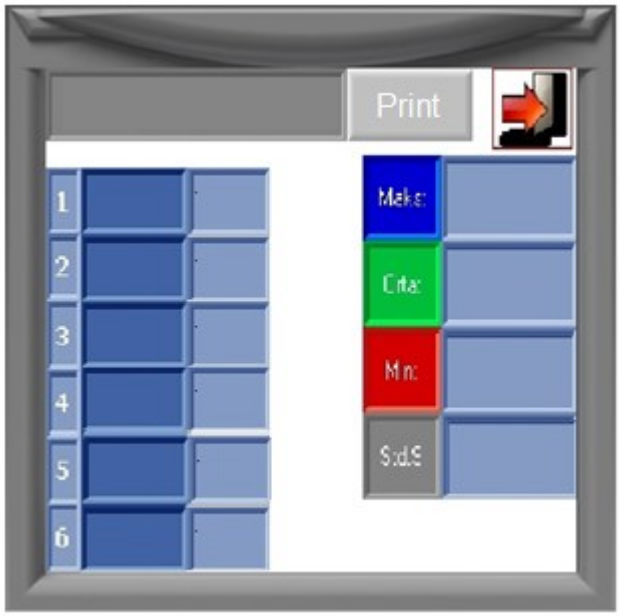


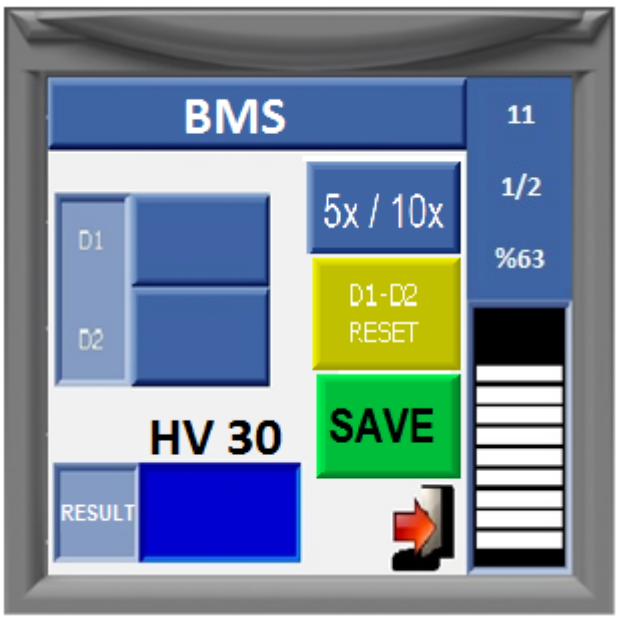
Each of the 100 data capacity, 50 memory zones available. Total data capacity is 5.000

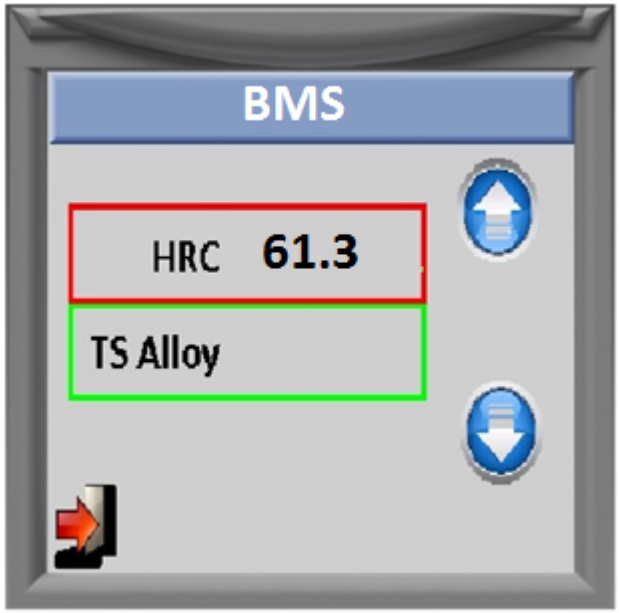


Zones in the memory can easly be registrated & you can examine the results of tests



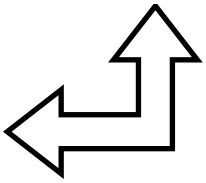




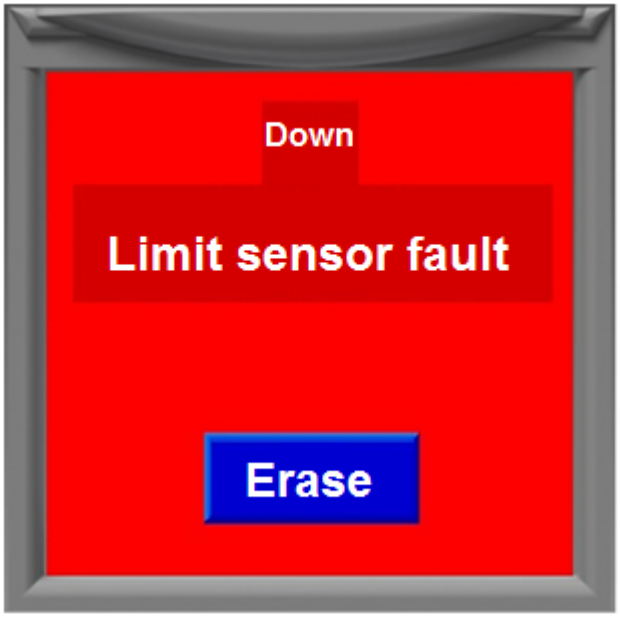


For Brinell & Vickers tests numbers on eyepiece can be entered as of D1&D2, then related hardness values is shown as of result.

Hardness conversions



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



For Rockwell tests, you can choose radius of round parts

19 *Calibration*

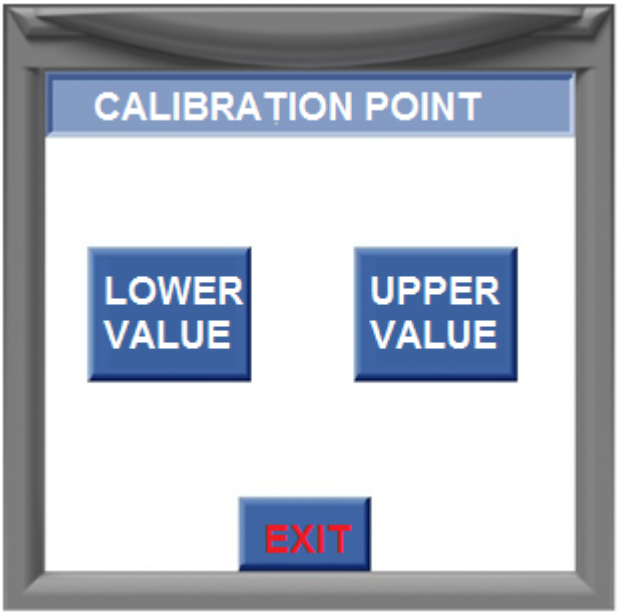
Important Notice: During calibration, 2 point calibration system used. Therefore, for each calibration, uppest and lowest test blocks must be choosen according to test meothods. For example, for HRC method, uppest block value 62-65 HRC, lowest block value 22-25 HRC arasında can be choosen.
Your equipment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


Settings
Calibration


SERVIS MENUSU
Şifre Gir
CALIBRATION
password:
EXIT
MAIN MENU


CALIBRATION
Menu


CALIBRATION POINT
LOWER VALUE
UPPER VALUE
EXIT


Choose the cal. point entering upper value
99.9
1.
2
3
4.
CLEAR
SAVE
EXIT


Choose the cal. point entering lower value
99.9
1.
2
3
4.
CLEAR
SAVE
EXIT

You can add correction values for Brinell methods

19.1 Load Calibration