



OMEGA-RT-60/150

Rockwell Hardness Tester



INSTRUCTION MANUAL

3601 E. 34th St. Tucson, AZ 85713 USA Tel. +1-520-882-6598 Fax +1-520-882-6599 email: pace@metallographic.com Web: <https://www.metallographic.com>



Equipment Type: Rockwell Hardness Tester

Model: **OMEGA-RT-60/150**

Electrical Requirements: 110 or 220 Volts (single-phase)

:

Frequency: 50/60 Hz

Manual Revision Date: April 24, 2022

Please read this instruction manual carefully and follow all installation, operating and safety guidelines.



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WARRANTY

Terms and Conditions applying to all PACE Technologies Products

1. LIMITED WARRANTY AND DISCLAIMER:

PACE Technologies microscopes and hardness testers are warranted for one year from the purchase date to be free from defects in material and workmanship under correct use, normal operating conditions, and proper application. PACE Technologies obligation under this warranty shall be limited to the repair or exchange, at PACE Technologies option, of any PACE Technologies Product or part which proves to be defective as provided herein. PACE Technologies reserves the right to either inspect the product at Buyer's location or require it to be returned to the factory for inspection. Buyer is responsible for freight to and from factory on all warranty claims. The above warranty does not extend to goods damaged or subjected to accident, abuse or misuse after release from PACE Technologies warehouse, nor goods altered or repaired by anyone other than specifically authorized PACE Technologies representatives. PACE Technologies shall not in any way be responsible for the consequences of any alteration, modification or misuse unless previously approved in writing by an officer of PACE Technologies. Note: Corrosion is considered a maintenance issue and not a warranty issue.

PACE TECHNOLOGIES MAKES NO EXPRESS WARRANTIES OTHER THAN THOSE WHICH ARE SPECIFICALLY DESCRIBED HEREIN. Any description of the goods sold hereunder, including any reference to Buyer's specifications and any description in catalogs, circulars and other written material published by PACE Technologies, is the sole purpose of identifying such goods and shall not create an express warranty that the goods shall conform to such description.

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2. LIABILITY CAP:

PACE Technologies maximum aggregate liability for loss and damage arising under, resulting from or in connection with the supply or use of the Equipment and Consumables provided under this purchase, or from the performance or breach of any obligation (s) imposed hereunder, whether such liability arises from any one or more claims or actions for breach of contract, tort, (including negligence), delayed completion, warranty, indemnity, strict liability or otherwise, unless otherwise limited by the terms hereof, shall be limited to one hundred percent (100%) of the purchase price.

3. DELIVERY:

Customer assumes and shall bear the risk of all loss or damage to the Products from every cause whatsoever, whether or not insured, and title to such Products shall pass to Customer upon PACE Technologies delivery of the Products to the common carrier of Pace Technologies choice, or the carrier specified in writing by Customer, for shipment to Customer. Any claims for breakage, loss, delay, or damage shall be made to the carrier by the Customer and Pace Technologies will render customer reasonable assistance in prosecuting such claims.



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4. ACCEPTANCE:

Customer shall inspect the Products promptly upon receipt of delivery. Unless customer objects in writing within thirty (30) business days thereafter, customer shall be deemed to have accepted the Products. All claims for damages, errors, or shortage in Products delivered shall be made by Customer in writing within such five (5) business day period. Failure to make any claim timely shall constitute acceptance of the Products.

5. PAYMENT:

Customer agrees to provide timely payment for the Products in accordance with the terms of payment set forth on the reverse side hereof or in any proposal submitted herewith. If any payment is not paid on or before its due date, Customer shall pay interest on such late payment from the due date until paid at the lesser of 12% per annum or the maximum rate allowed by law.

6. DEFAULT:

If Buyer is in default (including, but not limited to, the failure by Buyer to pay all amounts due and payable to Seller) under the work or purchase order or any other agreement between Buyer and Seller, Buyer's rights under the warranty shall be suspended during any period of such default and the original warranty period will not be extended beyond its original expiration date despite such suspension of warranty rights.

7. MISCELLANEOUS PROVISIONS:

This agreement has been made in and shall be governed by the laws of the State of Arizona. All disputes arising under or relating to the purchase of the equipment shall be brought and resolved solely and exclusively in the State of Arizona, Pima County. These terms and conditions and the description of the Products on the reverse side hereof or in any proposal submitted herewith constitute the entire agreement and understanding of the parties with respect to this sale and supersede all prior and contemporaneous agreements or understandings, inducements or representations, expressed or implied, written or oral, between the parties with respect hereto. Any term or provision of this Agreement may be amended, and any observance of any term of this Agreement may be waived, only by a writing signed by the party to be bounds. The waiver by a party of any breach shall not be deemed to constitute a waiver of any other breach. Should suit be brought on this Agreement, the prevailing party shall be entitled to recover its reasonable attorneys' fees and other costs of suit including costs and attorneys' fees incurred on appeal or in collection of any judgment., errors, or shortage in Products delivered shall be made by Customer in writing within such five (5) business day period. Failure to make any claim timely shall constitute acceptance of the Products.

8. RESTOCKING FEE:

All Returns are subject to a restocking charge equal to 15% (fifteen percent) of the Invoice, unless the Goods are proved to be non-conformed by PACE Technologies.

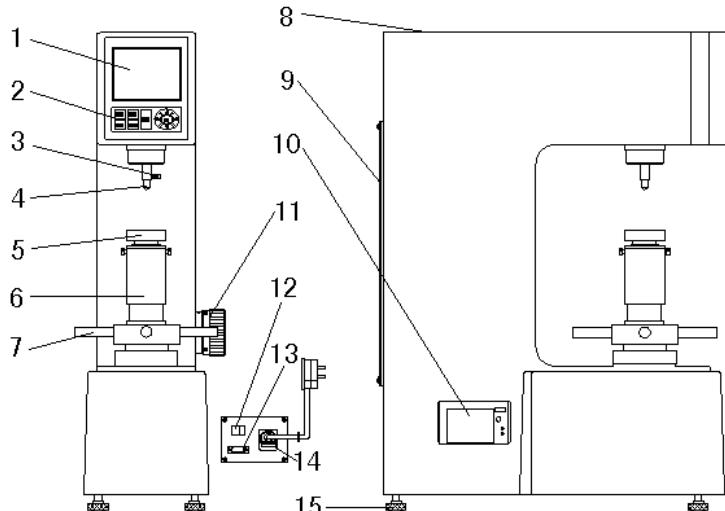


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1.0 Product Description

1.1 General Description

1. LED screen
2. Operating keys
3. Indenter fastening screw
4. Indenter
5. Anvil
6. Up and Down lead screw
7. Screw adjustment wheel
8. Upper cover
9. Back cover
10. Printer
11. Weight adjustment knob
12. Power switch
13. Power cord
14. RS232 connector
15. Leveling feet



The OMEGA-RT-60/150 Rockwell hardness tester is designed to evaluate metallographic specimen hardness.

The OMEGA-RT-60/150 Rockwell hardness tester has a load ranging from 60 kg to 150 kg.



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1.2 Technical Specifications

Electrical specifications:	110 or 220V single-phase (50/60 Hz)
Test forces:	Rockwell 60 kg 100 kg 150 kg
Dwell time of test force:	2-60 seconds
Max. height of specimen:	175 mm (7-inches)
Distance from indentation: center to frame	165 mm (6.5-inches)
Weight:	Approx. 175 lbs (80 kg)
Dimensions (WxHxD):	Approx. 21" x 8.5" x 30.5" (525 mm x 210 mm x 770 mm)
Working temperature:	70° - 85°F (23 - 28°C)



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2.0 Unpacking, Shipping and Installation

2.1 Unpacking

Unit is delivered in a box. Unpack and check for completeness of parts.

Measures WxHxD: 26"x15"x36" (660x380x915 mm)

Weight: Approximately 200 lbs (90 kg)

2.2 Shipping

When moving box, lift from bottom.



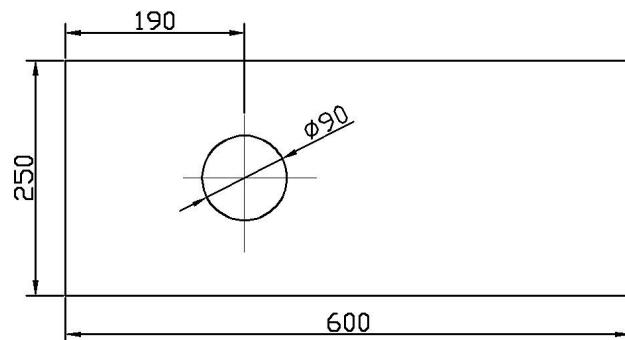
! Caution: Heavy equipment. Take care to avoid bodily injury.

2.3 Installation



Install unit carefully! Improper installation voids warranty.

The **OMEGA-RT-60/150** should be placed on a flat stable vibration free surface. If high samples are to be tested so that the up / down lead screw is lowered significantly, a hole will need to be made in the table (see drawing for specifications - mm)



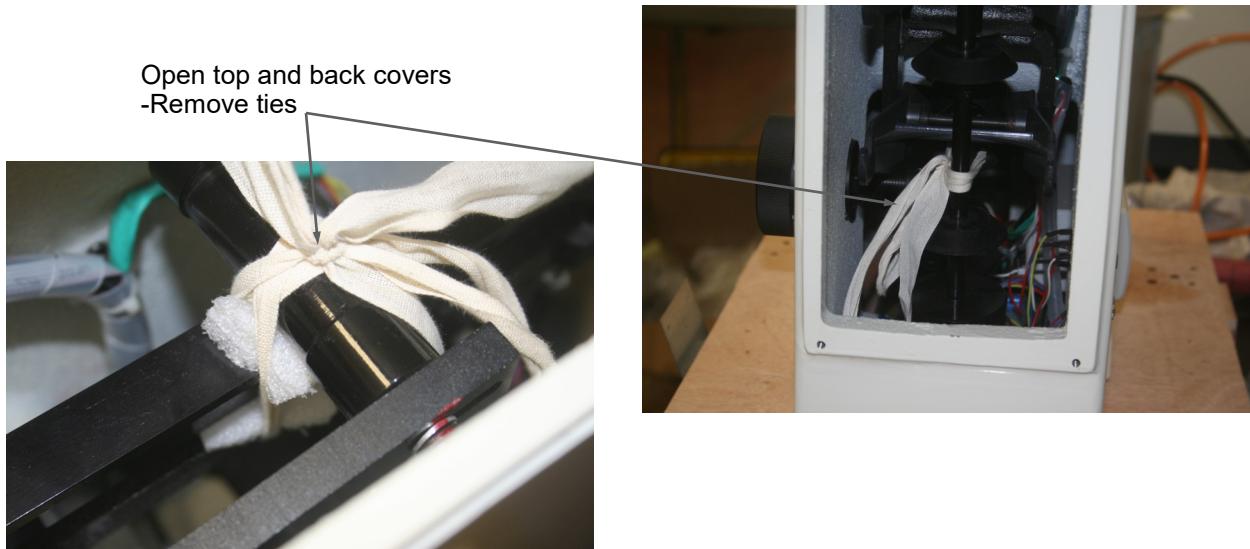
2.3.1 Install leveling feet



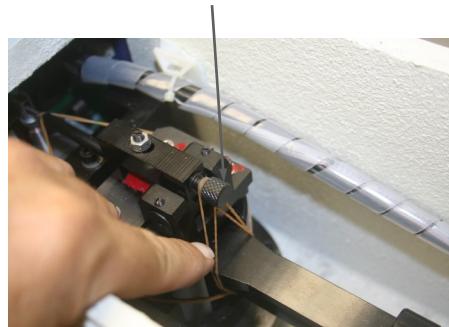


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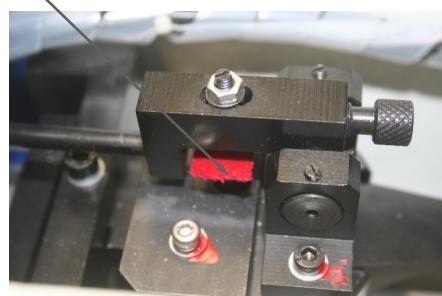
2.3.2 Remove shipping securing tie downs



Remove rubber band



Remove felt pad

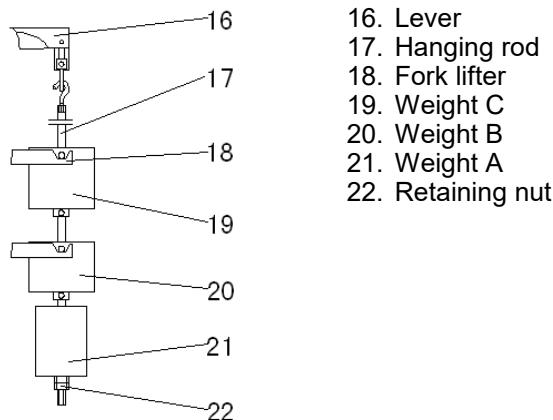


2.3.3 Installing weight stack





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Test force for respective weights

Scale	Test Force (N)	Graduated value on Load-Change hand wheel	Weight
HRA	588.4 (60 kg)	588.4 (60)	Hanging rod + Weight A
HRB	980-7 (100 kg)	980-7 (100)	Hanging rod + Weight A + Weight B
HRC	1471 (150 kg)	1471 (150)	Hanging rod + Weight A + Weight B + Weight C



2.3.4 Installing Anvil Stage



Insert anvil into up/down screw feed



Raise cover and tighten thumb screws

2.3.5 Leveling unit

Place bubble level on stage and adjust feet height to level the unit





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2.3.6 Inserting Indenter



Align flat end of indenter shank with the holding screw



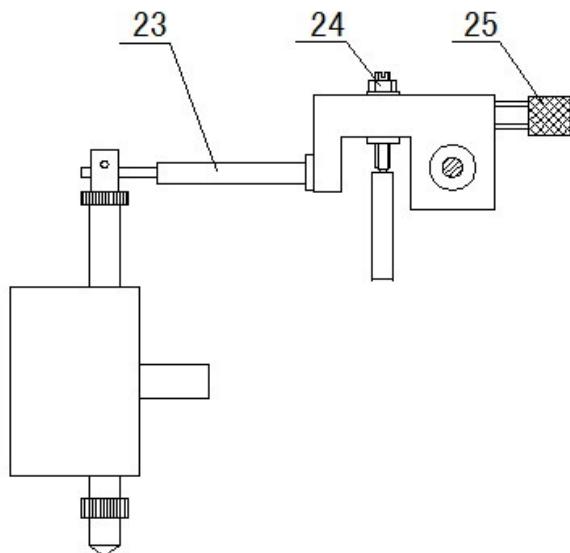
After loading indenter - run a sample indent to properly set the indenter



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2.3.7 Calibration

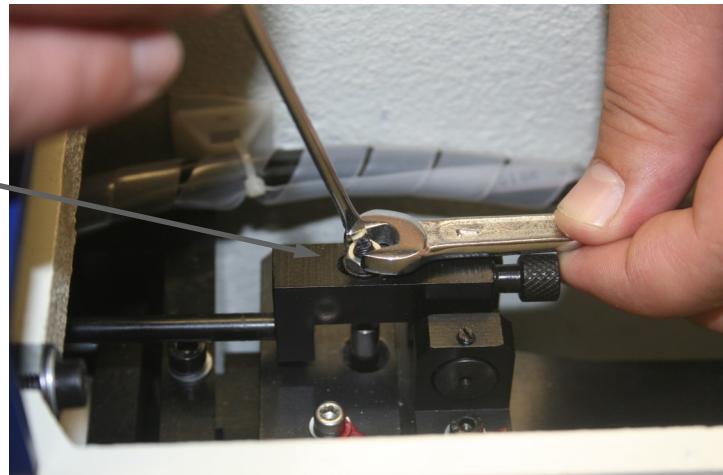
- 23. Connecting rod
- 24. Adjustment screw
- 25. Fine tuning adjustment knob



To calibrate to test blocks - hold screw in place at (24) and loosen nut, adjust screw (25)

Values reading low - adjust screw clockwise

Values reading high - adjust screw counter-clockwise





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Scales	Hardness Range of the Standard Hardness Blocks	Max. Tolerance of Displaying Value
HRA	(20~75)HRA	±2HRA
	(>75~88)HRA	±1.5HRA
HRB	(20~45)HRB	±4HRB
	(>45~80)HRB	±3HRB
	(>80~100)HRB	±2HRB
HRC	(20~70)HRC	±1.5HRC
HRD	(40~70)HRD	±2HRD
	(>70~77)HRD	±1.5HRD
	(>90~100)HRE	±2HRE
HRF	(60~90)HRF	±3HRF
	(>90~100)HRF	±2HRF
HRG	(30~50)HRG	±6HRG
	(>50~75)HRG	±4.5SHRG
	(>75~94)HRG	±3HRG
HRH	(80~100)HRH	±2HRH
HRK	(40~60)HRK	±4HRK
	(>60~80)HRK	±3HRK
	(>80~100)HRK	±2HRK
HRE	(70~90)HRE	±2.5HRE
HRL	(100~120)HRL	±1.2HRL
HRM	(85~110)HRM	±1.5HRM
HRR	(114~125)HRR	±1.2HRR



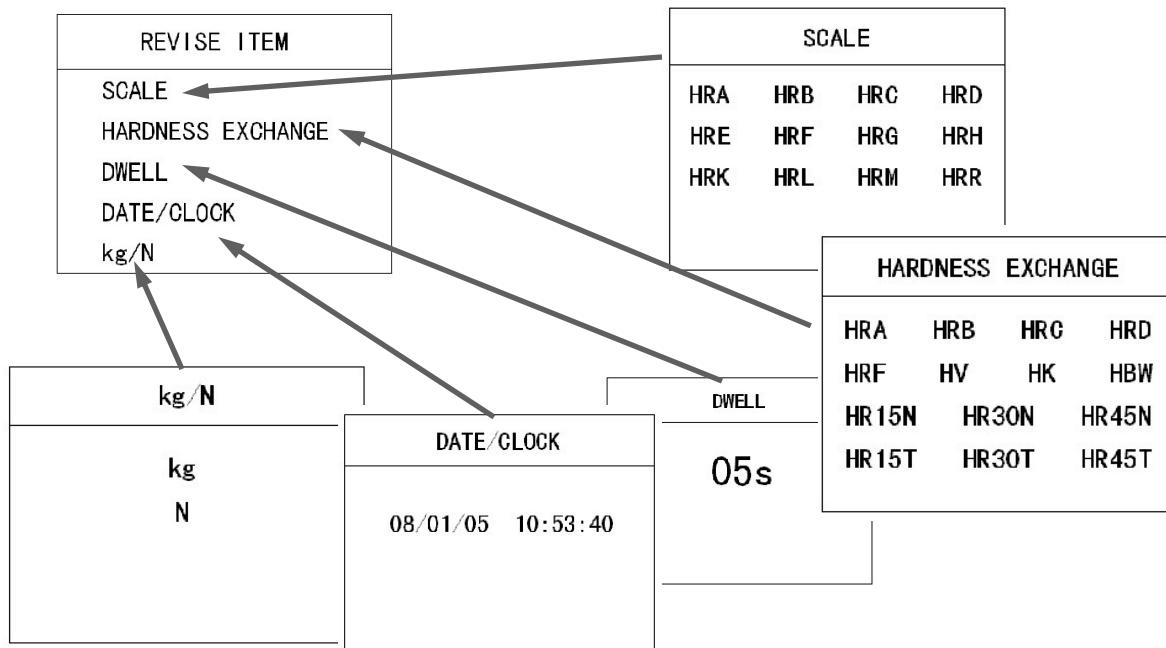
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2.3.8 Key Pad Functions



REV1

Review Key to change the scale, conversion, dwell, date and force units.





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Zero's value



Delete the present measured hardness value



Prints hardness value, average value, range, number of tests, date



Display Key - Displays hardness, range, time , up to 12 values



Confirmation Key - Press to enter data



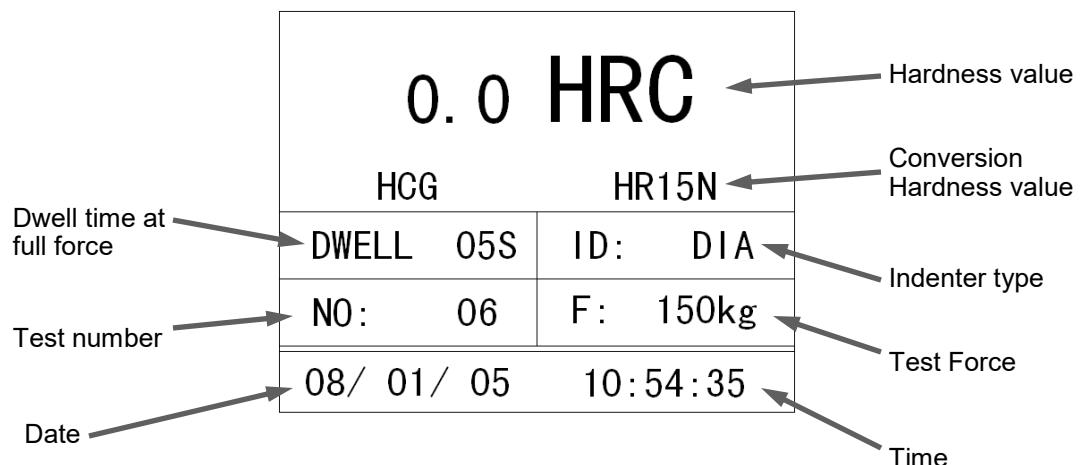
Up and Down cursor control



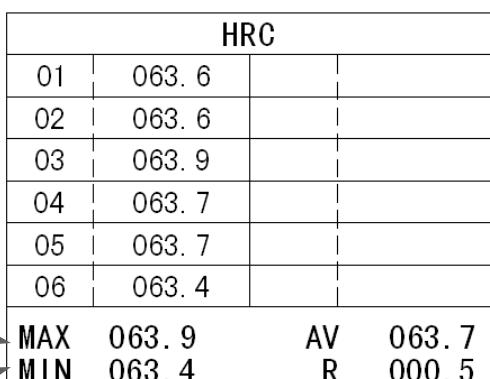
Left and Right cursor control



2.3.8.1 Main Screen



2.3.8.2 Display Screen



The diagram shows the display screen of the OMEGA-RT-60/150 Rockwell Hardness Tester, displaying a history of hardness measurements:

HRC			
01	063. 6		
02	063. 6		
03	063. 9		
04	063. 7		
05	063. 7		
06	063. 4		
MAX	063. 9	AV	063. 7
MIN	063. 4	R	000. 5

Annotations on the left side of the table:

- Max. hardness value:** Points to the maximum value in the table.
- Min. hardness value:** Points to the minimum value in the table.

Annotations on the right side of the table:

- Average Hardness value:** Points to the average value.
- Max and Min. Range:** Points to the range value.



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3.0 Safety Guidelines

3.1 Warning Sign

- !** This sign points to special safety features on the machine.

3.2 Safety Precautions

- !** Careful attention to this instruction manual and the recommended safety guidelines is essential for the safe operation of the **OMEGA-RT-60/150**.
- !** Proper operator training is required for operation of the **OMEGA-RT-60/150**. Any unauthorized mechanical and electrical change, as well as improper operation, voids all warranty claims. All service issues need to be reported to the manufacturer / supplier.

- !** Operate unit as specified in this manual.
- !** Disconnect power before opening unit.
- !** Lower stage to avoid damaging indenter or lens when not in use.
- !** Cover unit with dust cover when not in use to eliminate dust contamination.

3.3 Emergency Statement

Always follow proper operational guidelines and avoid contact with lubricants and abrasives.



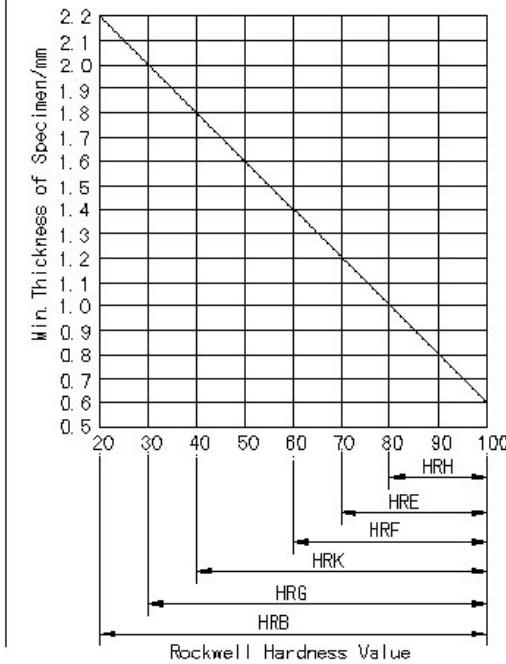
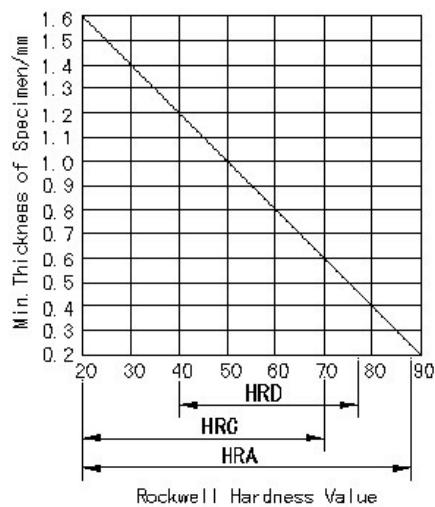
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4.0 Operation

STEPS FOR OMEGA-RT-60/150 OPERATION IN BRIEF

(Please see explanation of important points on next pages before proceeding)

1. Mount the sample so it is flat on the stage. For non-parallel mounts a leveling vice is recommended (optional)
 - Sample should be clean
 - Minimum thickness should be 10X the depth of the indentation
 - Do not test samples in a metallographic mounts
 - Sample must be secured so it does not move during loading, otherwise the indenter can be damaged



- 2.
3. Select appropriate load and indenter (see following table).

PRECAUTIONS



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4.0 Operation (continued)

Scale	Indenter Type	Initial Test Force	Total Test Force (N)	Application
HRA	Diamond Indenter	98.07 N (10 kg)	588.4 (60 kg)	Hard alloys, carbide steel, surface quenched steel, carburized steel plate
HRD			980.7 (100 kg)	Steel sheet, surface quenched steel
HRC			1471 (150 kg)	Quenched steel, tempered steel, hard cast iron
HRF	Ball Indenter φ1.5875mm (1/16 inch)	98.07 N (10 kg)	588.4 (60 kg)	Cast iron, aluminum, magnesium alloy, bearing alloy, annealed copper alloy, mild steel sheet
HRB			980.7 (100 kg)	Mild steel, aluminum alloy, copper alloy, malleable cast iron, annealed steel
HRG	Ball Indenter φ3.175mm (1/8 inch)	98.07 N (10 kg)	1471 (150 kg)	Phosphor bronze, beryllium bronze, malleable cast iron
HRH			588.4 (60 kg)	Aluminum, zinc, lead, etc
HRK			980.7 (100 kg)	Bearing alloy, tin, hard plastics and other soft materials
HRE	Ball Indenter φ12.7mm (1/2 inch)	98.07 N (10 kg)	1471 (150 kg)	
HRL			588.4 (60 kg)	
HRM			980.7 (100 kg)	
HRR			1471 (150 kg)	



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4.0 Operation (continued)

4. Rotate Hand Wheel clockwise to move sample into indenter

-Continue to turn wheel slowly to apply the initial test load (approx. 580-610 hardness on the display).

-When the buzzer is sounded allow stop adding the initial load and let the servo motor apply the test force for the preset Dwell time (If the initial load is too fast or over 610 the buzzer will produce a long sound indicating an error in the measurement. For this situation lower the sample and move the sample to a new location and then re-apply the initial test)

IMPT: Do not rotate the hand wheel or move the specimen during the operation as this may damage the instrument.

5. Turn rotating wheel counter-clockwise to lower the sample. Move the sample to the second test location.

-NOTE: the first measurement is done to set the indenter and is not included in the data

6. To print, remove load or back off sample from indenter and press "PRT" to print the output

Clamp the sample properly on the self-leveling vice. This will make the sample exactly perpendicular to the indenter.

Important : This is very important as a tilted sample can damage the indenter. It is also very important to have a flat specimen. A rounded specimen will have varying height as it moves and can touch and damage the indenter.

Important : Take utmost care to insure that the sample or the leveling vice does not touch the indenter as this may damage the indenter



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5.0 Maintenance

5.1 Introduction

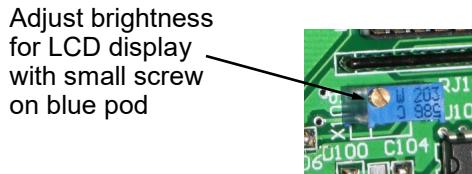
The **OMEGA-RT-60/150** requires very minimal maintenance. However, to increase the life of the Rockwell Hardness tester, it is suggested that the unit be covered when not in use.

5.2 Cleaning outside cabinet

The cabinet should be cleaned occasionally with a moistened cloth. Do not use any chemicals or cleaning abrasives.

6.0 Trouble Shooting

Phenomenon	Possible Causes	Method Used
LCD does not turn on	1. No power 2. The fuse is blown.	1. Check the power cable. 2. Change the fuse.
When the tester is on, the keys do not work	The instrument is not in working state.	When the tester is turned on, wait until the instrument returns to the working state.
The Up / Down Lead Screw is hard to move	The space between the Up / Down Lead Screws are blocked by the thread ends or dirt	Remove the protecting cover for the Up / Down Lead Screw and clean the screw threads
The deviation of the displaying hardness value is too great.	1. The indenter is damaged 2. The Weights are not installed in order. 3. The tester is not placed in the horizontal level and the weights are touching the inside wall of instrument body. 4 .The total test force or the indenter are not correct. 5. The protecting cover of Up/ Down Lead Screw is to high over the supporting plane of the Testing Table	1. Change the diamond indenter or the ball indenter. 2. Install the weights properly 3. Level the tester 4. Choose the appropriate testing force and indenter 5. Lower the protecting cover and clean the Up and Down Lead Screw.
LCD hard to read	1. LCD display brightness not set properly	1. Adjust blue pod adjustment on back of LCD panel (see below)





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7.0 Hardness Testing Basic

Hardness Testing provides useful information, which can be correlated to tensile strength, wear resistance, ductility, and other physical characteristics of the material. Hardness testing is therefore useful for monitoring quality control and for aiding in the materials selection process.

ROCKWELL HARDNESS

Rockwell hardness (HR) is an indentation hardness test that is determined with a spherconical penetrator, or hard steel ball, that is forced into the specimen surface. The test is accomplished by bringing the specimen into contact with the penetrator and allowing the penetrator to be slowly forced into the specimen surface by a series of weights acting through a system of levers. After the load is released, a dial pointer or LED screen indicates the hardness number.

Typical Applications:

- Quality control for metal heat treatment
- Materials receiving inspection
- Evaluation of welds in steels and other metal alloys
- Failure analysis

Standard Rockwell testing is at 60, 100 and 150 kg loads and Superficial Rockwell testing is at 15, 30 and 45 kg loads.

BRINELL HARDNESS

To determine a Brinell hardness number (BHN), a 10 mm diameter steel ball is typically used as an indenter with a 3,000 kgf (29 kN) force. For softer materials, a smaller force is used; for harder materials, a tungsten carbide ball is used. The BHN can also be converted into the ultimate tensile strength (UTS), although the relationship is dependent on the material, and therefore is only an empirically based value.

VICKERS HARDNESS

The Vickers test is often easier to use than other hardness tests since the required calculations are independent of the size of the indenter, and the indenter can be used for all materials irrespective of hardness. The Vickers test can be used for all metals and has one of the widest scales among hardness tests. The unit of hardness given by the test is known as the Vickers Pyramid Number (HV) or Diamond Pyramid Hardness (DPH).

MICROHARDNESS

Microhardness testers are both mechanical and optical measuring tools. The indent is produced by



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applying a known load to the specimen and then measuring the size of the appropriate diagonals either optically or with image analysis software.

Microhardness is primarily determined with either a Knoop or Vickers indenter under test loads in the range of 1 to 2000 gram-force. Microhardness is used to measure the hardness of specific phases, small particles, and for brittle materials.

Knoop hardness (HK) number is based on the size of the indent that a rhombic-based, pyramidal diamond indenter produces under a known applied load. The HK number is calculated by dividing the applied load (kilogram-force) by the projected area of the indentation (square millimeters).

The Vickers hardness (HV) number is obtained by dividing the applied load in kilogram-force by the surface area of the indentation. The area of the indentation produced from the Vickers square-based pyramidal diamond is determined by the mean distance between the two diagonals of the indentation.