Density Meter of homogeneous liquids, heterogeneous liquids, solids, powders and gels

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AWARD PRESENTED TO
Hassan Mohammadi
FOR THE INVENTION
Homogeneous and Heterogeneous Liquids Density Meter
10 TO 12 AUGUST 2022
GENEVA, SWITZERLAND
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Homogeneous and heterogeneous liquids density Meter was designed and manufactured in 10 years and was patented in 2018 and was approved by the University of Tabriz and the National Elite Foundation of Iran and won the following titles:

- Certificate of “Inv” Membership
- Silver TRL of Iran Tech Hub
- 2nd place in the Swiss Invention Competition in 2022
- Silver medal of Teknofest Türkiye in 2022

The main reason and purpose of designing and building this device is that in various industries around the world, a device that looks like a scale and is equipped with a special container is often used to measure the density of grouts. For the following reasons, this type of densitometers have low accuracy and working with them has special problems:

- They have a special container that has holes to adjust one liter of liquid for measurement. Adjusting 1000 cc of liquid with this method is not an accurate method due to the overflow of the liquid from the holes in the container.
- At least one liter of liquid is required for measurement.
- It is difficult to read the information from its calibrated screen and it is accompanied by errors.
- Due to the relatively high weight of the device and the overflow of liquid from the holes in the measuring container, its use has certain problems, especially if the user is one person.
- Temperature compensation in container, scale and liquid part is not considered.

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Capabilities of the density meter

- Measuring the density of homogeneous liquids such as water, acids, alkaline, alcohols, refinery products, perfumes, etc.

- Measuring the density of heterogeneous liquids such as pulps, mixtures, slurries of production lines, industrial effluents, suspensions, body fluids, drinks, etc.

- Measuring the density of solids such as plastics, light metallic and non-metallic alloys, glass, ceramics, etc.

- Measuring the density of powders such as salt powder, cement powder, metal concentrate powder, etc.

On this device:

- Liquid density measurement is independent of liquid temperature and temperature changes do not affect the measurement result.

- Liquid density measurement is done with different volumes and volume changes do not affect the measurement result.

- It is possible to measure the density of liquids that settle quickly, thick, volatile and unstable liquids and liquids in which insoluble particles settle quickly.

Applications

- In mineral concentration factories such as steel, copper, aluminum, zinc and gold to measure pulps and slurries

- In refineries and petrochemicals to measure products such as crude oil, gasoline, alcohol, acetone, detergents

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- In medical and pharmaceutical industries to measure the density of suspensions, powders, mixtures

- In the food industry to measure the density of drinks, honey, solutions, food powders

- In the construction industry to measure the density of concrete and cement mortar

- In the polymer and paint industries to measure the density of colors

- In laboratories and universities.

Possibilities

- Equipped with Wi-Fi to send information to peripheral devices such as mobile phones and computers.

Full color display and equipped with wireless and wired charger for battery charging.

Specifications

Machine weight + crystallizer	500 g
Dimensions	10 × 10 × 10 cm
Measuring container	Crystallizer 80*45 mm
Sample size interval	40 to 140 cc
Measurement accuracy	± 0.001 g/cm³ (4 Digits)
Charging the device	Wireless charger and Normal Adaptor 5 Vdc
Ambient temperature range	-10 °C to +50 °C
Sample temperature range	-10 °C to +50 °C
Accuracy of ambient and sample temperature measurement	± 0.1 °C
Accuracy of sample weight measurement	± 0.01 g
Accuracy of sample volume measurement	± 0.01 cc
power consumption	5Vdc, 100mA

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Measurement method

1- Place the device on an almost horizontal surface.

2- Press the ON button to turn on the device.

3- If the weight of the measuring container is not zero, set it to zero by pressing the Tare button.

4- Take the container and pour desired amount of liquid into it and place it inside the device.

In less than 5 seconds, the information visible on the display:

- Weigh the liquid exactly 0.01 g
- Liquid volume with an accuracy of 0.01 cc
- Liquid temperature with an accuracy of 0.1 ºC
- Ambient temperature with an accuracy of 0.1 ºC
- Liquid density with an accuracy of 0.001 g/cm³ (4 digits)

5- Turn off the device by pressing the Reset button for 3 seconds (if necessary).

Measuring the density of water

Use the above method to measure the density of water. The density of water at room temperature is 0.997 g/cm³. Water is used for device calibration and verification. 0.997 g/cm³ should be observed at any ambient temperature and at any water temperature, otherwise calibrate the device.

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Device calibration

- Press both ↑ and → buttons together.

- Release the buttons when the calibration number changes. By pressing ↑ the calibration number increases and by pressing → the calibration number decreases.

- Press the Save button and reset the device with the Reset button to perform the calibration.

Measuring the density of water and cement mixture

Use the above method to measure the density of water and cement mixture. The density of water and cement mixture is more than 1.000 g/cm³. If we want to see the percentage of dry cement soluble in water, we must enter the number 1440, which corresponds to the dry density of cement, to see the percentage of dry cement.

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Setting the number of dry percentage of the material

To set the dry number of a specific material:

- Press the ↑ button until the first letters of the number change from A to E.

- After seeing the letter A, press the → key to highlight the thousand digit.

- Use the ↑ button to set the thousand digit.

- Set the hundreds, tens and ones digits by pressing the → key.

- Press the Save button and reset the device with the Reset button to set the dry percentage of the desired material.

The percentage seen on the display corresponds to the dry percentage of the substance.

The number of dry percentage of different materials can be stored in A, B, C and D.

Measuring the density of solids

- First, pour some water or a homogeneous liquid into the crystallizer and note its weight and volume on the device's display.

- Remove the container from inside the device and put the non-porous solid piece into the liquid and put it inside the device.

- Write down the weight and volume.

- From the difference of weights and volumes, the weight, volume and density of the solid piece are obtained.

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Mobile connection to the device

- Activate mobile Wi-Fi and connect to the device.
- Run the Density Scale software and the option

  Tap Connect to display device information

  It can also be seen on mobile.
- From the Solid Density menu to measure the

Piece Solid is used.

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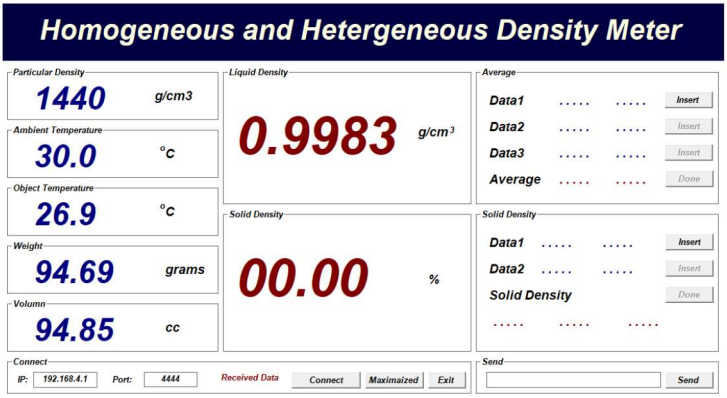
Connecting the computer to the device

-Activate the Wi-Fi of the computer and connect to the device.

- Run the Density Scale software and click the Connect option so that the display information of the device can also be seen on the computer.



Important points

- Only the bottom part of the machine can be washed.
- This device is breakable.
- Inform the manufacturer of any problems related to the measurement and performance of the device.
- Use only a wireless charger or 5V adapter to charge the device.
- Dead Band message means the device cannot measure the density of the liquid.
- Use the device's own container to measure.
- Pouring liquid on the bottom of the device will damage it.
- Calibrate this device with water.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