# DENSITY BALANCE

## 0.1mg, 1mg & 10mg

**PHOENIX** High Precision Balances incorporate advanced Electro Magnetic Force Restoration (EMFR) technology for offering unmatched accuracy and reliability, coupled with unique ADC circuit with inbuilt temperature compensation to offera very high stability. All adjustment parameters are programmable to take care of any minor mismatchof different sub-assemblies & Balances are configured with these parameters.

Density Determination Kit is available in 2 types one to be mounted on the pan and the other type is with attachment for weigh below the balance. Density Determination Kit consists density weighing pan assembly, stainless steel base for beaker, glass beaker, optional sinker for testing materials having density less than water and software (program) for density determination.

Facility for programming densityof liquid (otherthan water) and temperature of water.
In case of multiple samples, storage of the entire sample weights in air first and then in water, viewing of density of individual samples one by one on the display.

To measure density of solids using a balance is an easy and convenient process that delivers highly reliable results when compared to other methods in which the volume of the part is determined independently of the weight. This makes the purchase of the Density Kit accessory a very cost-effective investment. With the addition of a glass sinker of known volume, the Density Kit can also be used for determining the density of liquid samples. The built-in Density application provides step-by-step instructions making it easy for even untrained operators to use.
Benefit further from:

- Automatic density calculations for solids and liquids including temperature adjustment of the reference liquid
- Statistic evaluation of multiple samples
- All results, including User, Sample ID, Lot Number, Time and Date can either be printed or saved on a USB stick.

Determination of Density in Solids Samples
The solid is weighed in air (A) and then again (B) in the auxiliary liquid with a known density. The density of the solid ρ can be calculated as follows:

$$\rho = \frac{A}{A - B} (\rho_0 - \rho_L) + \rho_L$$

ρ = Density of the sample
A = Weight of the sample in air
B = Weight of the sample in the auxiliary liquid
ρ0 = Density of the auxiliary liquid
ρL = Density of air
The temperature of the liquid must be taken into account as this can cause density changes of the order of magnitude 0.001 to 0.1 per °C, the effect of which can be seen in the third decimal place of the result.

# Density Determination Using a Laboratory Balance

## Ensure Product Quality with an Easy and Reliable Method

Density determination is essential for assessing the purity, uniformity, and quality of many kinds of goods. In industry, density is used in the inspection and price-setting of incoming raw materials, for troubleshooting production processes, and for quality control of final goods. Density determination is used for Gold, Silver, Gemstones, Food Production, Mining, Refining Petroleum Products, Manufacturing Plastic Parts, Construction Materials, and much more.
Measuring density of a sample is an important quality parameter of both raw materials and finished products. Various techniques enable the density of solid, viscous and liquid materials to be accurately determined e.g. Metals, Plastics, Chemicals, Lubricants and Food.

**Density for Quality Control**
A variation in a raw material, indicated by a change in the density, may have a detrimental outcome on the functioning or quality of the final product. Density measurement of raw materials can be used to confirm the purity of the material. If a substance has been adulterated with a cheaper alternative, the measured density of the composite material will be different from the pure substance.
Density can also be used to ensure homogeneity. If a manufactured part is not homogeneous, key performance attributes such as strength and crack resistance can be affected. For example, an internal air bubble could ultimately cause a part to fail when placed under stress. Random sampling of parts is a simple and cost-effective way to monitor ongoing quality.

**The Challenges of Accurate Density Measurement of Solids**

(A) Bubbles
By far, the biggest source of error in density measurement is the limited wettability of the sample. When the sample is submerged in liquid, it is crucial that all bubbles adhering to the sample and equipment are removed. Any remaining bubbles will cause a buoyancy effect and distort the density calculation. (A bubble with a 1 mm diameter causes a buoyancy of 0.5 mg.) We recommend:
Use a wetting agent or organic liquids (the density change experienced by distilled water by the addition of a few drops of wetting agent can be neglected).
Degrease solvent-resistance solids
Clean equipment regularly
Do not touch parts to be submerged with bare hands
Use a fine brush to remove stubborn air bubbles

(B) Temperature
Solids are generally so insensitive to ambient temperature fluctuations that the corresponding density changes are of no consequence. However, as density determination is carried out with an auxiliary liquid, temperature must be taken into account. Temperature has a greater effect with liquids and causes density changes of order of magnitude 0.1 to 1‰ per °C.
This effect is already apparent in the third decimal place of the result. To obtain accurate results, we recommend that you always take the temperature of the auxiliary liquid into account in all density determinations. Values are available in dedicated books of tables. The densities of the most important reference liquids ($H_2O$ and Ethanol) are stored in the balance.

(C) Weighing
As mentioned above, weighing plays an important part in the accurate determination of density so it is critical that the balance used meets the needs of the density application. For small samples, the minimum net sample weight of the balance must be considered – weighing a sample below this weight cannot be trusted to be of the required level of accuracy.

# Technical Data

**General data**

Standard power supply AC/DC adapter:

Input: 140 – 300 V AC ± 10%, 47 – 63 Hz

Output: +8V/ 0.5A, +15V & - 15V/ 0. 1Amp (Limited Power Source)

**Protection and standards**

| | |
|---|---|
| Overvoltage category: | II |
| Degree of pollution: | 2 |
| Application: | Use only indoors in dry locations |

**Environmental conditions**

| | |
|---|---|
| Ambient temperature: | Operating conditions for ordinary lab application: +10°C to +30 °C (operability guaranteed between +5 °C and +40 °C) |
| Relative air humidity: | Max. 80% up to 31 °C, linearly decreasing to 50% at 40 °C, non-condensing |
| Warm-up time: | At least 30 minutes (60 minutes for 0.1 mg models) after connecting the balance to the power supply. When switched on from standby, the instrument is ready for operation immediately. |

**Materials**

| | |
|---|---|
| Housing: | Top Housing: Die-cast aluminum, powder coated<br>Bottom housing: Die-cast aluminum, powder coated |
| Weighing pan: | ø 85 mm: Stainless steel in 0.1mg<br>ø 100 mm: Stainless Steel in 1mg<br>ø 160 mm: Stainless Steel in 10mg |
| Draft shield: | ABS, glass |

## Technical Datasheet of PHOENIX Brand NLB Series 0.1 mg Balance

| MODEL | NLB 2204 | NLB 1204 | NLB 604 |
|---|---|---|---|
| Capacity | 220 gm | 120 gm | 60 gm |
| Readability | 0.1 mg | 0.1 mg | 0.1 mg |
| Repeatability (std dev) | 0.1 mg | 0.1 mg | 0.1 mg |
| Linearity (+/-) | 0.2 mg | 0.2 mg | 0.2 mg |
| Pan Size (mm/inch) | 85 mm dia/ 3.4" | | |
| Response Time | 4-5 Sec. | | |
| Display | 7 Digit LCD Display with Backlit. | | |
| Calibration | Automatic External Calibration. | | |
| Unit of Measure | Gram, Mg, Carat. | | |
| Other Features | Count, M+, % Weighing, GSM. | | |
| Tare Range | 100% Subtractive. | | |
| Operating Temperature | 18° to 35°C | | |
| Accessories (Optional) | Wired Extra Display, Wireless RF Extra Display, RS-232 Serial Port, USB Device Port, USB Host Port, Bluetooth App, Motorized Internal Calibration, Density Kit with Software. | | |
| Compliance | ISO, CE | | |
| Dimension (WXDXH) mm | 343 X 234.5 X 354 mm | | |
| Power Supply | AC Adapter 230 V ± 10% 5O Hz ± 2% | | |
| Net Weight with Packing | 11 kg (Approx.) | | |
| Packing Dimension (Balance & Wind Shield) | 474 X404 X 201 mm/ 307 X307 X135 mm. | | |

# Technical Datasheet of PHOENIX Brand NLB Series 1 mg Balance

| MODEL | NLB 2003 | NLB 3003 | NLB 5003 | NLB 7003 |
|---|---|---|---|---|
| Capacity | 200 gm | 300 gm | 500 gm | 700 gm |
| Readability | 1 mg | 1 mg | 1 mg | 1 mg |
| Repeatability (std dev) | 1 mg | 1 mg | 1 mg | 1 mg |
| Linearity (+/-) | 1 mg | 1 mg | 1 mg | 1 mg |
| Pan Size (mm/inch) | 100 mm dia/ 4" | | | |
| Response Time | 4-5 Sec. | | | |
| Display | 7 Digit LCD Display with Backlit. | | | |
| Calibration | Automatic External Calibration. | | | |
| Unit of Measure | Gram, Mg, Carat. | | | |
| Other Features | Count, M+, % Weighing, GSM. | | | |
| Tare Range | 100% Subtractive. | | | |
| Operating Temperature | 18° to 35°C | | | |
| Accessories (Optional) | Wired Extra Display, Wireless RF Extra Display, RS-232 Serial Port, USB Device Port, USB Host Port, Bluetooth App, Motorized Internal Calibration, Density Kit with Software. | | | |
| Compliance | ISO, CE | | | |
| Dimension (WXDXH) mm | 343 X 234.5 X 354 mm | | | |
| Power Supply | AC Adapter 230 V ± 10% 5O Hz ± 2% | | | |
| Net Weight with Packing | 11 kg (Approx.) | | | |
| Packing Dimension (Balance & Wind Shield) | 474 X404 X 201 mm/ 307 X307 X135 mm. | | | |

# Technical Datasheet of PHOENIX Brand NLB Series 10 mg Balance

| MODEL | NLB 50002 | NLB 40002 | NLB 30002 | NLB 20002 | NLB 12002 |
|---|---|---|---|---|---|
| Capacity | 5Kg | 4Kg | 3Kg | 2Kg | 1.2Kg |
| Readability | 10 mg | 10 mg | 10 mg | 10 mg | 10 mg |
| Repeatability (std dev) | 10 mg | 10 mg | 10 mg | 10 mg | 10 mg |
| Linearity (+/-) | 20 mg | 20 mg | 20 mg | 20 mg | 20 mg |
| Pan Size (mm/inch) | 160 mm dia/ 6.4" | | | | |
| Response Time | 3-4 Sec. | | | | |
| Display | 7 Digit LCD Display with Backlit. | | | | |
| Calibration | Automatic External Calibration. | | | | |
| Unit of Measure | Gram, Mg, Carat. | | | | |
| Other Features | Count, M+, % Weighing, GSM. | | | | |
| Tare Range | 100% Subtractive. | | | | |
| Operating Temperature | 18° to 35°C | | | | |
| Accessories (Optional) | Wired Extra Display, Wireless RF Extra Display, RS-232 Serial Port, USB Device Port, USB Host Port, Bluetooth App, Motorized Internal Calibration, Density Kit with Software. | | | | |
| Compliance | ISO, CE | | | | |
| Dimension (WXDXH) mm | 343 X 234.5 X 354 mm | | | | |
| Power Supply | AC Adapter 230 V ± 10% 5O Hz ± 2% | | | | |
| Net Weight with Packing | 11 kg (Approx.) | | | | |
| Packing Dimension (Balance & Wind Shield) | 474 X 404 X 201 mm/ 307 X 307 X 135 mm. | | | | |

*All Specifications and designs are subject to change for improvement.

PHOENIX®

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