Digital Newton Meter

01-7000

INSTRUCTIONAL GUIDE

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Specifications:

- Size: 150 x 45 x 24 mm
- Weight: 75 g without batteries
- Range: 0.00–19.99 N / 0–1999 g (± 0.01 N / 1 g)
- Batteries required: 2x **AAA batteries (P8-5605)**

Recommended for Activity:

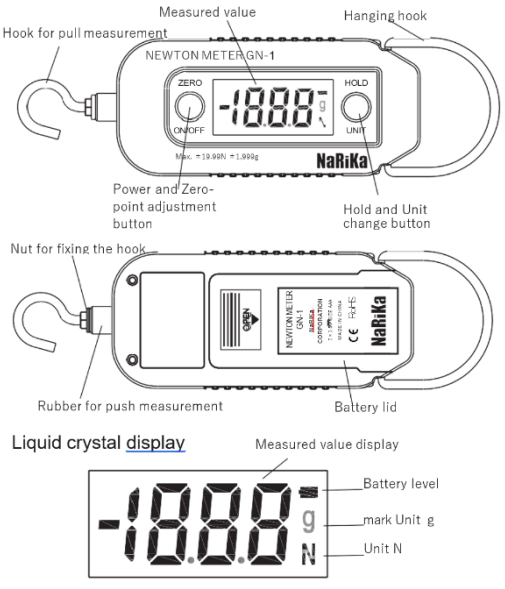
- **Hooked Mass, Set of 9 (91-1000)**
- **Ring Stand Base with Rod (66-4220)**

Introduction

The Digital Newton Meter provides an excellent alternative to push-pull spring scales in the same range. It is a compact and versatile tool, making it a must-have resource in the physics toolbox. It allows for the simple exploration of fundamental concepts like the relationship between mass and weight. With some simple unit analysis, the gravitational constant can easily be measured. More activities may include exploration of vector theory, friction forces, and the hands-on investigation of free-body diagrams just to name a few.

Instructions

Press the power/zero button once to turn on the Newton Meter. If the batteries are low, a symbol will appear in the top right portion of the display. To replace the batteries, simply slide the back cover off, replace the batteries, and slide the cover back on. Zeroing the Newton Meter is accomplished by briefly pressing the power/zero button when the unit is in the desired orientation. If measuring vertically, be sure to zero the unit while it is hanging vertically, otherwise the components of the measuring device will bias the reading when the Newton Meter changes direction. Press and hold the power/zero button to turn the Newton Meter off.



When the power is turned on, the display will automatically read in Newtons (N). To change the reading to grams (g), press and hold the hold/unit button until the symbol on the right of the display changes from N to g. Measurements may be taken by pulling on the hook or by unscrewing the hook and pushing on the rubber bumper. A reading can be held by briefly pressing the hold/unit button. The display will flash to indicate the measurement is being held, and the force may be removed without losing the reading.

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Activity

The difference between mass and weight is a fundamental concept in physics, but the two terms are often used synonymously in every-day life. This is a proportional relationship, so with more mass experiencing acceleration, more weight is measured. Finding the proportionality constant, the acceleration of gravity, is straight forward and only requires a little unit analysis.

1. Suspend the Digital Newton Meter from its ring. A ring stand and right-angle clamp works best. Find several objects of known masses or a **set of hooked masses (91-1000)**.
2. While the Newton Meter is suspended, zero the reading without any mass on the hook.
3. When the Newton Meter is zeroed, take the first mass and suspend it from the bottom hook. Record the mass used in kilograms and the reading in Newtons in the table below.

Mass (kg)	Weight (N)	Gravitational Constant

4. Repeat step three with four different masses for 5 total trials.

Analysis:

We know from Newton's second law that force = mass x acceleration. From here we can figure out that weight must be a force since it is found by multiplying the mass of an object by its acceleration due to gravity. With the data above, rearrange Newton's second law to solve for the gravitational constant and write each calculation in the third column. What unit of measurement does the gravitational constant have?

Discussion

1. Define the relationship between weight and mass.

2. A Newton is the fundamental unit of force. Use what you have learned to define Newtons in terms of mass and acceleration.

Related Products

Complete Set of Push-Pull Spring Scales (P1-1090) These unique spring scales include a specialized plunger that allows students to measure by pulling or pushing.

Newton's Apple (P1-1019) has a weight of approximately one Newton and is made of soft foam, in case you want to act out the story that started it all.

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