SECTION 12 - MEASUREMENT INSTRUMENTS

Index

Lengths and angles	Page 200
Volumes/Time intervals	Page 202
Density/Forces, weights and masses	Page 204
Temperature	Page 207
Electrical devices	Page 208







Measurement instruments set

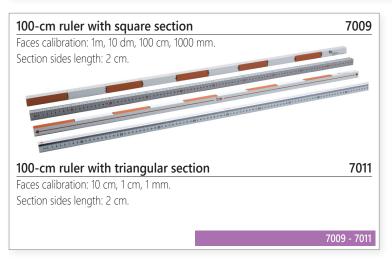
This kit includes all items needed to perform weight, length, angle capacity, time, temperature, force and electrical measures. Items stored in a small plastic case.

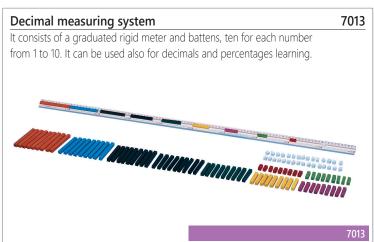
Equipment supplied

- Decimal Metric system
- Metric wheel 10m
- Vernier caliper
- 1 Tape measure
- Protractor
- 1 Inclinometer
- Big-size vernier caliper
- graduated cylinder 100ml
- graduated cylinder 250ml
- Digital timer
- 1 Spring scale 100g/1N 1 Spring scale 250g/2,5N
- Spring scale 1000g/10N
- Mathematical scales
- Digital thermometer -50+150° C
- Wall Thermometer
- 1 Portable Digital Multimeter
- 1 Case



7019











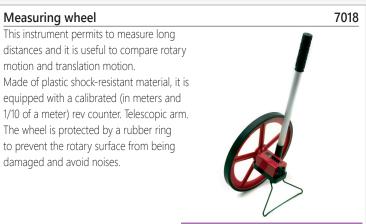






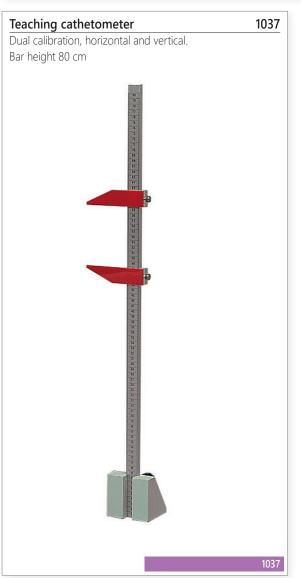


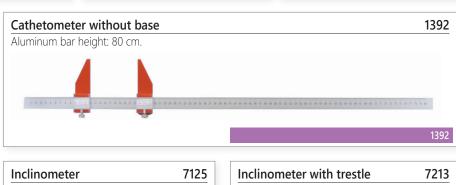












This item is used to measure the angle according to which you can see a tree, a tower, an hill, etc., in order calculate their height using draw to scale. Protractor diameter 30 cm.



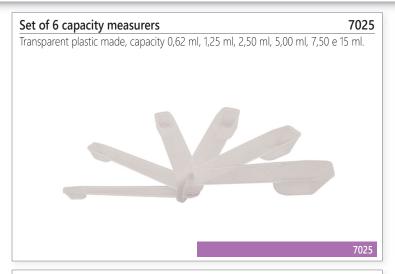
Inclinometer with trestle

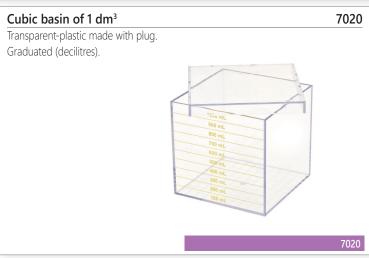
As Inclinometer cod. 7125, but mounted on a telescopic trestle. This trestle permits the clinometer to rotate 360° on the horizontal axis, to be lengthwise and widthways inclined. Instrument height considering the maximum extension of the trestle: 180 cm.



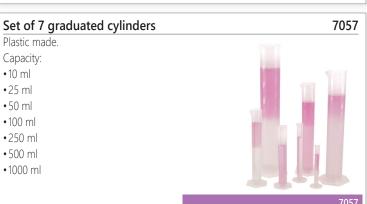
Spherometer
To measure the bending rays of spherical sufaces.







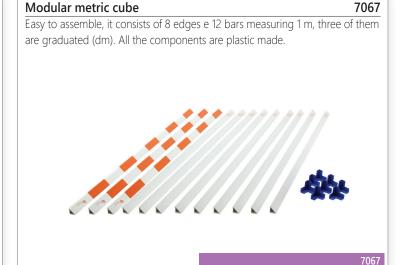




Series of 200 cubes of 1 cm³ - 1 g

Made of coloured plastic. They can be assembled and they allow to measurement of surfaces and volumes. They can be used for measurements weigh with two plates scales.









Sundial model 7121

This model is supplied without the calibration, which has to be done by the students according to the supplied teaching guide explanations (pdf version). In this guide it is possible to read the physical principles that make it work. It is supplied with protractor and compass.

Size: 20x20 cm.



7121

Digital stopwatch "stratos"

F1023

Measuring range: 9h, 59 min, 59 sec.

Time unit: 1/100 sec.



F1023

Digital table stopwatch

1416

- Liquid crystals display: 82x40 mm
- Accuracy: 1/100 sec
- Power supply: 1.5 V battery
- Reading: hours minutes seconds. Clock function, with date, the day of the week and alarm clock to be set.



1416

Clock model

Plastic made, it permits to understand how a clock works.

Diameter: 32 cm.



7054

7054

Analog chronometer "amigo"

F1006

Model of 15 minutes, accurancy 1/10 of a second.

- 1. Green button: to start the calculation.
- 2. Red button: to stop the calculation.
- 3. Black button: zeroing.

Box made of synthetic material; Ø 60mm.



F1006

Electromagnetic ticker tape timer

1408

Alternating voltages working 4-8V. Fitted with support, paper roll, carbonate paper disks and two connecting wires.

Frequency: 50 Hz.

Power supply not included.

Spare paper tapes

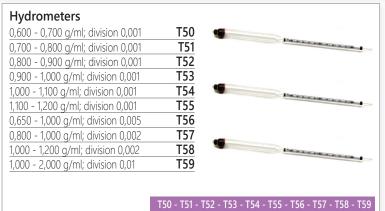
1408.1

6 rolls for the ticker tape timer code 1408.

Carbonate paper disks for ticker tape timer

1408.2





Optika precision spring scales Transparent plastic made with engraved graduated scale. Protection against overload and possibility to set to zero. Linear, capacity 1N, division 0,01N 1193.1 1256.1 Linear, capacity 2N, division 0,02N Linear, capacity 5N, division 0,05N 1257.1 Linear, capacity 10N, division 0,1N. 1258.1 Linear, capacity 20N, division 0,2N 1259.1

Teaching spring balances

Plastic made with engraved graduated scale.

Protection against overload and possibility to set to zero.

Capacity 100 g/1N, division 2 g/0,02N 1347 Capacity 250 g/2,5N, division 5 g/0,05N 1348 Capacity 500 g/5N, division 10 g/0,1N 1356 Capacity 1000 g/10N, division 20 g/0,2N 1357 Capacity 2000 g/20N, division 40 g/0,4N 1358

Capacity 5000 g/50N, division 100 g/1N 1359



1347 - 1348 - 1356 - 1357 - 1358 - 1359

Set of Spring balances 1424

Set of Spring balances with double calibration: 100 g/1N; 250 g/2,5N; 500 g/5N; 1000 g/10N; 2000 g/20N; 5000 g/50N.

Plastic case.



Basic scale 7069

Made from resistant plastic. Capacity: 2000 g, sensibility: 1 g. Plates surface: 100 cm2. Supplied with 8 masses and with instructions quide. Size: 30x12x11 cm.



Teaching scale

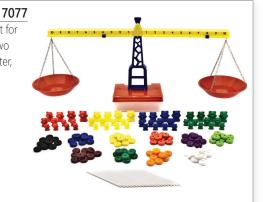
40,8x22x18 cm.

1150 Wooden base, marble surface, polished brass plates, capacity: 2 Kg, fitted with 1 mass of a 1 Kg, 10 masses of 100g, 10 masses of 10g, 10 masses of a 1g. Size:



Mathematical scale

Plastic made. It's an important teaching support for middle school. It is fitted with plates and with two buckets which permit the students to weigh water, sand, and so on, in order to understand scales working and measurement rules.



Series of 200 g masses

1035

Made from nickel-plated brass in a plastic holder with cover; gramme fractions are kept in a small support with plexiglass cover; supplied with clasp.



Supplied weights: 100 g 1pc, 50 g 1pc, 20 g 2pcs, 10 g 1pc, 5 g 1pc, 2 g 2pcs, 1 g 1pc, 500 mg 1pc, 200 mg 2pcs, 100 mg 1pc, 50 mg 1pc, 20 mg 2pcs, 10 mg 1pc.

Series of 2 kg masses 1148

Made from raw brass and painted steel, wooden support:

1000 g 1pc, 500 g 1pc, 200 g 1pc, 100 g 2pcs, 50 g 1pc, 20 g 1pc, 10 g 2pcs, 5 g 1pc, 2 g 2pcs, 1 g 1pc.



Series of masses with hook

Made from nickel-plated brass and painted steel with support: 1000 g 1pc; 500 gr 1pc; 200 g 2pcs; 100g 1pc; 50 g 1pc; 20 g 2pcs and 10 g 1pc.



Technical balance 1433

The technical balance allows you to compare two masses. The two plates are supported by a beam that rests on a fulcrum. The beam is symmetrical to the vertical plane assing through the fulcrum and can freely rotate around it.

An index is rigidly attached to the beam. By putting masses on tl

Dimensions:

Height: 33 cm Base: 32 x 20 cm Three adjustable feet Provided with a weight box, from 10 mg up to 100g





Bucket & cylinder Apparatus - optional

Use this technical balance as an hydrostatic scale.



Bucket (external measures): h = 60 mm; d = 41 mm Cylinder: h = 50 mm; d = 30 mm

The Bucket and Cylinder Apparatus is used to verify the Archimedes' Principle, or law of buoyancy.

By immersing the filled cylinder into the water, you can notice an apparent weight reduction: the upward buoyant force that is exerted on a body immersed in a fluid, whether fully or partially submerged, is equal to the weight of the fluid that the body displaces. By filling the hollow bucket with water, the buoyant force is balanced.



1433 - 1461

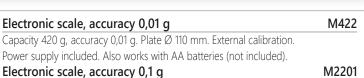






For the full range of Optika scales, please visit www.optikabalances.com

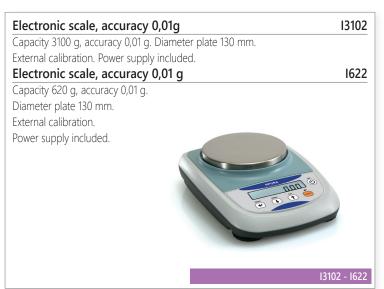




Capacity 2200 g, accuracy 0,1 g. Plate 150x140 mm. External calibration. Power supply included. Also works with AA batteries (not included).



Certified masses		Weight of 200 g class F1	PS200F1
Weight of 100 g class E2	PS100E2	Weight of 1000 g class F1	PS1F1
Weight of 100 g class F1	PS100F1	Weight of 2000 g class F1	PS2F1







Big themometer model 7055

It is possible to make scroll a coloured tape on a scale calibrated in Celsius and Fahrenheit, heigth: 60 cm and width: 15 cm.





Digital electronic thermometers

-50°+300°C, resolution: 0,1°C, probe integrated in the instrument's body.

Powered by 1 LR44 battery (not included). Unit of measurement: °C and °F.



-50°+150°C, resolution: 0,1°C, probe integrated in the instrument's body.



-50°+150°C, resolution: 0,1°C, fitted with steel probe connected to the instrument's body thanks to a cable (1m length).

CHT-1



AF15 - CHT - CHT-1

Ground thermometers, set of 3

7147

They allow measurement of soil temperature at 3 different depths; 50 cm, 100 cm and 150 cm.



Alcohol thermometers

Permanent graduated scale, chemical products-resistant.

Stem diameter: 6.5 mm, minimum length of the non-graduated part: 40 mm. All ecological thermometers, no risk of contamination in case of break.

-10°+60°C, divis. 0,5°C, length 305 mm.	T19
-10°+110°C, divis. 0,5°C, length 305 mm.	T20
-20°+110°C, divis. 1°C, length 305 mm.	T22
-20°+150°C, divis. 1°C, length 305 mm.	T23
-0,1°+51°C, divis. 0,1°C, length 470 mm.	T24
-1°+101°C, divis. 0,1°C, length 610 mm.	T25
-10°+250°C, divis. 1°C, length 410 mm.	T26



Thermometer 2038 Maximum and minimum thermometer (indoor and outdoor). Mounted on a small plastic base and fitted with small roofing for external use.





Infrared rays thermometer Measurament range: -50~550°C (-58~1022°F) Accuracy: ±1.5% or ±1.5°C Repeatability: ±1% or ±1°C Distance spot ratio: 12:1 Emissivity: 0.95 Resolution: 0.1°C / 0.1°F Response time: 500 mS Wavelength: 8-14 μm

MEASUREMENT INSTRUMENTS - Electrical devices













5262



Digital wattmeter

To measure the energy and / or power absorbed by a resistive charge in a DC or AC electrical circuit. Two measuring units available: mJ / mW for currents up to 10mA J / W for currents up to 10A Capacity: for DC circuits, voltage not exceeding 20V; for AC circuit, voltage not exceeding 14V. Equipped with digital display, reset button, J/W switch and measuring unit selector.



Analogical portable multimeter 5116						
Function		Measure	ment ran	ges	Allowance	Remarks
Voltage DC	(±)0 ~ ((±)0 ~ 0.25, 2.5, 10, 50, 250, 10000 V			Within ±3% F.S.	Input impedance 30 KΩ/V
Voltage AC	0 ~ 10,	0 ~ 10, 50, 250, 10000V			Within ±4% F.S.	Input impedance 10 KΩ/V
Current DC	(±)0 ~ 0.25, 2.5, 25, 250 mA 10 A (10 A±5%F.S.)			4	Within ±3% F.S.	Voltage drop 250 mV
Current AC	0 ~ 10 A	0 ~ 10 A (10A±5%F.S.)			Within ±4% F.S.	
Resistance	Range	Min.	Mid.	Мах.	Within ±3%	
	x1	0.2 Ω	20 Ω	2 ΚΩ	of scale length	
	x100	20 Ω	2 ΚΩ	200 ΚΩ		
	x1 K	200 Ω	20 ΚΩ	2 ΜΩ		
	x10 K	2 ΚΩ	200 ΚΩ	20 ΜΩ		
CONT test	about 3	K Ω con	duction			



Coulombmetro

5721

For charge detection and measurement. Useful for a wide range of experimental applications including charging by induction or Coulomb's law. Power supply: 9V

Battery PP3 type

Dimensions: 130x60x90mm Weight: 0.20kg

Range: 0 - 1999nC Resolution: 1nC

Accuracy: ±10% of full scale



10 ~ + 22 dB ~ + 62 dB

Decibel

Digital portable multimeter





Model with display LCD 3,5 digit

Input impedence	10 M Ω for VDC and 4,5 M Ω for VAC	
Precision	Voltage DC ±0,8% + 5 digit Current DC ±1,5% + 5 digit Voltage AC ±1,5% + 5 digit Resistance ±0,8% + 5 digit	
Range	$\begin{array}{llllllllllllllllllllllllllllllllllll$	
Functions	Continuity test with buzzer signaling Diodo tester Memory Transistor tester (hFE)	
Protections	Up to 200mA with fuse - 10A without fuse	
Power supply	Battery 9 V type 6F22 (included)	
Dimensions/Weight	145x80x35 mm / 200 g	
Accessories included	Test leads Instructions	

5196

Digital portable multimeter

5197



Model with display LCD 3,5 digit

Input impedence	10 M Ω for all voltage ranges	
Precision	DC voltage ± 0.8% + 4 digits DC current ± 1.0% + 5 digits AC voltage ± 1.0% + 5 digits AC current ± 1.5% + 5 digits Resistance ± 1.2% + 3 digits Capacity ± 3.5% + 5 digits Temperature ± 2, 0% + 5 digits	
Range	Volt DC 200mV - 2V - 20V - 20V - 1000V; res. max. 0.1 mV Ampère DC 200µA - 2mA - 20mA - 200mA - 10A; res. max. 0.1 μA Volt AC 200mV - 2V - 20V - 20V - 750V; res. max. 0.1 mA Ampère AC 200µA - 2mA - 20mA - 200mA - 10A; res. max. 0.1 µA Volt AC 200mV - 2V - 20V - 200V - 750V Ohm 200Ω - 2kΩ - 20kΩ - 20kΩ - 2MΩ - 20MΩ; res. max. 0.1Ω Ampère AC 200µA - 2mA - 20mA - 200mA - 10A Capacity 2nF - 20nF - 20nF - 2µF - 20µF; res. max. 1pF Temperature from -40 °C to +1000 °C; res. max. 1°C	
Functions	Continuity test with acoustic signal by buzzer Test LED 1.5V and 9V battery test Memory Auto power OFF	
Protections	Measurements in Ampère with fuse	
Power supply	9V battery type 6F22 (supplied)	
Accessories included	Pair of tips – Protective shell Type K temperature probe (200°C) – Instruction manual	

Digital bench multimeter

5421

DC Voltage

Range	Resolution	Accuracy
600 mV	0.1 mV	± (0.6% + 2)
6 V	0.001 V	
60 V	0.01 V	± (0.3% + 2)
600 V	0.1 V	
1000 V	1 V	± (0.5% + 3)

DC Current

Range	Resolution	Accuracy
600µA	0.1μΑ	
6000µA	1μΑ	± (0.5% + 3)
60mA	0.01mA	
600mA	0.1mA	± (0.8% + 3)
10A	10mA	± (1.2% + 3)

Resistance

_		
Range	Resolution	Accuracy
600 Ω	0.1 Ω	± (0.8% + 3) + circuito di test, valore di resistenza di cortocircuito
6 kΩ	0.001 kΩ	
60 kΩ	0.01 kΩ	± (0.5% + 2)
600 kΩ	0.1 kΩ	
6 MΩ	0.001 MΩ	± (0.8% + 2)
60 MΩ	0.001 ΜΩ	± (1.2% + 3)

- · Continuity test
- Resistance

AC Voltage

Range	Resolution	Accuracy
600 mV	0.1 mV	40 Hz-50 kHz: ± (0.6% + 5); 50 kHz-100 kHz: ± (1% + 5)
6 V	0.001 V	40 Hz-1 kHz: ± (0.6% + 5); 1 kHz-10 kHz: ± (1.0% + 5); 10 kHz-100 kHz: ± (3% + 5)
60 V	0.01 V	40 Hz-1 kHz: ± (0.6% + 5); 1 kHz-10 kHz: ± (1.5% + 5); 10 kHz-20 kHz: ± (3% + 5); 20 kHz-100 kHz: ± (8% + 5)
600 V	0.1 V	40 Hz-1 kHz: ± (0.6% + 5); 1 kHz-10 kHz: ± (3.5% + 5)
1000 V	1 V	40 Hz-1 kHz: ± (1.2% + 3); 1 kHz-3 kHz: ± (3% + 3)

AC Current

Range	Resolution	Accuracy
600 µA	0.1 μΑ	40 Hz-10 kHz: ± (1.0% + 5); 10 kHz-15 kHz: ± (2%+ 5)
6000 µA	1 μΑ	40 HZ-10 KHZ. ± (1.076 + 3), 10 KHZ-13 KHZ. ± (276+ 3)
60 mA	0.01 mA	40 Hz-10 kHz: ± (1% + 5); 10 kHz-15 kHz: ± (3%+ 5)
600 mA	0.1 mA	40 HZ-10 KHZ. ± (1/0 + 3), 10 KHZ-13 KHZ. ± (3/0+ 3)
10 A	10 mA	40 Hz-5 kHz: ± (2.0% + 6)



5/21

5195

Digital Oscilloscope - 20 MHz, 2 Channels, 250 MS/s

Developed specifically for the education and hobby sector, this series of digital oscilloscopes offers the best possible price/performance ratio without compromising on functionality or technical features.

It has Autoset and Autoscale functions, Math Functions, FFT, Cursor or XY Modes and even a Zoom Function. All standard functions are integrated.

Waveform data storage is internal with memory for 16 waveforms or external, on a USB memory, in TXT, CSV or BIN format. The data can be read with the included software. Configurations can be saved internally, display screens can be saved externally.

With the Autoset function you can view waveforms quickly and intuitively. With the Autoscale function waveforms can be displayed even more precisely, as needed. Settings can also be performed Manually.

- Two-channel oscilloscope, 20 MHz bandwidth, 250 MS/s sampling rate
- 17.5 cm (7") TFT color display with 800 x 480 pixels
- USB "device" interface for real-time data transmission
- USB "host" interface for external USB memories
- Handy and slim, with carrying handle
- Autoset function for easy use
- Registration up to 10,000 points
- Automatic measurement mode, XY and FFT function
- Complies with safety standards: EN 61010-1; CAT II 400V
- Accessories: USB cable, CD software for Windows, power cable, 2 probes, operation manual

