# SECTION 12 - MEASUREMENT INSTRUMENTS

## Index

Lengths and angles	Page 194
Volumes/Time intervals	Page 196
Density/Forces, weights and masses	Page 198
Temperature	Page 201
Electrical devices	Page 202



#### Measurement instruments set

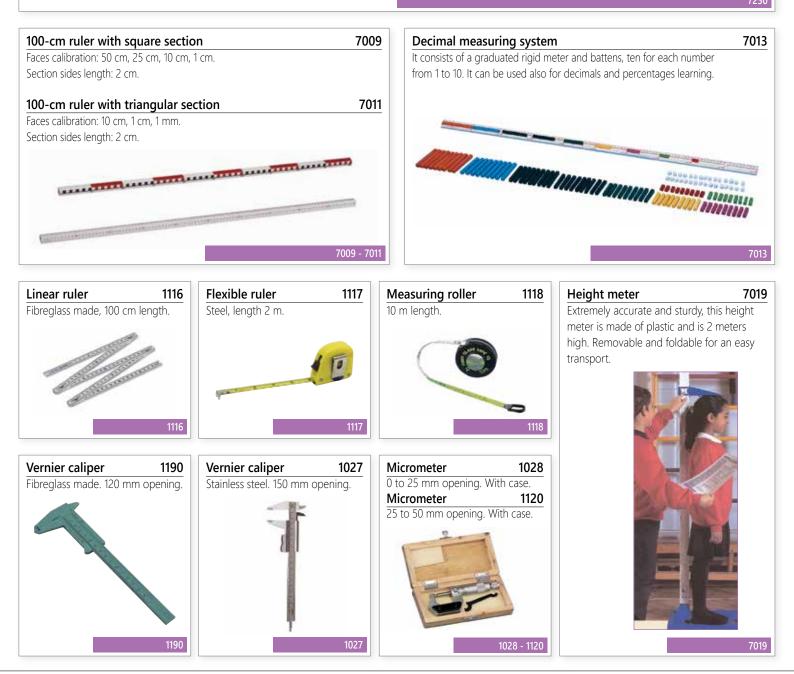
This kit includes all items needed to perform weight , length, angle capacity, time, temperature, force and electrical measures. Items stored in a small plastic case.

#### Equipment supplied

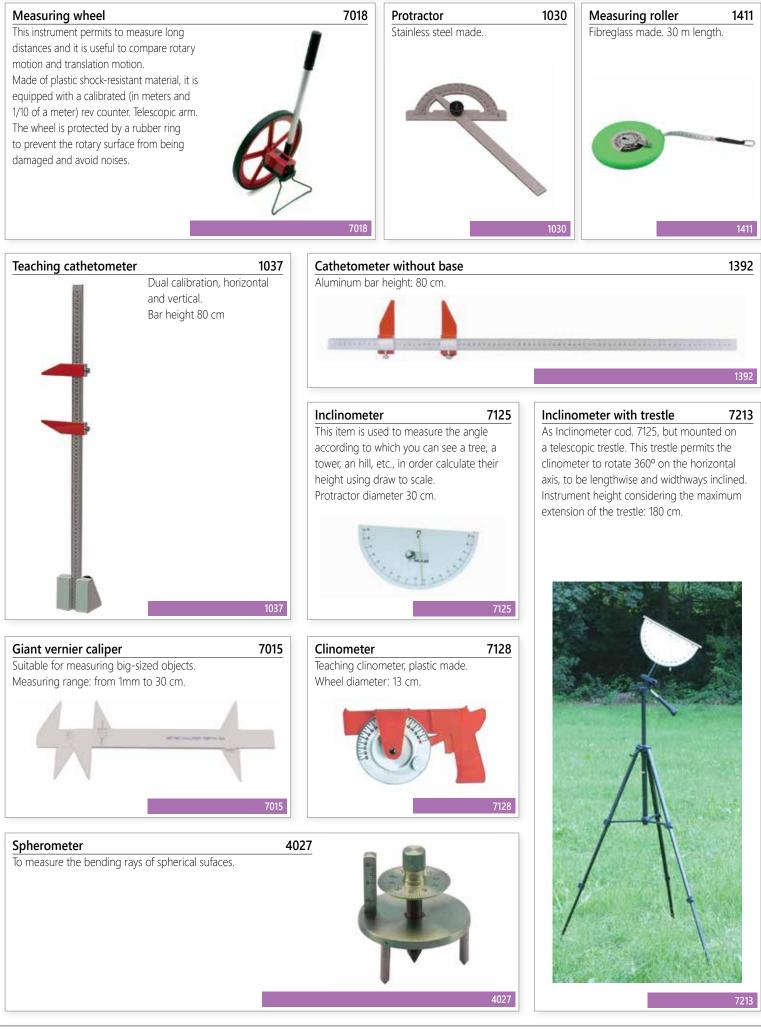
Equipment supplied	
1 Decimal Metric system 1 Metric wheel 10m 1 Vernier caliper 1 Tape measure 1 Protractor 1 Inclinometer 1 Big-size vernier caliper 1 graduated cylinder 100ml 1 graduated cylinder 250ml 1 Digital timer 1 Spring scale 100g/1N 1 Spring scale 100g/1N 1 Spring scale 250g/2,5N 1 Spring scale 100g/1N 1 Mathematical scales 1 Digital thermometer 1 Digital Multimeter 1 Case	



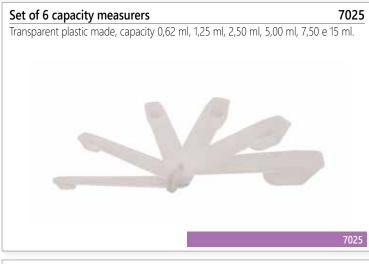
7250



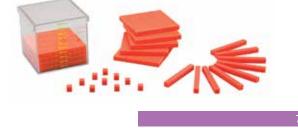
## Lengths and angles - MEASUREMENT INSTRUMENTS



## **MEASUREMENT INSTRUMENTS** - Volumes/Time intervals



Cubic basin of 1 dm³ with shelves, slide rules and cubes7024Transparent-plastic made. Used to demonstrate the equivalence between a dm³and a litre. Equipped with: 9 Shelves 10x10x1cm - 9 Slide rules 10x1x1cm - 10 Cubes1x1x1cm.



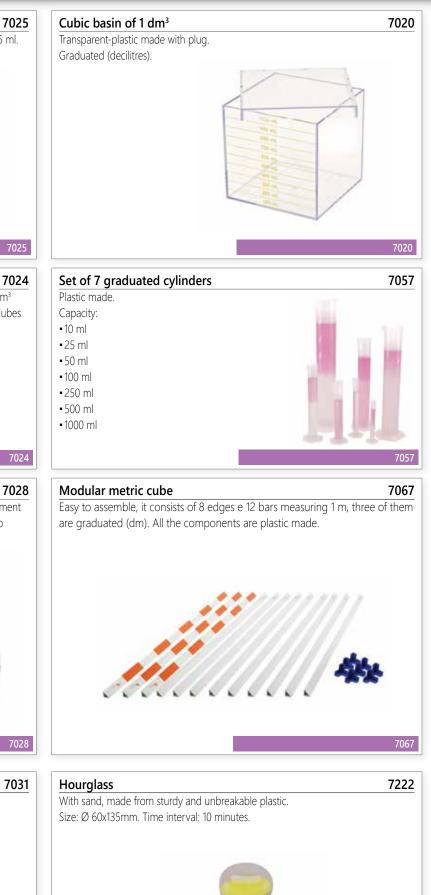
Series of 200 cubes of 1 cm<sup>3</sup> - 1 g

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.

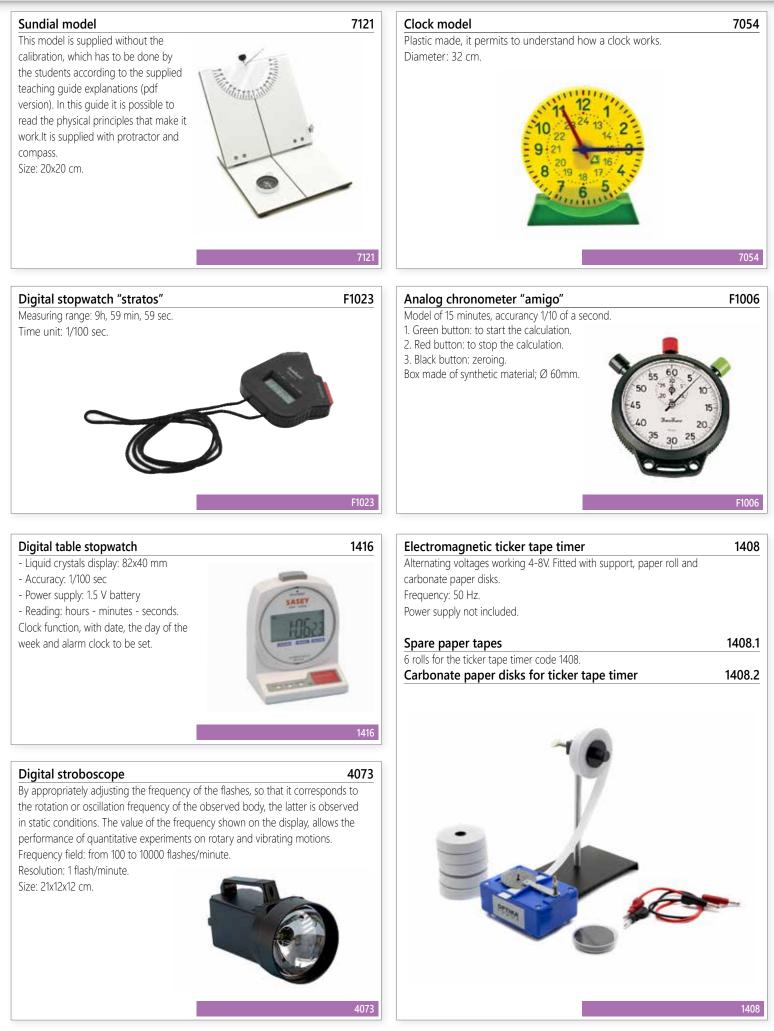


Pair of hourglasses Time of the first: 1 minute; time of the second: 3 minutes. Size: 18x60 mm.





## Volumes/Time intervals - MEASUREMENT INSTRUMENTS



## **MEASUREMENT INSTRUMENTS** - Density/Forces, weights and masses



1148

1147

### Density/Forces, weights and masses - MEASUREMENT INSTRUMENTS



SCHOOL SCIENTIFIC LABORATORY - SECTION 12 - Page 199



13102

11202

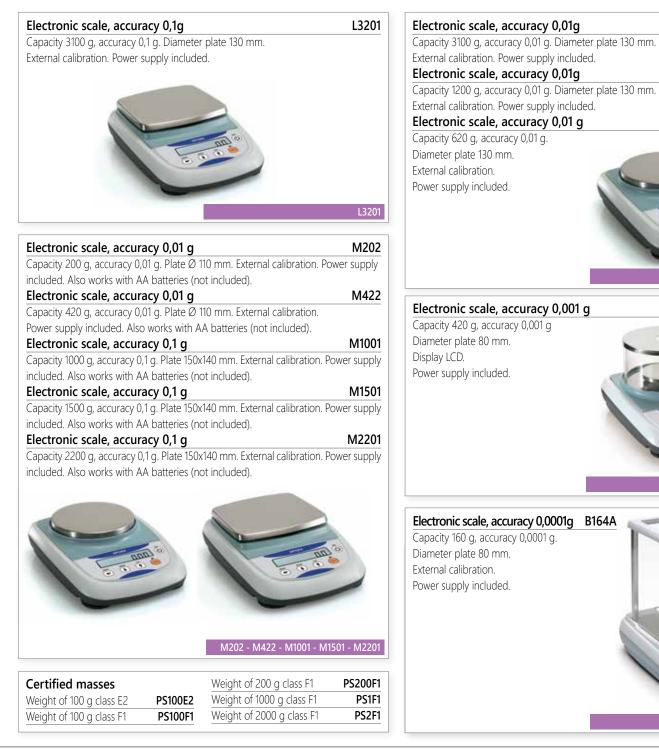
1622

H423

H423

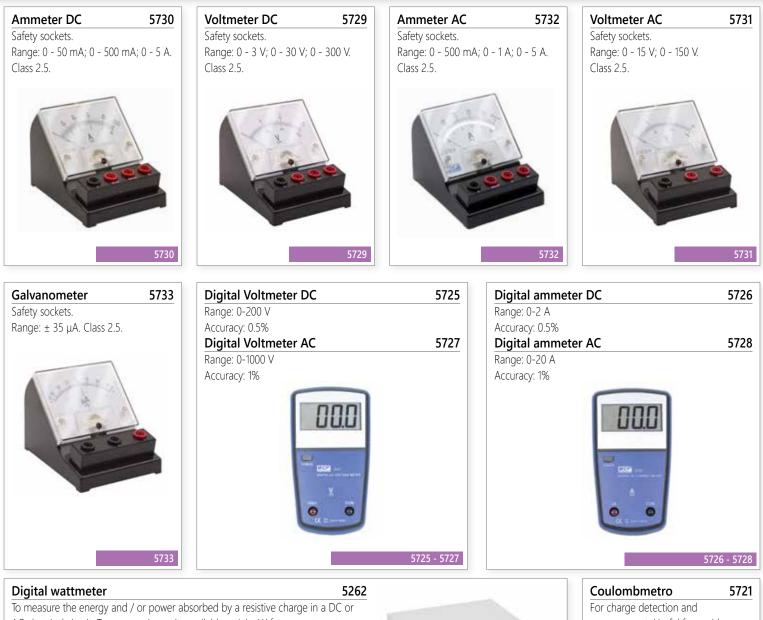


For the full range of Optika scales, please visit **www.optikabalances.com** 





## **MEASUREMENT INSTRUMENTS** - Electrical devices



5116

Remarks

Input impedance 30 KΩ/V

Input impedance 10 KΩ/V

Voltage drop 250 mV

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.

Within ±3% F.S.

Within ±4% F.S.

Within ±3% F.S.

Within ±4% F.S.

Within ±3% of scale length



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



5116

#### Page 202 - SCHOOL SCIENTIFIC LABORATORY - SECTION 12

Analogical portable multimeter

0 ~ 10, 50, 250, 10000V

10 A (10 A±5%F.S.)

Range Min.

x1

x100

x1 K

x10 K

0 ~ 10 A (10A±5%F.S.)

0.2 Ω

20 Ω

200 Ω

2 ΚΩ

about 3 K Ω conduction

- 10 ~ + 22 dB ~ + 62 dB

(±)0 ~ 0.25, 2.5, 25, 250, mA

(±)0 ~ 0.25, 2.5, 10, 50, 250, 10000 V

Mid.

20 Ω 2 KΩ

20 KΩ

200 KΩ

Max.

2 KΩ

200 KΩ

2 MΩ 20 MΩ

Voltage DC

Voltage AC Current DC

Current AC

Resistance

CONT test

Decibel

#### Digital portable multimeter

#### Model with display LCD 3,5 digit



Input impedence	10 $M\Omega$ for VDC and 4,5 $M\Omega$ 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	Volt DC 200 mV - 2 V - 20 V - 200 V - 600 V maximum resolution 0,1 mV   Ampère DC 200 μV - 2 mA - 20 mA - 200 mA - 10 A maximum resolution 0,1 μA   Volt AC 200 V - 600 V maximum resolution 100 mV   Ohm 200 Ω - 2 KΩ - 20 KΩ - 200 KΩ - 2 MΩ - 20 MΩ maximum resolution 0,1 Ω	
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 gr.	
Accessories included	Test leads Instructions	

#### 5196

5197

5196

## Digital portable multimeter

#### Model with display LCD 3,5 digit

Input impedence	10 $M\Omega$ for all ranges voltmetric	
Precision	Voltage DC±0,8% + 4 digit Current DC±1,0% + 5 digit Voltage AC±1,0% + 5 digit Current AC±1,5% + 5 digit Resistance ±1,2% + 3 digit	
Range	Volt DC 200 mV - 2 V - 20 V - 200 V - 1000 V maximum resolution 0,1 mV   Ampère DC 200 μV - 2 mA - 20 mA - 200 mA - 10 A maximum resolution 0,1 μA   Volt AC 200 mV - 2 V - 20 V - 200 V - 750 V maximum resolution 0,1 μA   Ampère AC 200 μA - 2 mA - 20 mA - 200 mA - 10 A maximum resolution 0,1 μA   Ohm 200 Ω - 2 KΩ - 20 KΩ - 200 KΩ - 2 MΩ - 20 MΩ maximum resolution 0,1 Ω	
Functions	Continuity test with buzzer signaling Diodo tester - Memory - Transistor tester (hFE) Battery test (1.5V and 9V) - LED test	
Protections	Measures in Ampère with fuse	
Power supply	Battery 9 V type 6F22 (included)	
Accessories included	Test leads - Protective shell Instructions	

## **MEASUREMENT INSTRUMENTS** - Electrical devices

## Digital bench multimeter

DC Voltage	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	0.1µA	
6000µA	1µA	± (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 MΩ	± (1.2% + 3)

## Continuity test

Resistance

## Dual oscilloscope 5" - 20 MHz

Analogue oscilloscope.

#### Vertical axis

Features	Technical specifications
Sensitivity	5 mV/div - 20 V/div in sequenza 1-2-5 12 posizioni
Accuracy	± 3% maggiore
Input impedence	1 MΩ ± 3%, 25 pF ± 5 pF 10:1 sonda: 10 MΩ ± 5%, 16 pF ± 2 pF

#### Horizontal axis

Features	Technical specifications	
Scanning speed	0.2 S/div – 0.2 µS/div.19 posiz. in sequenza 1-2-5	
Accuracy	± 3%	

#### Trigger

- HORIZAN HARING HAR

ingger	
Features	Technical specifications
Tirgger sensitivity	INT: CC - 10 MHz 1.0 div CC - 10 MHz 1.0 div TV Signal 2.0 div
	EXT: CC - 10 MHz 0.3 V CC - 20 MHz 0.5 V TV Signal 0.5 V

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

5421

Range	Resolution	Accuracy
600 µA	0.1 µA	40 Hz~10 kHz: ± (1.0% + 5); >10 kHz~15 kHz: ±(2%+ 5)
6000 µA	1 µA	
60 mA	0.01 mA	40 Hz~10 kHz: ± (1% + 5); >10 kHz~15 kHz: ±(3%+ 5)
600 mA	0.1 mA	
10 A	10 mA	40 Hz~5 kHz: ± (2.0% + 6)





5421

5195