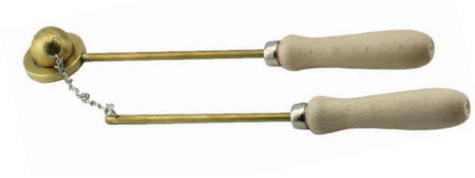
Ball and ring apparatus 2076

With the following experiment we can verify the thermal expansion of a metal.



2076

Bi-metallic strip 2062

Two foils fixed together, made of iron and copper, expand in different ways, causing the strip to bend.

2062

Ball and ring apparatus, with stand 2070

In order to prove the volumetric thermal expansion.
It can be used with the alcohol (or gas) burner.
Height: 30 cm.

2070

Dilatometer for liquids and gases 2137

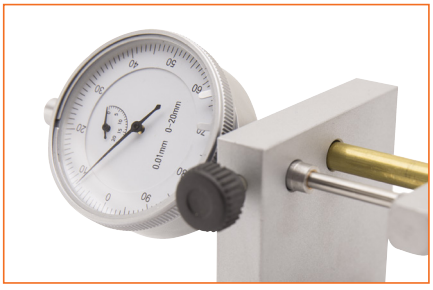
With this simple apparatus it is possible to determine the thermal expansion coefficient of liquids and of air.

Precision linear expansion apparatus 2095

The precision linear expansion apparatus is provided with two metal hollow rods of different materials that are heated by the steam passing through them. The linear expansion of the different metals is measured using a dial gauge, while temperature is measured using a thermometer placed in contact with the rod.
In this way students can obtained all the information necessary to calculate the coefficient of linear thermal expansion.

Equipment supplied

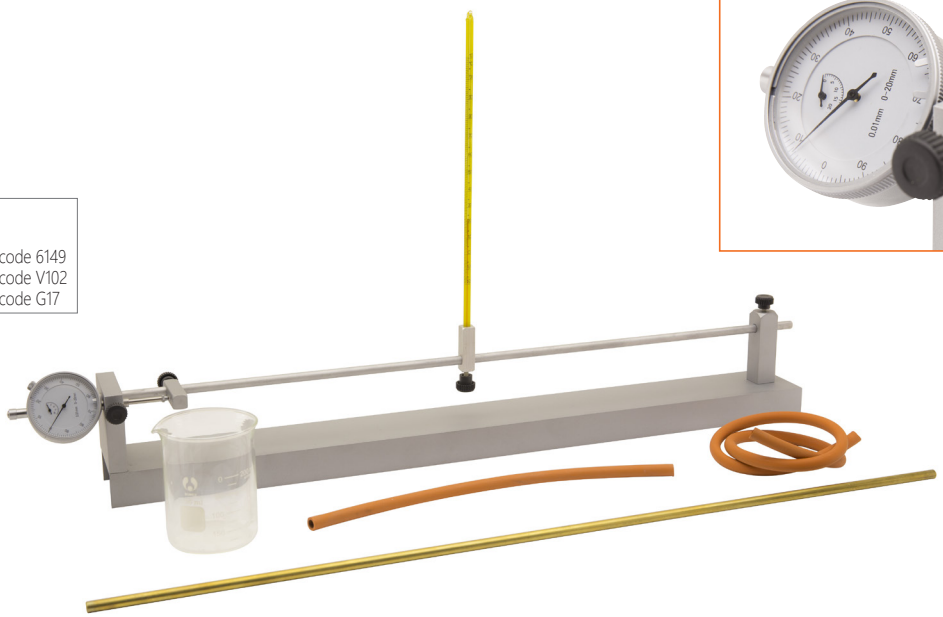
1 Linear expansion apparatus
1 Aluminum rod 700 mm
1 Brass rod 700 mm
1 Dial gauge 0-10 mm, 0.01 mm
1 Thermometer
1 Beaker
2 Silicone tube 50 cm



Equipment required, not supplied

Steam generator kit:

1 Heating plate	code 6149
1 Filtering flask	code V102
1 Rubber stopper	code G17



2095

Linear expansion apparatus 2046

To prove the thermal expansion of a bar. It works with cotton wads soaked in denatured alcohol and it is supplied with three rods: iron, brass and aluminium.
Dimensions: 30x13 cm.

2046

Specific heat kit 2030

It allows you to calculate the ratio between Q (heat supplied) and T (temperature increase).

Equipment supplied

1 Aluminium cylinder 800 g	1 Base
1 Copper cylinder 800 g	2 Insulated handles
1 Brass cylinder 800 g	1 Thermometer
1 Iron cylinder 800 g	1 Case
1 Electric heater 12V	

Equipment required, not supplied

1 Balance	1 Power supplier (max 3V; 2A cc)
1 Voltmeter	5 Leads
1 Ammeter	1 Stopwatch

2030

Set of 4 samples with equal volume 2036

For the measurement of specific heat through water calorimeter up to 350 ml. They are made of iron, brass, aluminium and PVC. Dimensions: Ø 20 mm. Height: 50 mm.

2036

Set of 4 samples with same mass 2087

For the measurement of specific heat through 1000 ml water calorimeter. They are made of iron, brass, aluminium and PVC. Mass about 500 gr.

2087

Electric calorimeter 200 ml 5283

The item is supplied with two stoppers; one stopper has an electric resistor. Maximum voltage: 6V.
Supplied with thermometer and stirrer.
Aluminium packaging.
Capacity 200 ml.

5283

Thermoscope 4/T

It is suitable for experiments on the thermometer calibration. Length: 30 cm.

4T

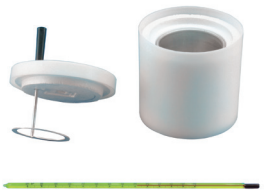
Thermal conductivity apparatus 2131

It is composed of 5 tubes, of different metals (aluminum, brass, copper, stainless steel, iron). If you heat the central cylinder on a flame, the pieces of wax placed at the ends of the tubes melt down at different times.

2131

Water calorimeter 350 ml 2099

This item is suitable for measuring the specific heat of solid and liquid samples. It is supplied with thermometer and stirrer.
Plastic material packing.
High thermal insulation.
External dimensions: Ø130 mm, height 130 mm.
Capacity: 350 ml.



2099

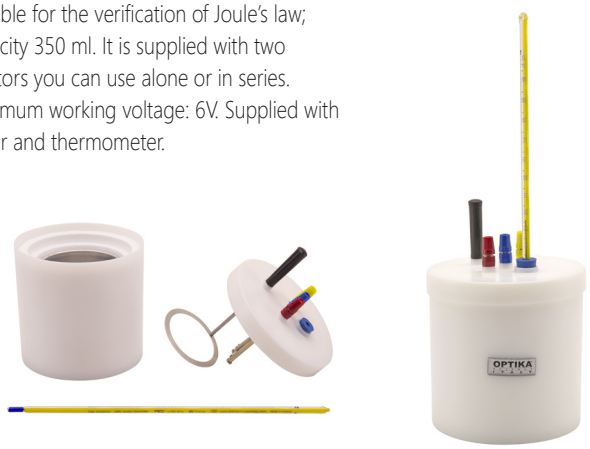
Water calorimeter 1000 ml 2056

Supplied with thermometer and stirrer and has double aluminium walls insulation from heat.
Dimensions: Ø 150 mm.
Height: 150 mm.

2056

Electric calorimeter 350 ml 8201

Suitable for the verification of Joule's law; capacity 350 ml. It is supplied with two resistors you can use alone or in series.
Maximum working voltage: 6V. Supplied with stirrer and thermometer.



8201

Kit to study processes to achieve thermal equilibrium 8202

Through the use of two temperature sensors, this item lets you study how the transfer of heat occurs between two bodies, solids or liquids, with different initial temperature. As in each balance phenomenon, the warmer body gives heat to the colder body until the cancellation of the thermal difference. The Law, states that the temperature of the warmer body varies over the time is exponentially decreasing, while the Law according to which the temperature of the colder body increases is exponentially increasing. It is possible to establish an analogy with the water balance phenomenon and electric balance.

Topics

- Thermal equilibrium between two bodies with the same thermal capacity;
- Thermal equilibrium between two bodies with different thermal capacity.

Equipment supplied

1 Thermostatic container, capacity 350 ml
1 Alcohol thermometer
1 Hollow aluminium cylinder wire, mass 400 g
1 Aluminium cylinder to be inserted into the previous one , mass 400 g
1 Brass cylinder to be inserted into the hollow cylinder, mass 1000 g
2 PVC hose

Equipment required, not supplied

1 Heating plate code 6150 1 Balance

Equipment for online use - not supplied

1 Interface code 9001
2 Temperature sensor code 9061
or
2 USB Temperature sensor cod. 9085

Suitable to be used with sensors

8202

Heat dissipation kit 8206

With this kit and two temperature sensors (not supplied with this kit), it is possible to compare the different speeds at which two bodies with the same mass and the same initial temperature dissipate heat. The dissipation is quicker when the exposed surface is bigger and it is decelerated if the body is protected by a heat-insulating material.

Topics

- Study of a body cooling according to its thermal capacity;
- Study of a body cooling according to its surface;
- Study of a body cooling according to the difference of temperature compared to the environment;
- Study of a body cooling according to the interaction with the surrounding air.

Equipment supplied

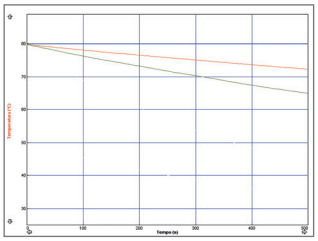
1 Brass cylinder with hook
2 Aluminium cylinders with hook
1 Aluminium thermal radiator
1 Insulating-material tube
1 Handle
1 Hardboard support plate

Equipment required, not supplied

1 Heating plate code 6150
1 Balance

Equipment for online use - not supplied

1 Interface code 9001
2 Temperature sensor code 9061
or
2 USB Temperature sensor cod. 9085



Cooling bend of two cylinders with the same size but made of different material: brass (red) and aluminum (green).

Suitable to be used with sensors

8206

Device to study thermal conductivity in solids 8203

The propagation of heat in solids occurs by conduction. The speed at which the heat spreads varies according to the substance. As regards metal, the speed is high while in other substances such as glass or plastic, it is very low. For this reason metals have been defined good conductors of heat.
Thermal conductivity can be studied thanks to this kit using three temperature sensors. An aluminium rod, a brass rod and a PVC rod, with a temperature sensor connected to each of them, are immersed simultaneously in a glass containing warm water. It is possible to observe the heat propagation speed difference between each rod.

Topics

- Comparison of the thermal conductivity of three different materials, both during heating and cooling;
- Comparison of thermal sensations and actual temperature measurements.

Equipment supplied

1 Beaker 400 ml with base
1 PVC disk with three holes
1 Aluminum rod
1 Brass rod
1 PVC rod

Equipment required, not supplied

1 Heating plate code 6150

Equipment for online use - not supplied

1 Interface code 9001
3 Temperature sensor code 9061
or
3 USB Temperature sensor cod. 9085

Suitable to be used with sensors

8203

Thermology kit 8212

Thanks to these items it is possible to perform some experiments related to thermal phenomena. For data collection and representation, 3 temperature sensors are enough. The real-time data acquisition system allows to obtain a graph of the temperature as a function of time during many thermal phenomena, which are essential to the Physics' program in secondary schools, for example, thermal balance, heat propagation, state changes, etc.

Topics

- Relation between heat and temperature
- Thermal equilibrium
- Thermal equilibrium
- Heat capacity in solids
- Cooling
- Thermal conductivity
- Greenhouse effect
- Evaporation
- Boiling
- The solidification and fusion.

Equipment supplied

1 Electrical calorimeter
4 Metallic samples
1 Kit for thermal balance
1 Kit for conductivity
1 Kit for cooling
1 Glass flask 250 ml
2 Rubber caps
1 Base
1 Metal rod
1 Clamp with clamp
1 Bottle of denatured alcohol
1 Glass tube
2 Lead cables
1 400 ml beaker
1 Bosshead
1 Thermometer -10 ° + 110 ° C

Equipment required, not supplied

1 Power supply
1 Heating plate
1 Electronic scale accuracy 1g
1 Table lamp 100 W
1 Timer
1 Distilled water
1 Sodium chloride
1 Vaseline oil

Equipment for online use - not supplied

1 Interface code 9001
3 Temperature sensor code 9061
or
3 USB Temperature sensor code 9085

Suitable to be used with sensors

8212

Gas thermometer 8209

In a gas thermometer, temperature readings are practically independent from the aeriform contained in the volume in which an isochoric process transformation (the variation in pressure and temperature at a constant volume) is produced if pressure and temperature conditions allow you to consider the aeriform used to be perfect. The kit consists of an aluminium container, with a capacity of about 330 cc, immersed in a glass container. Pressure and a temperature sensors allow you to characterize the system's evolution when it is heated or cooled. The straight line p = f (T) defined by the experimental data is the calibration curve of the air thermometer. The temperature value which is obtained extracting the graph up to the value p = 0, indicates that there is a temperature minimum value which is physically meaningful.

Topics

- Verifications of the Gay-Lussac Law
- Absolute zero
- The gas thermometer

Equipment supplied

1 Rubber tube
1 Beaker, 1000 ml
1 Base
1 Aluminium container with bung
1 Cover supporting the sensors

Equipment required, not supplied

1 Heating plate code 6150

Equipment for online use - not supplied

1 Interface code 9001
1 Temperature sensor code 9061
1 Pressure sensor code 9034
or
1 USB temperature sensor code 9085
1 USB pressure sensor code 9136

Suitable to be used with sensors

8209

Joule's effect apparatus 5711

It is a kind of electrical calorimeter with double transparent walls. It is possible to change the resistor without taking out the water.
Working voltage:6V D.C.
Resistors: 5 ; 10 Ohm
Capacity: 800ml

5711

Apparatus for the measurement of the mechanical equivalent of heat (Callendar machine) 2055

This apparatus is composed of a 7 cm long brass calorimetric cylinder width 5 cm and supported by ball bearings. A copper ribbon is rolled around the cylinder and retained by a spring; a 5 kg weight hangs from it. Because of the friction between the ribbon and the cylinder during the rotation, the water inside the cylinder warms up. If you measure the work done and the heat produced, it is possible to determine the mechanical equivalent of heat.
The apparatus is supplied with boss-heads and 1/10 degree digital thermometer.

Questo cilindro calorimetrico, in ottone, può essere facilmente montato e smontato dal perno dell'apparecchiatura.

2055

Convection apparatus 2058

Glass spare part of code 2058 2058.1

This apparatus allows to see how heat transmission happens through convection, in liquids. Through the upper opening, you have to introduce into the tube a small amount of glitters (approx. 1 g) and then seed oil (approx. 150 ml, not supplied). By heating the bottom of the tube, it will be seen that glitters spread circularly. Alcohol burner to be purchased separately.

2058 - 2058.1

Absorbent and emitting powers apparatus 2031

It is supplied with 3 aluminium bodies.
One body is black-black, another is black-white and the last one is white-white.
If you expose them to the energetic flux of the light bulb, you can verify how the absorbent power and the emitting power depend on the colour of the surface.

2031

Kit to study radiation 8205

The heating of a body occurs when it is exposed to electromagnetic radiation, and it depends on its surface, on its mass and its absorption power. Exposing two disks, with different characteristics, at a radiation flow emitted by the same source (the sun, or simply a lamp – not supplied), it is possible to observe in real time the different temperature trend.

Topics

- Comparison between the absorption power of a disc with two polished faces and that of a disc with a polished face and a blackened face;
- Comparison between the absorption power of a disc with two polished faces and that of a disc with two blackened faces;
- Comparison between the absorption power of a disc with two blackened faces and that of a disc with a polished face and a blackened face;
- Verification of the irradiation Law as a function of distance.

Equipment supplied

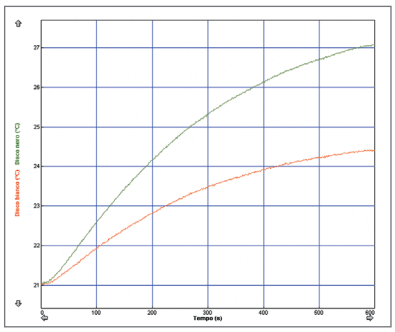
1 Platform with two adjustable supports	1 Aluminium disc with two blackened faces
1 Aluminium disc with two polished faces	1 Aluminium disc with a polished face and a blackened one

Equipment required, not supplied

1 Lamp 100 W

Equipment for online use - not supplied

1 Interface code 9001	or
2 Temperature sensor code 9061	2 USB temperature sensor code 9085



Two identical aluminium discs, a black-painted one and a polished one, are exposed to the light of a 100W lamp. A temperature sensor located on the discs demonstrates that the absorption coefficient of the black disc (green) is higher than the coefficient of the polished disc (red).

How to use the equipement

Suitable to be used with sensors

8205