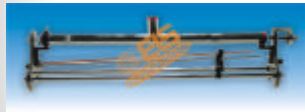


## Thermal Expansion

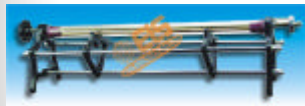
### Expansion Apparatus (ELP.105.101)

Comprising two cast-iron uprights, height 18 cm. linked by two nickel plated rods supporting on expansion bar, length 38 cm. fixed to one upright and resting on a friction pointer placed at the other. with scale reading 0 to 90 deg. with one each aluminum, brass and iron expansion bars.



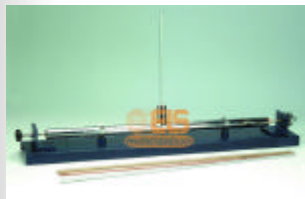
### Expansion Apparatus Linear (ELP.105.102)

Horizontal type. micrometer screw form. Two cast end pieces joined by two metal rods having support for brass tube nickel -plated 50 cm long , 1cm dia. with rifled inlet and outlet for connection to a steam supply and tublure for thermometer. One end -piece fitted with spherometer reading to 0.005 mm and other with contact screw. The end-pieces are provided with terminals for connecting bell or galvanometer for indicating exact point of contact of the screw. supplied with 3 metal rods one each of copper, brass and iron.



### Expansion Apparatus, Gunther (ELP.105.103)

comprising of two cast end pieces joined by three nickel -plated rods carry two sliding V-support for a glass jacket with inlet and outlet tubes. One end-piece fitted with spherometer reading to 0.005mm, and other with contact screw. The glass jacket encloses both a brass and a copper rod each 500 x 7 mm length x diameter, fitted through corks, a half turn of the jacket, changes rod in contact with the spherometer . A thermometer can be attached to either of the rods by rubber bands . Brass terminals are fitted to the apparatus so that an electrical circuit can be made through either rod to indicate the moment of contact of centre tube and spherometer, Supplied with 3 metal rods one each of copper, brass and iron.



### Expansion Apparatus, Linear (ELP.105.104)

New Pattern. Consisting of a metal rod 500 mm. in length and 4.5mm. in dia., enclosed in a well - lagged, nickel - plated brass tube with three tubules for steam inlet, outlet and thermometer. The metal rod to be investigated is supported in the steam jacket by detachable cups situated at the end of the tube. The apparatus is carried on a heavy channel base, at one end of which is an adjusting screw. At the opposite end is the micrometer screw reading to 0.01 mm. for the measurement of expansion. Supplied complete with Copper, Brass, Iron rods and thermometer.



### Ring & Ball, Gravesande (ELP.105.105)

An apparatus for demonstrating thermal expansion, comprising a captive brass ball secured to a mounted brass ring by a chain. Ring mounted on rod with a wooden handle. The ball passes through the ring when cold but will not pass through after being heated.

.01 Ball dia. 25 mm.

.02 Ball Dia. 19 mm.



### Ring & Ball, Gravesande (ELP.105.106)

An apparatus for demonstrating thermal expansion, comprising a captive brass ball 25 mm dia. with ring adjustably mounted on a tripod base.



### Bar & Gauge (ELP.105.107)

For illustrating expansion by heating and contraction by cooling .  
Comprising mild steel bar 110 x 12 mm length x diameter , on rod with wooden handle, overall length approx. 280 mm., with metal cast gauge, sliding fit over ends of bar and with hole 13 mm.bore, in one arm.



### Bar & Gauge (ELP.105.108)

Same as per **Cat no. ELP.105.107** but smaller in size.



### Bar Breaking Apparatus (ELP.105.109)

To show the forces which can be exerted during thermal expansion or contraction. Comprising a heavy cast iron frame 340 x 120 x 100 mm with slotted end pillars to carry a stout iron bar. The bar is threaded at one end for a large tensioning nut and has holes at the other end to accommodate the cast iron breaking bars. Supplied complete with ten breaking bars.



### Compound Bar, Brass & Invar (ELP.105.110)

To show the differential expansion of metals in a bimetallic strip.  
Comprising a length of bimetal strip 150 x 20 mm mounted in a wooden handle. The strip is only 1.5 mm thick so that very little heat is required to produce considerable bending. Length overal 270 mm approx.



### Compound Bar, Copper & Iron (ELP.105.111)

For demonstrating the differential expansion of two metals as shown by the curvature produced when the bar is heated. Comprising a bar of copper and a bar of iron, each 200 x 25 mm, riveted together.



### Compound Rod wood and Metal (ELP.105.112)

For demonstrating the difference in conductivity. Rod 300 x 18 mm length x dia. Half of which is brass and half of polished wood which is then joined together.



### Wood and metal Cylinder (ELP.105.113)

Comprising a cylinder 200 x 30 mm dia. Half of which is wood and other metal if paper is wrapped tightly round the cylinder and the rod is held above the flame, the portion in contact with the wood will be quickly scorched while the portion in contact with the metal will remain unchanged.

### Bulb Tube (ELP.105.114)

For liquid expansion experiments. Comprising bulb approximately 35 mm diameter, with plan capillary tube 400 mm long.

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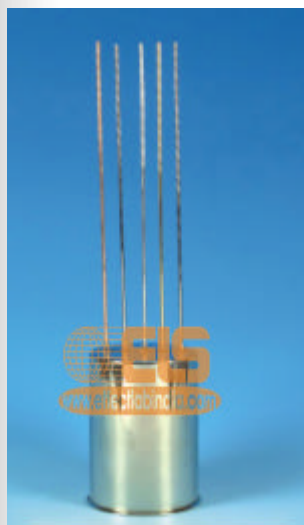
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# PHYSICS



## EDSERS APPARATUS (ELP.105.115)

A copper cylindrical vessel of 105 x 85 mm Ht x dia is fitted with 5 different 150 x 3mm Length x dia metal rods of copper, brass, iron, aluminium and zinc, each having adjustable index mark at its base.

## Hope's Apparatus (ELP.105.116)

To show the maximum density of water. Sheet iron cylinder 203 x 50 mm height x diameter, mounted on a base and encircled midway along its length by a gallery 63 x 100 mm, height x diameter. Fitted with tubulures to carry thermometers and rubber stoppers.



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**Expansion of liquids apparatus (ELP.105.117)**

For demonstrating the different thermal expansions of various liquids. Comprising five bulb tubes with plastic scales, mounted in a frame and supported in a trough through 240 x 108 x 77 mm deep. The frame has clamps to secure it to the trough and two cross members, the lower cross member having holes, and the upper, tubules to locate the bulb tubes. Dimensions overall 249 x 115 x 460 mm high approx. Bulb diameter 35 mm . Bulb stem 400 mm. Scale 0-25 cm. in millimeters.

**Thermostat bimetallic (ELP.105.126)**

Brass - Invar control. For operation on a gas supply, with adjustable screw valve and ruffled connections for gas supply and burner. Overall length 140 mm. approx.

**Thermostat Model (ELP.105.127)**

Demonstrate the operation of a thermostat, A vertical mounting bimetallic strip is used to open or close an electrical circuit with change in temperature. Consists of binding posts for connection to lower current circuits and adjustable contacts.

**Simple Thermocouple (ELP.105.141)**

Copper -constantan One each wires copper and constantan approximately 305 mm long, twisted and brazed together.

**Thermocouple mounted (ELP.105.142)**

Copper -iron With four copper and four iron wires approximately 130 mm long, twisted together to form seven junctions, four on one side, three on the other. With brass connectors.

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