

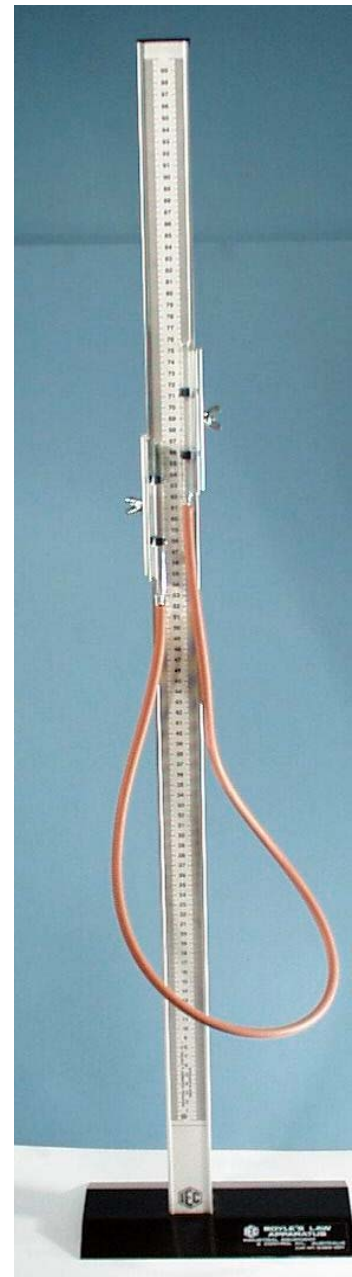
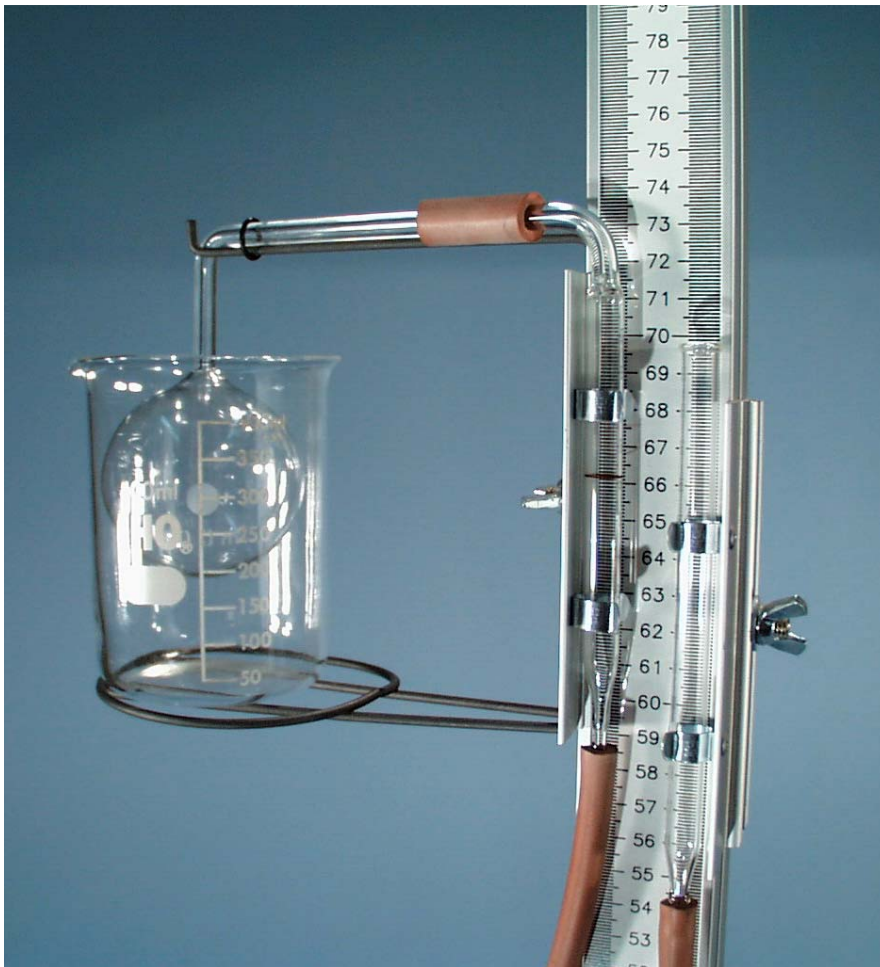
CONSTANT VOLUME THERMOMETER

Cat: MF1005-001 'Constant Volume Thermometer' or Charles' Law

DESCRIPTION:

The IEC **Constant Volume Thermometer** is a high quality instrument for performing the standard experiments relating to gas temperature and gas pressure. The unit requires approx. 150gm of distilled mercury (not supplied in the kit). By removing several components and fitting others, the instrument can be converted to be the IEC Boyle's Law Apparatus.

MF1005-001 Constant Volume Thermometer



Size: 250x140x1140mm LxWxH Weight: 1.8 kg

Pictures show the complete instrument on a base and the 'Constant Volume Thermometer' (or Charles' Law) section with the glass ball and beaker and beaker support. Any Boyle's Law apparatus can be converted to 'Constant Volume Thermometer'.

**KIT COMPONENTS LIST: FOR CONSTANT VOLUME THERMOMETER:**

- 1 pce Long aluminium rail complete with 1m scale and end cap. The scale has a transparent cover to permit marking and wiping clean by students.
- 1 pce Steel base.
- 1 pkt 2x Bolts, washers & nuts for sliders. 4 x Screws to mount rail to base.
- 2 pcs Aluminium sliders complete with clips for glass.
- 1 pce Glass tube with open end.
- 1 pce Glass tube with reference mark and bent leg.
- 1 pce Thin walled glass bulb approx. 50mm diameter ('Jolly bulb').
- 1 pce Rubber joining piece.
- 1 pce 'L' shaped wire support leg for glass tubes.
- 1 pce Rubber loop to hold glass tube to the 'L' shaped support.
- 1 pce Wire frame for supporting a beaker
- 1 pce Glass beaker, 400ml.
- 1 pce Rubber hose (for mercury) to join glass tubes, 1m long x 3mm bore.

ASSEMBLY INSTRUCTIONS:

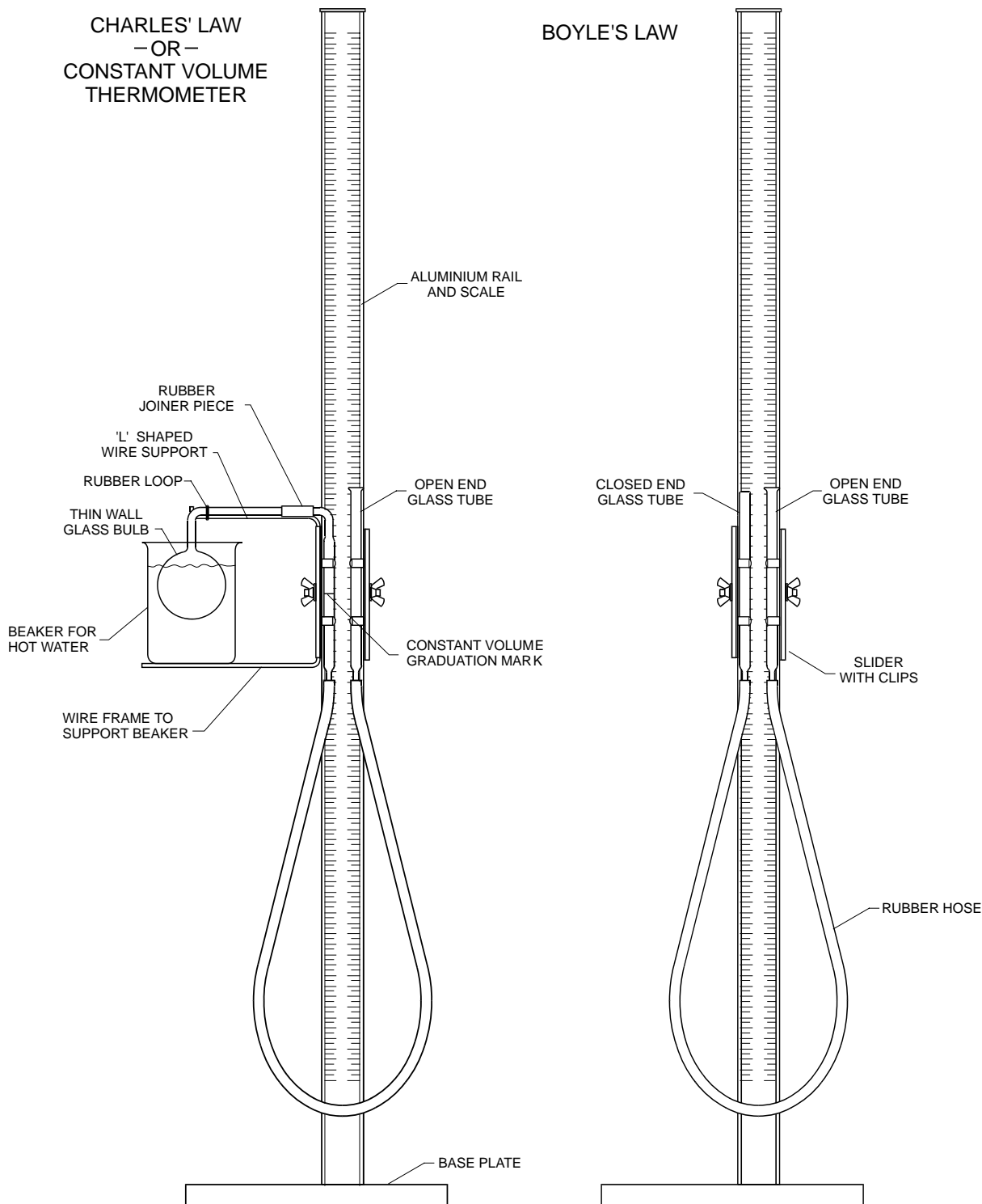
- Unpack containers and check all parts are correct. Insert the two large headed bolts into the two aluminium slider plates with the domed bolt head on the same side of the plate as the spring clips. Place the large washer over the thread and fit the wing nut to the thread. Do not tighten the wing nuts.
- Lay the long aluminium rail on the table with the plastic end cap at the far end and fit the two aluminium sliders to the rail by sliding the large domed bolt heads into the slots provided in the rail. The square shape on the bolt will slide in the slot in the rail and will prevent the bolt from rotating. Be sure that the spring clips are on the same side of the rail as the metric scale. Move the sliders along the rail to about the mid-position and tighten the wing nuts gently.
- Attach the steel base plate to the end of the long rail with the 4 small screws provided. If the plastic scale protection strip protrudes from the end of the rail, cut the excess with scissors or a sharp knife. Tighten the screws firmly and stand the unit upright on the table.
- Take the open end glass tube and the 'L' shaped glass tube and fit the rubber hose firmly to the small end of the OPEN END tube ONLY. To make the rubber fit more easily, wet the end of the glass. Do not wet the inside of the glass tube or the rubber hose.
- Take this open end glass tube and clip it into the spring clips of the right hand slider so that the rubber is about level with the bottom edge of the slider.
- Take the other (open) end of the RUBBER HOSE and temporarily clip it into the spring clips of the left hand slider whilst the mercury is being loaded into the open end glass tube.
- **FILLING: IMPORTANT NOTE: Mercury is an expensive, dangerous and very poisonous substance. Take care when filling the unit so that mercury is not spilled. Avoid contact with the skin.**



- Take distilled mercury in a plastic dropper bottle and, very carefully, squeeze the mercury into the right hand glass tube and the rubber hose until the level is visible about two thirds of the way up the glass tube. Wriggle the rubber hose gently with the hand to permit any trapped air to rise into the glass tube and escape.
- Carefully lower the left hand slider carrying the open rubber hose until the mercury is **JUST** visible approaching the end of the hose. **DO NOT ALLOW THE MERCURY TO ESCAPE OUT THE END OF THE HOSE.** Fit the small end of the 'L' shaped glass tube into the end of the rubber hose. Remove the hose from the clips and clip the 'L' shaped glass tube into its position.
- Fit the two short wire legs of the beaker support wire frame **UPWARDS** vertically into the lengthways holes in the aluminium slider. The legs will wedge securely into place and this wire frame will carry the glass beaker of hot water to heat up the air inside the glass ball ('Jolly bulb'). Fit the short leg of the 'L' shaped wire support **DOWNWARDS** into the front lengthways hole in the slider so that the long leg stands out and can pivot horizontally.
- With the two glass tubes side by side, pour the mercury into the open glass tube so that the mercury reaches the reference mark on the 'L' shaped glass.
- Fit the small rubber loop on the support wire and pass the leg of the glass 'Jolly bulb' through the loop and join it to the bent leg with the rubber joiner piece. At this time the horizontal legs of the glass tubes should be joined by the short rubber joiner and should be firmly attached to the 'L' shaped wire leg for strength and support.
- Place a beaker of hot water on the support frame under the glass ball and immerse the ball into the water. Soak the 'Jolly bulb' in the hot water so that the air pressure rises and the mercury is pushed down from the reference mark. Then raise the open glass tube so that the mercury returns exactly to the graduated line (the original air volume). Measure the water temperature and calculate the pressure applied by the mercury to compress the hot air to the original volume.

NOTE: When filled with mercury, do not knock over or invert the unit or mercury spillage will occur. During storage only, a rubber stopper fitted to the open glass tube may prevent spillage.

The IEC Constant Volume Thermometer and the Boyle's law are very similar instruments. The Constant Volume Thermometer can be converted to become a Boyle's Law by removing the bulb and the 'L' shaped tube and replacing it with a simple closed end glass tube.



Designed and manufactured in Australia