



## INTRODUCTION

The analysis of the quantity of water which can be discharged through an orifice is arrived at in a simple, straightforward manner by the application of Bernoulli's equation.

However, experimental tests typically produce a result which is only some 65% of the solution indicated by the simple analysis.

The study of water flow through an orifice is therefore a classic topic to illustrate the need for a semi-empirical approach which is so often required in Mechanics of Fluids.

## GENERAL DESCRIPTION

The Cussons Orifice sets are used in conjunction with the Inlet Head Tank P6103 for the investigation of the flow of water through a horizontal or a vertical orifice. Water is supplied to the tank via a hose connection to the base inlet, and is then distributed within the tank by a vertical perforated sparge pipe.

This arrangement avoids excessive turbulence and enables a steady level surface to be maintained. Two threaded holes are cut into the tank in which to mount the orifice being studied, one in the tank base for 'vertical' discharge, and the other in the tank side for 'horizontal' discharge. An orifice can be screwed into either of the threaded holes and the unused aperture sealed with the blanking plug provided. A scale is mounted on the side of the tank to enable the height of the water above either orifice position to be determined. The zero of the scale coincides with the centre of the side outlet position.

When an orifice is fitted in the horizontal discharge position a Trajectory Profile Hook Gauge P6107 can be used to determine the jet profile. Details of both sets of orifices are given as follows.

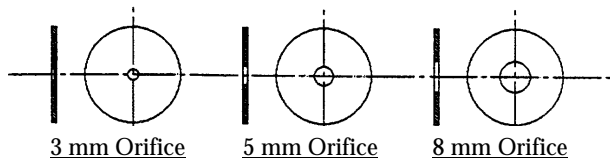
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## ORIFICE EXPERIMENTS

### P6223 ELEMENTARY ORIFICES

A set of three circular orifices are supplied in a plastic case. Each orifice is mounted in a 1" BSP threaded orifice holder, secured between an 'O' ring and a circlip. The orifice details are :-

- 3mm diameter orifice, square edged 0.61mm thick
- 5mm diameter orifice, square edged 1.22mm thick
- 8mm diameter orifice, square edged 1.22mm thick



P6223 ELEMENTARY ORIFICE SET

### EXPERIMENTAL CAPABILITIES

- ◆ Demonstration that for a given head, the flow through the orifice is proportional to its cross-sectional area.
- ◆ Confirmation that for orifices in general, the flow through the orifice is proportional to the square root of the head.
- ◆ Determination of the Discharge Coefficient for each orifice.
- ◆ Comparison of time of emptying a vessel through an orifice, for varying initial head conditions.
- ◆ Jet profile determination for side fitting orifices.
- ◆ Jet profile velocity determination at the point of discharge in order to obtain the 'Coefficient of Velocity' for the orifice.

### ACCESSORIES REQUIRED

P6103 Constant Head Inlet Tank  
 P6107 Hook Gauge (when Coefficient of Velocity required)  
 P6102 Pump Speed Display (optional)  
 Stop watch (not supplied)

### DIMENSIONS AND WEIGHTS

Nett:- 270 x 180 x 160 mm, 1.0 Kg  
 Gross:- 0.01m<sup>3</sup>, 2.0Kg.

## P6224 ADVANCED ORIFICES

A set of four orifices each mounted in a threaded orifice holder, a pair of callipers and an orientation tool are supplied in a plastic case. The orifice details are:

- a) Borda mouthpiece consisting of an orifice with extended upstream inlet tube which projects into the inlet head tank thus preventing flow of water across the face of the orifice. The leading edge of the inlet tube is reduced to a knife edge.

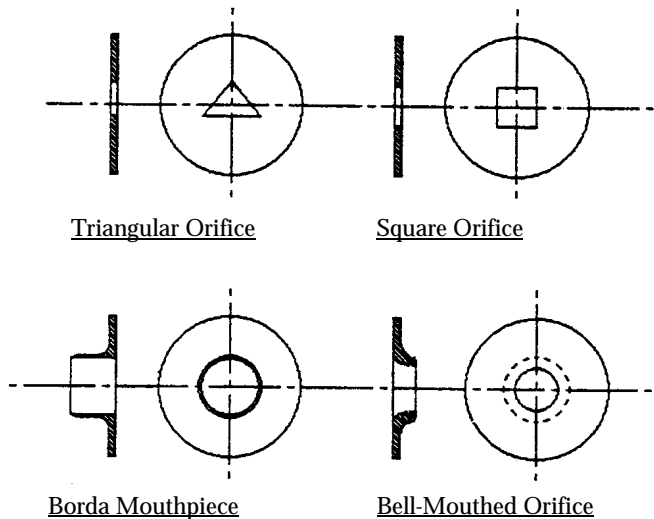
Orifice diameter	8 mm
Length of inlet tube	7 mm
Internal Diameter of inlet tube	8 mm

- b) Bell mouthed orifice having a bell shaped entry section.

Entry radius	2 mm
Bell mouth semi angle	23°
Orifice diameter	8 mm

- c) Triangular shaped orifice of side 10 mm (equilateral), square edged 1.22 mm thick.

- d) Square shaped orifice of side 7 mm square edged 1.22 mm thick.



P6224 ADVANCED ORIFICE SET

## EXPERIMENTAL CAPABILITIES

- ◆ Determination of 'Discharge Coefficient' for each of the orifice shapes.
- ◆ Visual appreciation of the change of jet shape with flow rate.
- ◆ Demonstration that the 'Coefficient of Contraction' for a Borda mouthed Orifice tends to the value of 0.5.
- ◆ Demonstration that the 'Coefficient of Contraction' for a Bell mouthed Orifice tends to the value of unity.

## ACCESSORIES REQUIRED

P6103 Constant Head Inlet Tank  
P6107 Hook Gauge (when Coefficient of Velocity required)  
P6102 Pump Speed Display (optional)

## DIMENSIONS AND WEIGHTS

Nett:- 270 x 180 x 60 mm, 1.0 Kg.  
Gross:- 0.005m<sup>3</sup>, 2.0 Kg.