

## PELTON TURBINE TEST RIG

### TECHNICAL SPECIFICATIONS:

| PARAMETERS    | DETAILS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SPECIFICATION | <ul style="list-style-type: none"> <li>• Sump Tank : 1200mm x 600mm x 600mm</li> <li>• Specific Speed : Appr ox. 19 RPM</li> <li>• Net Head : 45m Appr ox.</li> <li>• Discharge : Appr ox. 820 LPH appr ox.</li> <li>• Normal Speed : 750rpm. • Power : 1kw ( 5HP motor)</li> <li>• Runner Diameter: 250 mm.</li> <li>• Number Of Buckets : 16</li> <li>• Brake Drum Diameter : 200 mm.</li> <li>• Centrifugal Pump set suitable for supply of water of size coupled to 5 HP induction motor 3 phase 400 V. A. C. supply.</li> <li>• Flowing Measuring Unit : A 2' inch venturi meter OR Orifice meter OR Manometer with two pressure gauges on a Panel board to measure the differences of pressure.</li> <li>• Star ter switch, piping, foot valve, gate valve.</li> <li>• Spring Balance 10Kg- 1 No., 25Kg-1 No.</li> </ul> |



**Model: OR-PTT-2000**

### RANGE OF EXPERIMENT

- Demonstrating the operating characteristics i.e. power efficiency and torque of a Pelton Wheel at various speeds
- Determining the performance characteristics and effect of discharge and velocity of impinging water on Turbine operation.



## KAPLAN TURBINE TEST RIG

### TECHNICAL SPECIFICATIONS:

| PARAMETER     | DETAILS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SPECIFICATION | <ul style="list-style-type: none"> <li>• A Pressure gauge and Vacuum Gauge for head measurement. Rope brake arrangement by two circular balance methods. 300mm dia. cast iron water-cooled brake drum mounted on the main shaft with bearings for load test. The head of the turbine is 5 to 8 meters and discharge about 1500 LPM.</li> <li>• 7.5HP pump set suitable for supplying water to the above turbine and for operation on 400 volts 3 phase 50 cycles AC mains.</li> <li>• TPIC Switch and DOL, starter for the Pump set.</li> <li>• Flow measuring unit, consisting of 150mm Orifice meter and pressure gauge.</li> <li>• Piping system consisting of pipes, valves, and fittings complete set suitable for the test rig.</li> <li>• Fiber glass lined MS. Sump of size 1500 x 1000 x 550mm height to store sufficient water for independent circulation through the unit for experimentation and arranged within the floor space of the main unit.</li> <li>• Rigid M.S. framework compactly fitted with all the above items as a self-sufficient package unit suitable for operation without any foundation.</li> </ul> |



**Model: OR-KTR-1011**

### Experimentation:

design and function of a Francis turbine determination of torque, power and efficiency  
graphical representation of characteristic curves for torque, power and efficiency



## FRANCIS TURBINE TEST RIG

### TECHNICAL SPECIFICATIONS:

| PARAMETER     | DETAILS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SPECIFICATION | <ul style="list-style-type: none"> <li>Francis Turbine Horizontal type of size 75mm, develop about 1kW output, made of cast iron spiral casing, bearing housing and Aerofoil shaped gun metal guide vane and gun metal runner Transparent outlet pedestal with stainless steel draft tube.</li> <li>The cast iron external bearing pedestal for longer bearing life. A Cast iron base plate and slotted dead weights for conducting experiments in metric units. Pressure gauge and a vacuum gauge for head measurement in meters. 300 mm dia. cast iron water-cooled braked drum mounted on the main shaft with bearings for load test. The head of the turbine is 10 meters and discharge at about 1000 l,PM</li> <li>5 HP supply pump set 75mm size, 1000 T,PM at 14 meters head suitable for supplying water to the above turbine and for operation on 400 volts 3 phase 50 cycles AC mains</li> <li>Switch and DOL Starter suitable for the above monoblock pump set, mounted on a panel board.</li> <li>Flow measuring unit, consisting of a suitable orifice meter, pressure gauges.</li> <li>Piping system consisting of pipes, valves, fittings complete with suitable for the test rig.</li> <li>Fiber glass lined M.S Sump of size 1500 x 1000 x 550mm height to store sufficient water for independent circulation through the unit for experimentation and arranged within the floor space of the main unit.</li> <li>Rigid MS. framework compactly litted with all the above items as a self-sufficient package unit, suitable for operation without</li> </ul> |



**Model: OR-FTT-202**

## TWO STAGE AIR COMPRESSOR TEST RIG



**Model : OR-TSPT48**

### TECHNICAL SPECIFICATIONS:

| PARAMETER     | DETAILS                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SPECIFICATION | <ul style="list-style-type: none"> <li>• Air compressor - Double cylinder, Two stage type driven by a 2H.P.Three Phase motor mounted on air receiver provided with delivery valve.</li> <li>• Pressure gauges at outlet of the both stages.</li> <li>• Air tank 400 x 400 mm and orifice with water manometer for air intake measurement.</li> <li>• Digital temperature indicator 0 to 200° C</li> <li>• Energy meter to measure input power.</li> <li>• Starter</li> </ul> |

### RANGE OF EXPERIMENT

- The unit determines volumetric efficiency and isothermal efficiency at various discharge pressure.

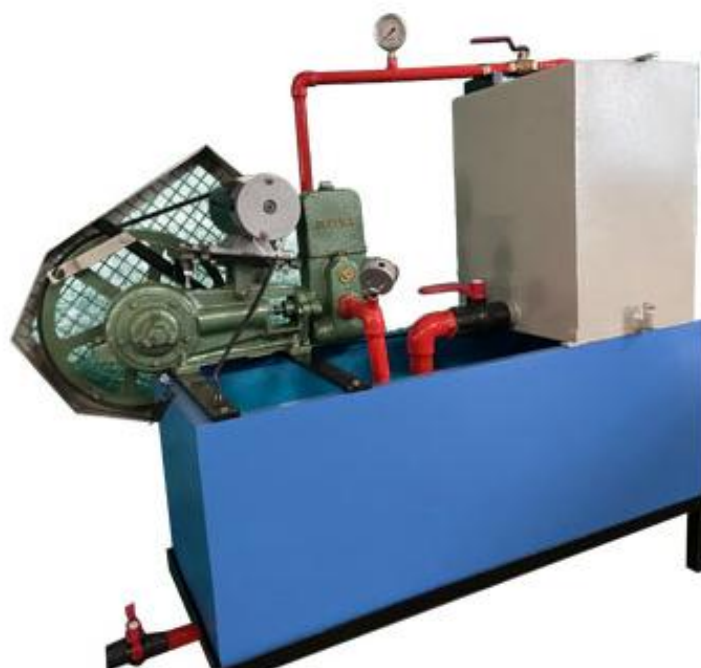
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## RECIPROCATING PUMP TEST RIG



**Model : OR-RPT40**

| PARAMETER     | DETAILS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SPECIFICATION | <ul style="list-style-type: none"> <li>• Reciprocating pump set suitable for pump test at variable</li> <li>• Speeds size 1/2 " X 3/4 " to discharge 220 GPH at 40m. head, (approx.) electric motor of capacity 1HP A.C. OR D.C. motor single phase drive from the motor to pump is given by a variable reduction pulley belt drive OR Dimmer Stat</li> <li>• Special arrangement for quick Alteration of speed. Additional special large air vessel is provided.</li> </ul> <p>i) Variable speed arrangement by reduction Pulley.</p> <p>ii) Pressure gauge, Vacuum gauge, foot valve,</p> <p>iii) Energy meter. Switch, star ter, and stop clock .</p> <p>iv) Measuring tank of size 300 mm x 300 mm x 500mm height with scale Fitting and I "drain valve</p> <p>v) Sump Tank</p> <p>of 1050mm x 300mm x 400mm vi) Instruction manual</p> |

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## CENTRIFUGAL AIR BLOWER TEST RIG

### Description

This equipment comprises of a FD Centrifugal Blower coupled to a Motor. Three interchangeable impellers with forward, backward and radial vanes are provided with the test rig. A Pitot Tube is provided in the delivery line of blower for static and dynamic pressure measurement.



Model : OR-CABT62

### TECHNICAL SPECIFICATIONS:

| PARAMETER     | DETAILS                                                                                                                                                                                                                                                                                                                                                                                             |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SPECIFICATION | <ul style="list-style-type: none"> <li>• 1 hp A. C. blower to drive the impellers.</li> <li>• Impellars</li> </ul> <p>FORWARD VANES</p> <p>RADIAL VANES</p> <p>Backward vanes</p> <ul style="list-style-type: none"> <li>• Orifice meter and manometer 300mm 2 Nos. to measure air flow.</li> <li>• Flow control valve on discharge side</li> <li>• Energy meter to measure input power.</li> </ul> |

### RANGE OF EXPERIMENT

To find out efficiency of reciprocating pump.

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## IMPACT OF JET APPARATUS



Model : OR-IJA-30

### TECHNICAL SPECIFICATIONS:

| PARAMETER      | DETAILS                                                                                               |
|----------------|-------------------------------------------------------------------------------------------------------|
| Size           | 30 cm x 30 cm dia. transparent cylinder mounted on a stand.                                           |
| -              | Differential lever mechanism with adjustable load screw mechanism & dead weight to measure the force. |
| Sump Tank      | 1050 x 300 x 400 mm                                                                                   |
| Measuring tank | 300 mm x 300mm x 500 mm with drain valve.                                                             |
| -              | Two nozzles with inside section : Straight taper ,Curved taper                                        |
| -              | Semicircular vane with angle of deflection 180°                                                       |
| -              | Curved vane with angle of deflection 135°                                                             |
| -              | Horizontal flat vane angle of deflection 90°                                                          |
| -              | 60° inclined flat vane<br>30° inclined flat vane                                                      |

### RANGE OF EXPERIMENT

- To study the impact of jet on various types of vanes & to measure impact forces
- To find coefficient of impact

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## VISCOSITY APPARATUS



**Model : OR-VTA998**

**Viscosity Apparatus** Cylindrical Glass  
Tube, Transparent viscous fluid, Metre  
Scale, Spherical ball, stop Watch

### Specifications

We have vast experience of manufacturing Viscosity Apparatus. Due to our latest infrastructure and trained & qualified staff our instruments are highly appreciated not only in India but also world wide . Viscosity Apparatus manufactured and supplied by us are designed and developed by our skilled staff. These equipments are highly applauded for its many positive attributes such as longevity, reliability, accuracy, perfect finish and more. Furthermore, supreme quality raw material sourced from well known dealers are used in the production of these range. Widely used for experiments and calculations, we are supplying Viscosity Apparatus at affordable market rates. With the help of this apparatus one can find the coefficient of viscosity of water by noting its flow through a capillary tube of uniform bore. A capillary tube of fine bore is fitted on a wooden board. Then two ends are joined by rubber tubing and it joints to two upright glass lshaped tubes forming the manometer with scale. With the help of a pinch cock, a steady flow of water is maintained. Complete with a three limbed constant level tank of brass on stand with rubber tube glass parts are made of borosil glass





## META CENTRIC HEIGHT APPARATUS



### Specifications

Floating body L x W x H : 300x130x190mm mast height: 400mm Horizontal scale: 180mm Vertical scale: 400mm Height scale of the floating body: 120mm / Clinometer scale:  $\pm 35^\circ$  Weights  
 Floating body without clamped weights: approx. 2,7kg  
 vertical clamped weight: 575g horizontal clamped weight: 196g Tank for water: 50L

**Model : OR-MAC19**

### Experimentation-

- study and determination of buoyancy
- center of buoyancycenter of gravity
- metacenter
- stability heel



## ROTAMETER APPARTUS



### Specifications

Venturi nozzle:  $A=84\ldots338\text{mm}^2$  angle at the inlet:  $10,5^\circ$   
Angle at the outlet:  $4^\circ$  Orifice plate flow meter:  
diameter=14mm

Rotameter: max. 1000L/h 6 tube manometers:  
390mmWC

**Required for Operation: Hydraulic bench**

**Model : OR-RLE-8475**

### EXPERIMENTATION

- flow measurement with
- orifice plate flow meter
- Venturi nozzle
- Rota meter
- pressure measurement with Pitot tube
- comparison of different instruments for flow measurement
- determining the corresponding flow coefficients
- calibrating measuring instruments



## FREE AND FORCE VORTEX FLOW APPARATUS



**Model : OR-VFA-405**

### Specifications

1. generation and investigation of vortices
2. transparent tank allows visualisation of vortex formation
3. two nozzles for radial water supply (free vortex)
4. two nozzles for tangential water supply (forced vortex)
5. different inserts for the water drain to generate free vortex
6. impeller for generating a forced vortex
7. point gauges detect the surface profile
8. flow rate determined by Hydraulic Bench
9. water supply using Hydraulic bench or via laboratory supply

**Technical Details:** Tank diameter: 250mm height: 190mm 4 inserts for the water drain diameter: 8, 12, 16 and 24mm Impeller with 3 blades Vertical point gauge 6 movable rods Horizontal point gauge 2 movable rods Measuring tube, movable horizontal 0...90mm, vertical 70...190mm diameter: 4mm

### Experimentation:

visualisation of various vortices investigation of free and forced vortices  
representation of surface profiles determination of velocity Required for  
Operation: Hydraulic bench



## HYDRAULIC BENCH



**Model : OR-HBP-405**

### Specifications

1. Base module for supplying experimental units in fluid mechanics
2. Closed water circuit with storage tank, submersible pump and measuring tank.
3. Measuring tank divided into two for volumetric flow rate measurement.
4. Measuring cylinder with scale for very small volumetric flow rates..
5. Measurement of volumetric flow rate by using a stopwatch.
6. Work surface with inside edge for safe placement of the accessories and for collecting the dripping water.

### Technical Data:

#### Pump

- power consumption: 500-750 W
- max. flow rate: 200-450 L/min
- max. head: 7-14 m

Storage tank, contents: 180 L

Measuring tank - at large volumetric flow rates: 40 L - at small volumetric flow rates: 10 L

Measuring cylinder with scale for very small volumetric flow rates - content: 2 L **Utility Required** 230V, 50/60Hz, 1 Phase

### EXPERIMENTATION :

Many experiments can be carried out with common basic table, with separate experimental set-ups (supplied at extra cost), which can be connected to hydraulic bench with flexible pipe:

## PITOT TUBE



### Specifications

Pitot static tube: Head diameter: 2.5 mm. Transparent pipe: 32 mm. internal diameter and 430 mm. length approx. Hose connections. Water manometer, 500 mm. length. Easy and quick coupling system built-in.

**Required for Operation: Hydraulic bench**

**Model : OR-TPE-0016**

#### Experimentation:

- Study of the function of a pitot static tube.
- To use a pitot static tube.
- Determination of tube flow speed profiles.
- Demonstration that the flow speed is proportional to the pressure difference between the total pressure and the static pressure.
- Error determination in flow measurements using the Pitot tube as measurement instrument.
- Factor  $C_d$  determination in the Pitot tube.

## PITOT TUBE



**Model : OR-TPE-0016**

### TECHNICAL SPECIFICATION

Pitot static tube: Head diameter: 2.5 mm. Transparent pipe: 32 mm. internal diameter and 430 mm. length approx. Hose connections. Water manometer, 500 mm. length. Easy and quick coupling system built-in.

**Required for Operation: Hydraulic bench**

### Experimentation:

Study of the function of a pitot static tube.

To use a pitot static tube.

Determination of tube flow speed profiles.

Demonstration that the flow speed is proportional to the pressure difference between the total pressure and the static pressure.

Error determination in flow measurements using the Pitot tube as measurement instrument.  
Factor  $C_d$  determination in the Pitot tube.

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## FREE AND FORCE VORTEX FLOW APPARATUS



**Model : OR-VFA-405**

### TECHNICAL SPECIFICATIONS:

Tank diameter: 250mm  
height: 190mm  
4 inserts for the water drain  
diameter: 8, 12, 16 and 24mm  
Impeller with 3 blades  
Vertical point gauge  
6 movable rods  
Horizontal point gauge  
2 movable rods  
Measuring tube, movable  
horizontal 0...90mm, vertical 70...190mm diameter: 4mm

### Pump

power consumption: 500-750 W  
max. flow rate: 200-450 L/min  
max. head: 7-14m

Storage tank, contents: 180L

Measuring tank

-at large volumetric flow rates: 40L

-at small volumetric flow rates: 10L

Measuring cylinder with scale for very small volumetric flow rates -content: 2L

Utility Required

230V, 50/60Hz, 1 Phase

### Experimentation:

visualisation of various vortices investigation of free and forced vortices representation of surface profiles determination of velocity Required for Operation: Hydraulic bench

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## VISCOSITY METER



Model : OR-VTA998

### DESCRIPTION

#### New User Interface

- Keypad control
- Sharp viewing screen for close up or distance viewing

#### No calculations required

- Direct reading of viscosity

#### Displayed Info:

- Viscosity (mPa·s)
- % Torque
- Speed/Spindle

**8 Speeds** for wide range capability

**Bubble Level** conveniently located for easy adjustment

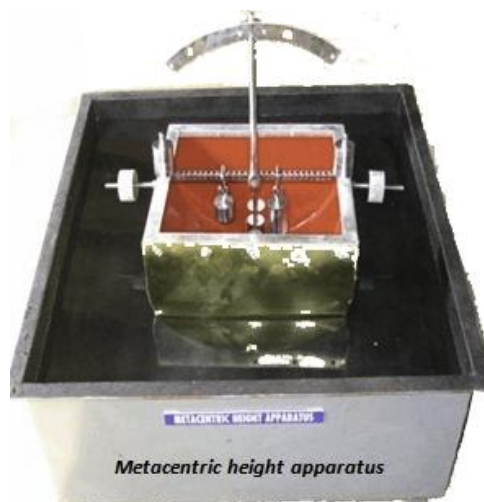
Accuracy:  $\pm 1.0\%$  of range Repeatability:

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## META CENTRIC HEIGHT APPARATUS



**Model : OR-FMA30**

### **Technical Details : Floating body**

L x W x H: 300x130x190mm

Mast height: 400mm

Horizontal scale: 180mm

Vertical scale: 400mm

Height scale of the floating body: 120mm

Clinometer scale: +/- 35°

### **Weights**

Floating body without clamped weights: approx. 2,7kg

Vertical clamped weight: 575g

Horizontal clamped weight: 196g

Tank for water: 50L

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## VENTURIMETER & ORIFICE METER AND ROTAMETER TEST RIG



**Model : OR-VRAT300**

### **System Components:**

1. Centrifugal Pump:  $\frac{1}{2}$  hp 230 VAC, 50 Hz.
2. Rotameter (100L/h).
3. Venturi Nozzle : A-84 338
4. Angle at Inlet 10,5
5. Angle at Outlet 4
6. Plate flow meter S 14mm
7. 6 tube manometers 390mmWC

### **List of Experiment:**

1. Flow measurement using venturimeter, orifice meter, variable area flow meter like Rotameter
2. Calibration of Flow meters.
3. Demonstration of use of different flow meter & its comparisons.
4. Determination of coefficient of discharge for flow meters.
5. Comparison of pressure drops across venturimeter & Orifice meter.

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## FRICTION FACTOR APPARATUS



Model : OR-FFAT400

### TECHNICAL SPECIFICATIONS

| PIPE SECTION                            |                          |
|-----------------------------------------|--------------------------|
| LENGTH                                  | 400MM                    |
| Ø, inner                                | 3mm                      |
| Tank                                    | 21L                      |
| Measuring ranges differential pressure: | 2x 370mmWC 1x 0...0,4bar |

**Experimentation:** measurements of the pressure loss in laminar flow  
 measurements of the pressure loss in turbulent flow determining the critical  
 Reynolds number determining the pipe friction factor comparing the actual pipe  
 friction factor with the theoretical friction factor  
 Required for Operation:  
 Hydraulic bench

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# BERNOULI'S THEOREM



## TECHNICAL SPECIFICATIONS

### VENTURI NOZZLE

A: 84...338mm<sup>2</sup>

angle at the inlet: 10,5°

angle at the outlet: 4°

Pitot tube

movable range: 0...200mm

diameter: 4mm

Pipes and pipe connectors: PVC

Measuring ranges

static pressure: 0...290mmWC

total pressure: 0...370mmWC

### Required for Operation

HM 150 (closed water circuit) or alternatively water connection and drain

[1] familiarisation with Bernoulli's principle

[2] Venturi nozzle with transparent front panel and measuring points for measuring the static pressures

[3] axially movable Pitot tube for determining the total pressure at various points within the Venturi nozzle

[4] 6 tube manometers for displaying the static pressures

[5] single tube manometer for displaying the total pressure

[6] flow rate determined by HM 150 base module

[7] water supply using HM 150 base module or via laboratory supply

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## REYNOLDS NUMBER APPARATUS



### TECHNICAL SPECIFICATIONS

**Tube Glass** : Material Borosilicate

**Dye vessel** : Material Stainless Steel

**Capillary Tube** : Material Copper/Stainless Steel

**Water tank Capacity** : 2200ml

**Pipe section** : length: 675mm, inside

**Diameter** : 10mm

**Tank for ink capacity**: approx 250mL

**Water Circulation**:FHP Pump

**Flow Measurement** : Using Measuring Cylinder

### EXPERIMENTATION:

*To determine the Reynold's number and hence the type of flow either laminar or turbulent.*

*To study transition zone.*

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## MINOR LOSSES APPARATUS



### TECHNICAL SPECIFICATIONS

Pipe, PVC

inner diameter: 17mm

sudden contraction: from  $d=17$  to  $d=9,2$ mm

sudden enlargement: from  $d=9,2$  to  $d=17$ mm

segment bend:  $d=17$ mm,  $90^\circ$

pipe angle:  $d=17$ mm,  $90^\circ$

narrow pipe bend:  $d=17$ mm,  $r=40$ mm,  $90^\circ$

wide pipe bend:  $d=17$ mm,  $r=100$ mm,  $90^\circ$

Measuring ranges

Sump Tank : Capacity 50 Ltrs.

pressure: 1x 0...1,6bar

6x 0...0,03bar

*Experimentation:*

*investigate pressure losses at segment bend and bends investigate pressure loss at contraction and enlargement pressure loss at a ball valve and determination of a simple valve*

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# HYDRAULIC BENCH



**Model : OR-HBP-405**

**DISCRIPTION:** This is a water re-circulation system consisting of a water sump tank, mono block, top tray with drain, discharge measurement tank, and a bye-pass arrangement for the mono block pump.

## TECHNICAL SPECIFICATION:

- Water Tray Size -200mm L X 1200MM W X 200mm Ht (Approx)
- Sump Tank – 1200mm L x 700mm W x 300mm Ht (Approx)
- Discharge Measurement Tank – 600mm L x 400mm W x 250mm Ht (Approx)
- Monoblock Pump – 1 Phase 230V AC, 0.5 hp 2800 rpm
- Digital Stop Watch – 1 No. For measuring rate
- Necessary Piping arrangement with a bye pass arrangement.
- Tachometer 1 No. For measuring rpm.

**This bench is useful to conduct experiment on various set ups.**

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# HYDRAULIC BENCH

## **EXPERIMENTS :**

- 1- Impact of Jet**
- 2- Venturimeter & Orifice meter**
- 3- Orifice & Mouthpiece.**
- 4- Pipe Friction Apparatus.**
- 5- Losses in Pipes.**
- 6- Free & Forced Vortex Tube.**
- 7- Notch Apparatus**
- 8- Reynold's Apparatus.**
- 9- Bernoulli's Theorem Apparatus**
- 10- Metacentric Height Ship Model**