



MECHANICAL ENGINEERING

**PRODUCT
CATALOGUE
2024**

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The entire Mechanical Catalogue

This Catalogue provides a quick overview of more than 300 products.

In our extensive catalogue you will find pictures, product descriptions and specifications.

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PROCESS CONTROL & INSTRUMENTATION LAB

ENVIRONMENTAL & BIO-ENGINEERING LAB

HEAT TRANSFER LAB

HEAT TRANSFER

Order Code - 14001 HEAT TRANSFER THROUGH LAGGED PIPE

Introduction: The apparatus setup is designed and fabricated to study lagging phenomenon in the case of pipes. It consists of three concentric pipes of small thickness as compared to diameter and are arranged concentrically, and closed with the help of two discs.

Specifications: This apparatus contains G.I. Pipe Inner: 5cm, Middle: 10cm, Outer: 15cm, Length of Pipes: 60cm, Heater: Nichrome Wire, Digital Voltmeter: 0-300 Volt., Ammeter: 0-2 Amp., Digital Temp. Indicator: 0-200°C, with multi-channel switch.



Order Code - 14002 HEAT TRANSFER THROUGH COMPOSITE WALL

Introduction: The setup consists of a heater sandwiched between two sets of slabs. Three types of slabs are provided on either sides of heater, which forms a composite structure. A small hand press frame is provided to ensure the perfect contact between the slabs. A variac is provided for varying the input to the heater. Digital Voltmeter and Digital Ammeter display the heat input. Heat produced by heater flows axially on both the sides.

Specifications: Slab assembly arranged symmetrically on both sides of heater, Cast Iron: 250mm & 20mm thick, Bakelite: 250mm & 15mm thick, Heater: Nichrome wire, Control panel comprising of, Digital Voltmeter: 0-300 Volts, Ammeter: 0-2 Amp., Variac: 0-230 V, 2Amp.



Order Code - 14003 HEAT PIPE DEMONSTRATOR

Introduction: It is a super-conducting device and involves the transfer of heat by boiling and condensation of a fluid and hence transfer of heat takes place under nearly isothermal condition. In this apparatus the comparison of heat pipe with the copper pipe as good conductor of heat and with the stainless steel pipe as same material of construction is made.

Specifications: 1st Heat pipe made of stainless steel, 2nd made of copper, 3rd made of stainless steel, Size: 32mm dia., and length 350mm, Control panel comprising of digital voltmeter: 0-300 Volts, Digital Ammeter: 0-2 Amp., Variac: 0-230 V, 4 Amp., Digital Temp. Indicator: 0-200°C, with multi-channel switch, Temp. Sensors: RTD PT-100 type.



Order Code - 14004 HEAT TRANSFER IN AGITATED VESSEL

Introduction: Heat transfer in agitated vessels can be carried out either through an external jacket on the vessel or by internal coils. Where a jacket or coils cannot provide the surface area required, a recirculating loop with an external heat exchanger may be used.

Specifications: System : Steam to Water, Vessel : Material stainless steel fitted with 4 baffles Dia. 250, Depth 350 mm (Approx.), Jacket : Width 25 mm. Insulated with ceramic wool and clad with aluminium foil, Helical Coil: Material Copper, OD 16mm, ID 13mm, Control panel comprising of: Digital Temp. Controller: 0-199.9°C (For Steam Generator), Digital Temp. Indicator: 0-199.9°C, with multi-channel switch, Temperature sensors: RTD PT-100 type, RPM Indicator: Standard makes Digital, Non Contact type, With standard make On/Off switch, Mains Indicator etc.



Order Code - 14005 HEAT TRANSFER THROUGH PIN-FIN

Introduction: The setup is designed to study the heat transfer in a pin fin. It consists of pin type fin fitted in a duct. A fan is provided on one side of duct to conduct experiments under forced draft conditions. Air flow rates can be varied. A heater heats one end of fin and heat flows to another end.

Specifications: Fin: Pin type, Material: Brass, Size: 12.5 mm (approx.) 15 cm. long (approx.), Duct: Made of MS, Fan: Standard makes, Heater: Band type, Nichrome Wire, Control panel comprising of: Dimmerstat: 0-230 V, 2Amp, Digital Temp. Indicator: 0-300°C, with multi-channel switch Temperature Sensors: RTD PT-100 type. 5 for pin and 1 for duct temperature, With standard make On/Off switch, Mains Indicator etc.



HEAT TRANSFER LAB

Order Code - 14006 UNSTEADY STATE HEAT TRANSFER UNIT

Introduction: The apparatus consists of a small test cylinder. The cylinder is heated by a constant temperature water bath, till steady state is reached. During heating, temperature of the cylinder is function of time and hence, heating of cylinder is under unsteady state Heat transfer. The temperature of cylinder is measured with the help of temperature sensor inserted in the centre. The hot water bath is provided with a heater and is controlled by digital temperature controller. An agitator is also provided to maintain the constant bath temperature.

Specifications: Water Bath: Material - stainless steel Capacity-8 lit, Stirrer for Bath: Stainless Steel Impeller with shaft coupled to a FHP motor, Heater : Nichrome wire heater, Test Cylinder: One each of Stainless Steel & Brass, Control Panel comprises of : Digital Temp. Controller: 0-199.9°C, (For Water Bath) Digital Temp. Indicator: 0-199.9°C, Temperature Sensors : RTD PT-100 type.



Order Code - 14007 FLUIDIZED BED HEAT TRANSFER UNIT

Introduction: The set up consists of a glass column filled with packing. Air is fed at the bottom of the column. Flow rate of air is measured using orifice meter and manometer. A heater in the form of cylinder is placed in the bed. The heater input can be controlled by the Digital Temperature Controller. Temperature sensors are provided to measure the temperature of air in let and air outlet.

Specifications: Column: Material Borosilicate Glass, Heater: Made of Nichrome Wire, Air Flow Measurement: By Orifice meter & manometer, Control panel comprising of Digital Temp. Controller: 0 to 199.9°C, Digital Temp. Indicator: 0 to 199.9°C, with multi channel switch, Temperature sensors: RTDPT-100 type-3Nos, With standard make on/off switch, Mains Indicator etc.



Order Code - 14008 POOL BOILING APPARATUS

Introduction: The present setup is designed to study the critical heat flux of a given nichrome wire. The setup consists of temperature controlled water bath with controller. Temperature of the water bath can be varied from ambient to 80°C to achieve different environment for nichrome wire. Test heater wire is placed in the bath & voltage is varied by variac provided. The system is complete with digital temperature controller, voltmeter, ammeter & voltage control facility.

Specifications: Boiling chamber: Rectangular chamber (Material SS) with transparent window for observation of test heater, Test heater: With holding arrangement for quick change of wire. Control panel comprises of : Digital Temp. Controller: 0-199.9°C, for water bath Voltmeter: 0-200 V, Ammeter: 0-2 Amp (with Peak Hold Facility), Dimmerstat: 0-4 A, 230 V, With standard make On-off switch, mains indicator etc.



Order Code - 14009 TWO PHASE HEAT TRANSFER UNIT

Introduction: The Unit consists of a strong cylinder containing fluid. A water cooled coil in the upper part of the cylinder condenses the vapour and returns it to the boiling liquid. The condenser cooling water rate can be measured and controlled also.

Specifications: Boiling/Condensation Cylinder: 300mm x 75mm O.D. approximately fitted with Sealed caps with pressure gauge and relief valve, Pressure gauge: Bourdan type, (0 to 2) kg/cm² Water Flow Measurement: Rotameter, (10 – 100) LPH, Temperature Sensor: RTD PT-100 type, Control panel comprises of: Digital Temperature Indicator: 0-199.9°C, with multi channels with Voltmeter: 0-200 V Ammeter: 0-2 Amp, Dimmerstat: 0-4 A, 230 V With standard make On-off switch, mains indicator etc. Provision for high pressure cutout for heater is also provided.



Order Code - 14010 CONVECTION AND RADIATION APPARATUS

Introduction: Under real conditions, the heat transport between two objects is normally substance-bound, i.e. convection and/or heat conduction, and not substance-bound, i.e. radiation, at the same time. Determining the individual heat quantities of one type of transfer is difficult. This trainer enables users to match the individual heat quantities to the corresponding type of transfer. The core element is a heated metal cylinder located at the center of the pressure vessel.

Specifications: Heating element output: 20W radiation surface area: approx. 61cm² Pressure vessel pressure: -1 to 1.5bar volume: 11L Pump for vacuum generation power consumption: 370W nominal suction capacity: 5m³/h final pressure with gas ballast: 2*10⁻³mbar final pressure without gas ballast: 7*10⁻²mbar Measuring ranges negative pressure: 0.5*10⁻³...1000mbar pressure: -1...1.5bar rel. temperature: 0...250°C power: 0...23W.



HEAT TRANSFER LAB

⇒ CONDUCTION

Order Code - 14011 THERMAL CONDUCTIVITY OF INSULATING POWDER

Introduction: This apparatus is designed to determine the thermal conductivity of insulating powder. The apparatus consists of two thin walled concentric copper spheres. Inner sphere houses Nichrome Wire heater. Insulating powder is filled between the two spheres. Heat flows radially outwards. Temperature sensors at proper positions are fitted to measure surface temperatures of spheres. Heat input to the heater is given through a variac and measured by Digital Voltmeter & Digital Ammeter. By varying the heat input rates, data can be obtained.

Specifications: Inner Sphere: Dia. - 100 mm, Outer Sphere : Dia. - 200 mm, Heater: Nichrome Wire. Control panel comprising of: Digital Voltmeter: 0-300 Volt, Digital Ammeter: 0-2 Amp. Variac: 0-230 V, 2 Amps. Digital Temp. Indicator: 0-199.9°C, with multi-channel switch Temperature Sensors: RTD PT-100 type. With standard make On/off switch, Mains Indicator etc.



Order Code - 14012 THERMAL CONDUCTIVITY OF INSULATING SLAB

Introduction: The set-up is designed to determine thermal conductivity of insulating materials in the form of slab. The apparatus consists of main central heater and ring guard heater, sandwiched between two specimens. Cooling plates are provided on either side of the specimen. Two identical specimens are clamped between heater that ensures unidirectional heat flow through specimen. The whole assembly is kept in chamber and insulated by ceramic wool insulation around the set-up.

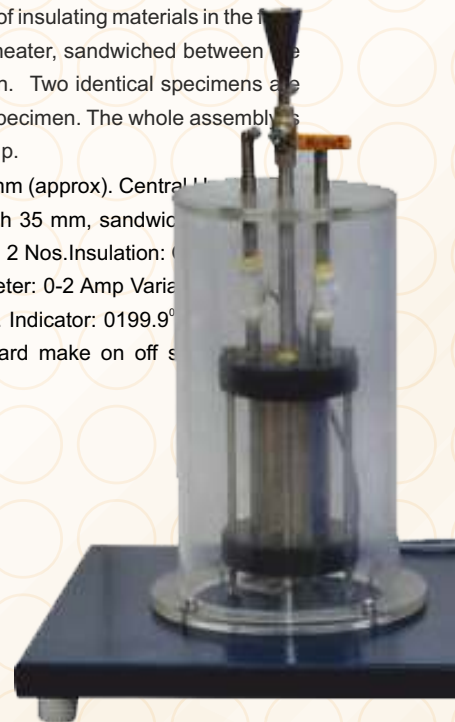
Specifications: Specimen, Diameter: 180 mm (approx). Thickness: 12 mm (approx). Central Heater: 100 mm, sandwiched between copper plates. Ring Guard Heater: Width 35 mm, sandwiched between copper rings. Cooling chamber: Made of Aluminium for water circulation. 2 Nos. Insulation: Ceramic Wool. Control panel comprising of: Digital Voltmeter: 0-300 Volt. Digital Ammeter: 0-2 Amp Variac: 0-230 V, 2 Amps, (2 Nos.) One each for central & ring guard heater. Digital Temp. Indicator: 0-199.9°C, with multi-channel switch Temperature Sensors: RTD PT-100 type. With standard make on off switch, Mains Indicator etc.



Order Code - 14013 THERMAL CONDUCTIVITY OF LIQUIDS

Introduction: The apparatus is designed to determine thermal conductivity of different liquids. The apparatus consists of a heater. The heater heats a thin layer of liquid. A cooling plate removes heat through liquid layer, ensuring unidirectional heat flow. Temperature is measured across the liquid layer and complete assembly is properly insulated. A proper arrangement for changing the liquids is provided. The whole assembly is kept in a chamber.

Specifications: Liquid Chamber: Dia 160 mm (approx). Heater: Dia 100 mm sandwiched between copper plates. Insulation: Ceramic Wool Cooling chamber: Made of Aluminium for water circulation. Control panel comprising of: Digital Voltmeter: 0-300 Volt. Digital Ammeter: 0-2 Amp. Variac: 0-230 V, 2 Amp. Digital Temp. Indicator: 0-199.9°C, with multi-channel switch Temperature Sensors: RTD PT-100 type. With standard make On/Off switch, Mains Indicator etc.



Order Code - 14014 THERMAL CONDUCTIVITY OF METAL ROD

Introduction: The experimental set up consists of metal bar, one end of which is heated by an electric heater while the other end of the bar projects inside the cooling water jacket. A cylindrical shell filled with insulating material surrounds the middle portion of the bar. The temperature of the bar is measured at different sections. Heat Input to the heater is given through variac. By varying the heat input rates, data can be obtained. Water at constant rate is circulated through the jacket and its flow rate and temperature rise is noted.

Specifications: Metal Bar Material: Copper, Length: 400 mm (approx.), Diameter: 25 mm Insulating shell, Length : 250 mm, Diameter : 200 mm Cooling Water Jacket, Length : 75 mm, Diameter : 100 mm, Heater: Nichrome Wire. Water Flow measurement: By Measuring cylinder, Control panel comprising of Digital Voltmeter: 0-300 Volt. Variac: 0-230 V, 2 Amps. Digital Temp. Indicator: 0-199.9°C, with multi-channel switch, Temperature Sensors: RTD PT-100 type.



HEAT TRANSFER LAB

CONVECTION

Order Code - 14015 HEAT TRANSFER IN FORCED CONVECTION

Introduction: The apparatus consists of blower unit fitted with the test pipe. Nichrome Wire heater surrounds the test section. Four Temperature Sensors are Embedded on the test section, two placed in the air stream at the entrance and exit of the test section to measure the inlet and outlet air temperature. Test pipe is connected to the delivery side of the blower along with the orifice to measure flow of air through the pipe. Constant heat flux is given to pipe by an electric heater through a variac and measured by Digital Voltmeter and Digital Ammeter.

Specifications: Test section : Horizontal, externally heated, Diameter: 28 mm (approx.) Length: 400 mm (approx.) Blower: FHP of Standard makes. Heater: Nichrome Wire. Air Flow measurement: Orifice meter & Manometer. Control panel comprising of: Digital Voltmeter: 0-300 Volt. Digital Ammeter: 0-2 Amp. Variac: 0-230 V, 2 Amps, Digital Temp. Indicator: 0-300°C, with multi-channel switch. Temperature Sensors: RTD PT-100 type.



Order Code - 14016 HEAT TRANSFER IN NATURAL CONVECTION

Introduction: The setup consists of a brass tube fitted in a rectangular duct in a vertical position. The duct is open at the top and bottom, and forms an enclosure that serves the purpose of undisturbed surrounding. One side of the duct is fitted with a transparent acrylic window for visualization. An electric heating element is kept in the vertical tube that in turns heats the tube surface. The heat is lost from the tube to the surrounding air by natural convection.

Specifications: Test Section Diameter: 38 mm (approx.) Length: 500 mm (approx.) Heater: Nichrome Wire. Control panel comprising of : Digital Voltmeter: 0-300 Volt. Digital Ammeter: 0-2 Amp. Variac: 0-230 V, 2 Amp. Digital Temp. Indicator: 0-300°C, with multi-channel switch, Temperature Sensors: RTD PT-100 type.



RADIATION

Order Code - 14017 EMISSIVITY MEASUREMENT APPARATUS

Introduction: The present Set-up is designed to measure the emissivity of test plate. The test plate comprises of a mica heater sandwiched between two circular plates. Black plate is identical with test plate, but its surface is blackened. As all the physical properties, dimension and temperature are equal; heat losses from both plates will be same except radiation loss. Hence the input difference will be due to difference in emissivity. Both plates are supported on individual brackets in a enclosure with one side glass to ensure steady atmospheric conditions.

Specifications: Table for set-up support. Test plate Diameter: 160 mm (approx.) Black Plate Dia.: 160 mm (Approx.) Heater (2Nos.): Nichrome Wire Heater. Control panel comprising of Digital Voltmeter.: 0-300 Volt. Digital Ammeter : 0-2 Amps. DPDT Selector switches : For Digital Voltmeter & Digital Ammeter. Variacs: 0-230 V, 2 Amps, (2 Nos.) Digital Temp. Indicator: 0-300°C, with multi-channel Switch



Order Code - 14018 STEFAN BOLTZMANN'S APPARATUS

Introduction: The apparatus is designed to determine the Stefan Boltzmann constant. The apparatus consists of a hemisphere fixed to a Bakelite plate, the outer surface of which forms the jacket to heat it. Hot water to heat the hemisphere is obtained from a hot water tank, which is fixed above the hemisphere. The copper test disc is introduced at the center of hemisphere. The temperatures of hemisphere and test disc are measured with the help of temperature Sensors.

Specifications: Hemisphere : Dia.- 200 mm (approx.) made of Copper Jacket: Dia. 250 mm (approx.) made of Stainless Steel Test Disc Size : 20 mm Dia. x 1.5-mm thickness made of Copper Water Tank: Stainless steel 12 Ltrs. cap. Heater: Nichrome wire immersion heater. Control panel comprising of Digital Temp. Controller: 0 to 199.9°C, Digital Temp. Indicator: 0 to 199.9°C, with multi channel switch Temperature sensors: RTD PT-100 type.



HEAT TRANSFER LAB

HEAT EXCHANGER

Order Code - 14019 PARALLEL FLOW/COUNTER FLOW HEAT EXCHANGER

Introduction: Heat exchanger is a device in which heat is transferred from one fluid to another. The apparatus consists of a concentric tube heat exchanger. Hot water flows through inner tube in one direction only and cold water flows through the outer tubes. Direction of cold fluid flow can be changed from parallel or counter to hot water so that unit can be operated as parallel or counter flow heat exchanger. Flow rates of hot and cold water are measured using Rota meters.

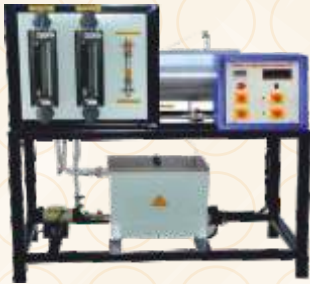
Specifications: System : Water to Water, concentric tube type Heat Exchanger: Length 1.6m (approx.), insulated with ceramic wool and cladded by aluminum foil. Outer Tube: Material Stainless steel. ID 27.5mm, OD 33.8 mm (approx) Inner Tube : Material Stainless Steel, OD 12.7mm (appx) Water Flow Measurement: Rotameters (2Nos.) one each for cold & hot fluid. Hot Water Tank: Made of Stainless steel. Insulated with ceramic fiber wool. Hot Water Circulation : Magnetic Pump Heaters : Nichrome wire heater (2Nos) Control panel comprising of Digital Temp. Controller: 0-199.9°C Digital Temp. Indicator: 0-199.9°C, with multi-channel switch Temperature Sensors: RTD PT-100 type.



Order Code - 14020 SHELL & TUBE HEAT EXCHANGER

Introduction: Shell and Tube Heat Exchanger are popular in industries because they occupy less space and offer reasonable temperature drop. The apparatus consists of ss shell, inside which Stainless Steel tubes with baffles on outer side are fitted. This is single-pass heat exchanger so that hot water passes from one end of shell to the other end through the tubes. The cold water is admitted at the one end of shell, which passes over the hot-water tubes. Hot fluid flows in one direction only, whereas direction of cold fluid flow can be changed from parallel or counter to hot water so that unit can be operated as parallel or counter flow heat exchanger.

Specifications: Outer Shell Material :SS 304 Inner Tube Material: Stainless Steel Outside Diameter: 6.35 mm (approx). Heat Transfer area is equivalent to that of the Tubular Heat exchanger for direct comparison. The whole set-up is well designed and arranged on a rigid structure painted with industrial PU Paint.



Order Code - 14021 FINNED TUBE HEAT EXCHANGER

Introduction: Heat exchangers are widely used in various industries. Finned tube Heat Exchanger is a Tube-in-tube type heat exchanger. The inner tube is of Stainless steel with fins on its outside surface. Hot water flows through inner tube and cold fluid flows through the outer tube. The flow rate of hot & cold fluid is measured with the help of rotameters. Inlet and outlet temperatures of fluids are measured with the help of digital temperature indicators.

Specifications: System : Water to Water, concentric tube type Inner Tube : Dia 32 mm approx., Length 500mm. Longitudinal Fins: Width 20mm, Length 500mm, 6 Nos.

Water Flow Measurement : Rotameters for hot and cold fluid Hot Water Tank: Made of Stainless steel Double Wall, insulated with ceramic Wool. Hot Water Circulation: Magnetic Pump made of Polypropylene to circulate Hot water Maximum working temperature is 85°C. Heaters: 2 kW Nichrome wire heater (2 Nos.)



Order Code - 14022 PLATE TYPE HEAT EXCHANGER

Introduction: Plate type heat exchanger consists of ramien which independent metal plates are clamped between a head and follower. The plates are sealed at their outer edges and around the ports by gaskets, which are so arranged that the liquid and the heating /cooling media are directed alternately into passages formed between the plates. The hot fluid enters at the top on the right side of the fixed end cover and flows downwards through alternate channels between the plates.

Specifications: System: Water to Water Plates: Material Stainless Steel Frame: Rigid MS Structure Water Flow Measurement: By Rotameter (2Nos.) one each for cold & hot fluid. Hot Water Tank: Made of Stainless steel, Double Wall, Insulated with ceramic wool. Hot Water Circulation: Magnetic Pump. Heaters: Nichrome wire heater. Control panel comprising of: Digital Temp. Controller: 0-199.9°C, Digital Temp. Indicator: 0-199.9°C, with multi-channels with Temperature Sensors RTD PT-100 type. -4Nos.

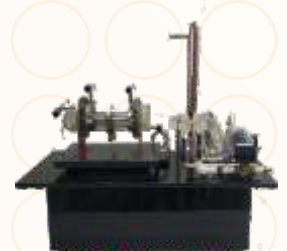


HEAT TRANSFER LAB

Order Code - 14023 HEAT EXCHANGER TEACHING SET-UP

Introduction: The present set-up is designed to accommodate four types of heat exchanger using one at a time, most commonly used in industries. These Heat Exchanger can alternatively be installed on the same set-up. For hot water Circulation through the heat exchanger, a temperature controlled heating system and a fixed speed circulating pump With by-pass to vary the hot water flow rate through the heat exchanger, are provided. Cold water supply is to be Provided by the user.

Specifications: System : Water to Water, concentric tube type Heat Exchanger: Length 1.6m (approx.). insulated with ceramic wool and cladded by aluminum foil. Outer Tube: Material Stainless steel. ID 27.5mm, OD 33.8 mm (approx) Inner Tube : Material Stainless Steel, OD 12.7mm (appx.) Water Flow Measurement: Rotameters (2Nos.) one each for cold & hot fluid. Hot Water Tank: Made of Stainless steel. Insulated with ceramic fiber wool. Hot Water Circulation : Magnetic Pump Heaters : Nichrome wire heater (2Nos) Control panel comprising of Digital Temp. Controller: 0-199.9°C Digital Temp. Indicator: 0-199.9°C, with multi-channel switch Temperature Sensors: RTD PT-100 type.



Order Code - 14024 JACKETED VESSEL WITH COIL & STIRRER

Introduction: In most industrial processes including reactors, heat is to be added or extracted to control the process. The addition and removal of heat is done by passing hot water in jacket fitted to the outside of the vessel or passing cold water in helical coil inside the vessel. For effective heat transfer and even distribution of heat, the liquid in side is continuously agitated.

Specifications: System : Water to Water, concentric tube type Heat Exchanger: Length 1.6m (approx.). insulated with ceramic wool and cladded by aluminum foil. Outer Tube: Material Stainless steel. ID 27.5mm, OD 33.8 mm (approx) Inner Tube : Material Stainless Steel, OD 12.7mm (appx.) Water Flow Measurement: Rotameters (2Nos.) one each for cold & hot fluid. Hot Water Tank: Made of Stainless steel. Insulated with ceramic fiber wool. Hot Water Circulation : Magnetic Pump Heaters : Nichrome wire heater (2Nos) Control panel comprising of Digital Temp. Controller: 0-199.9°C Digital Temp. Indicator: 0-199.90C, with multi-channel switch Temperature Sensors: RTD PT-100 type.



Order Code - 14025 CROSS FLOW HEAT EXCHANGER

Introduction: In a cross flow heat exchanger, the supply and exhaust airflow perpendicular to each other separated by aluminum plates which transfer the heat from one side to the other.

Specifications: This unit consists of a PVC rectangular duct, axial fan and a single fan radiator. The radiator is accommodated in the middle and across the air duct. The axial fan is located between the radiator and one edge of the duct. It can provide max air velocity of 2m/s. The fins of the radiator are made from copper and shine in the light, and allow a heat transfer area of 14,000mm². Four thermocouples measure input and output water and air temperatures



Order Code - 14026 HELICAL COIL HEAT EXCHANGER

Introduction: Helical Coil Heat Exchanger set up consists of coil through which hot fluid passes and it is contained in a strong cylinder such that cold fluid passes over the helical coils. Rotameters are provided to measure the flow rate of hot and cold fluid.

Specifications: System: Water to Water. Coil: Material Stainless Steel. Frame: Rigid MS Structure. Flow Measurement: By Rotameter (2Nos.) one each for cold & hot fluid. Hot Water Tank: Made of Stainless steel, Double Wall, Insulated with ceramic wool. Hot Water Circulation: Magnetic Pump. Heater: Nichrome wire heater.



HEAT TRANSFER LAB

⇒ CONDENSATION

Order Code - 14027 DROPWISE & FILMWISE CONDENSATION APPARATUS

Introduction: This setup is designed for determining heat transfer co-efficient of two types of condensation and for visualization of these processes. It consists of a vertical frame. Condensation tubes are fitted inside compact glass cylinder. Steam generator is fitted at the backside of the cylinder. Steam comes directly from generator to the cylinder. Two valves are fitted to control flow rate of water in individual tubes. Digital Temperature Indicator monitors the temperatures.

Specifications: Steam Generator : 8 Ltrs. (Approx.) made of Stainless steel with 1.5 kW heater. Insulated with ceramic wool and cladded by aluminum foil. Pressure Gauge : Bourdon type. Copper tubes (2 Nos.): one with natural finish and other nickel polished. Diameter: 19 mm (Approx.) Length: 170 mm (Approx.) Water Flow measurement: Rotameter. Condensate Measurement : Measuring Cylinder & Stopwatch Control valves: one each for Steam, Cooling water & Drain. Control panel comprising of : Digital Temp. Controller: 0- 199.9°C (For Steam Generator) Digital Temp. Indicator: 0-199.9°C, with multi-channel switch. Temperature Sensors : RTD PT-100 type with Standard make On/Off switch, Mains Indicator etc.



Order Code - 14028 VERTICAL & HORIZONTAL CONDENSER

Introduction: The present set-up offers a comparative study of Vertical & Horizontal condenser, which can be operated one at a time. Condenser consists of Stainless steel shell, with stainless steel tubes. Cold fluid flows through inside the tubes and steam flows through the shell. Valves are provided to control the flow rates of cold fluids. Flow rate of cold water is measured using a Rotameter. Shell is fitted with steam traps from where condensate is collected in measuring cylinder. Temperature of inlet and outlet of both hot & cold fluids are measured by temperature sensors.

Specifications: System : Steam to Water Condensers: 2 Nos. (Vertical & Horizontal) Insulated by Ceramic wool and cladding by aluminium foil Shell : Material stainless steel. Inner Dia 100 mm, Length 500 mm (Approx.) Tubes : OD 12.7mm, Length of tubes 500mm Condensate Measurement : Measuring Cylinder & Stopwatch Water Flow Measurement : Rotameter Steam Generator: Made of stainless steel fitted with level indicator, pressure gauge, safety valve, drain and insulated with ceramic wool & cladding with Aluminium foil Heaters: Nichrome wire heater (2 Nos.) Control panel comprising of: Digital Temp. Controller: 0-199.9°C (For Steam Generator) Digital Temp. Indicator: 0-199.9°C, with multi-channel switch Temperature sensors: RTD PT-100 type with Standard make On/Off switch, Mains Indicator etc.



⇒ EVAPORATION

Order Code - 14029 OPEN PAN EVAPORATOR

Introduction: Evaporation is a process for concentrating a solution by vaporizing part or all of the solvent. In most of the cases the solvent is water. The Pan Evaporator set-up is designed to study the fundamentals of evaporation process. The set-up consists of a jacketed pan evaporator made of stainless steel and an electrically heated steam generator of suitable capacity. To evaporate the solution in pan, steam is allowed to enter in the jacket using a control valve. Condensate is collected from steam trap for energy measurement. Tilting is done by a worm gear arrangement to empty the pan.

Specifications: Evaporator: Hemi-spherical, Jacketed type, made of stainless Steel insulated from outside. Dia. 300 mm approx. Steam Generator: Made of stainless steel, provided with Pressure Gauge & Level Indicator, Safety valve and drain etc. & insulated with ceramic Wool and cladding With Aluminium foil Condensate Measurement: Using Measuring Cylinder & Stop watch. Temp. Measurement: By RTD Pt-100 Sensor Special arrangement to measure the evaporated volume of solvent is done. Control panel comprises of : Digital Temp/Controller: 0-199.9°C, (For Steam Generator) Digital Temp. Indicator: 0-199.9°C With Standard make On/Off switch, Mains Indicator etc. Instruction Manual: An ENGLISH instruction manual will be provided along with the Apparatus. The whole set-up is well designed and arranged in a good quality painted structure.



HEAT TRANSFER LAB

Order Code - 14030 SINGLE EFFECT EVAPORATOR

Introduction: Condensed steam leaves as condensate or drips. Since the solution in the evaporator is assumed to be completely mixed, the concentrated product and the solution in the evaporator have the same composition and temperature, which is the boiling point of the solution.

Specifications: Evaporator : Material stainless steel Shell Dia - 75mm, Length - 750mm, Tubes Dia - 12mm, Length - 750mm Feed Circulation : By Gravity feed Feed Tank: Material stainless steel, Capacity 25 Ltrs. Flow Measurement: Rota meters (One each for feed & cold water). Steam Generator: Made of stainless steel provided with Pressure Gauge & Level Indicator, Safety valve and drain etc. & insulated with ceramic wool and cladding with Aluminium foil. Piping: Stainless Steel and PVC, size ¼". Condenser: Shell & Tube type made of Stainless Steel. Bottom Product Tank: Made of Stainless Steel, capacity 10 Ltrs. Water Supply Tank: Made of Stainless Steel, capacity 50 Ltrs. For condenser Pump : FHP capacity Heaters: Nichrome wire heater. Control panel comprises of Digital Temp. Controller: 0-199.9°C, (For Steam Generator) Digital Temp. Indicator: 0-199.9°C, with multi-channel switch. Temp. Sensors: RTD PT-100, Standard make On/Off switch, Mains Indicator etc.



Order Code - 14031 DOUBLE EFFECT EVAPORATOR

Introduction: Evaporation deals with the concentration of a non-volatile solute from a solution by the removal of required amount of volatile solvent. Usually the solvent is water. By vaporizing apart of the solvent, use ful product i.e. the concentrated solution or thick liquor is produced and the vapour is discarded. Long tube evaporators are usually used for the concentration of foamy liquids.

Specifications: Evaporator (1st): Shell Dia-75mm, Length-500mm, Made of Stainless Steel Tubes Dia - 12mm, Length-500mm Evaporator (2nd): Shell Dia-75mm, Length 500mm, Made of Stainless Steel Tubes Dia - 12mm, Length-500mm Feed Tank: Material Stainless Steel, Capacity 30 Ltrs. Flow measurement: Rota meters (One each for feed & cold water). Steam Generator: Made of Stainless Steel provided with Pressure Gauge & Level Indicator, Safety valve and drain etc. & insulated with ceramic wool and cladding with Aluminium foil. Piping: Stainless Steel and PVC, size ¼". Condenser: Shell & Tube type made of Stainless Steel. Bottom product tank: Made of Stainless Steel, capacity 10 Ltrs. Water supply tank: Made of Stainless Steel, capacity 50 Ltrs. for condenser Pump: FHP capacity Heaters: Nichrome wire Heater. Control panel comprises of: Digital Temp. Controller: 0-199.9°C. (For Steam Generator) Digital Temp. Indicator: 0-199.9°C, with multi-channels witch. Temp. Sensors: RTDPT-100 type-8Nos.



Order Code - 14032 CALANDRIA EVAPORATOR

Introduction: Evaporation deals with the concentration of a non-volatile solute from a solution by the removal of required amount of volatile solvent. Usually the solvent is water. By vaporizing a part of the solvent, useful product i.e. the concentrated solution or thick liquor is produced and the vapour is discarded. It is a short tube vertical evaporator; the tubes are surrounded by a Stainless Steel jacket and fitted with accumulator. Dilute solution is feed to the evaporator and heated by Steam from a steam generator to concentrate the dilute feed solution to a desired level.



Order Code - 14033 FALLING FILM EVAPORATOR

Introduction: It consists of a Stainless-Steel heat exchanger in which both the feed and steam enters at top and leaves at bottom, hence the name FALLING FILM. The evaporator is completely insulated using glass wool and aluminum cladding. 2 metering pumps are used in the apparatus, also called as DOSING PUMP.

Specifications: Inner Diameter of evaporator, $D = 0.108$ m, Length of evaporator, $L = 0.500$ m, No of tubes, $N_t = 7$, Inner diameter of the tubes $D_i = 13$ mm Outer diameter of the tubes, $D_o = 9$ mm Feed Circulation: By metering pump, Feed Tank: Material stainless steel/glass, Capacity 25 Litres. Steam Generator (Optional): Made of stainless steel provided with Pressure Gauge & Level Indicator, Safety valve and drain etc. & insulated with ceramic wool and cladding with Aluminium foil. Piping: Stainless Steel and PVC, size ¼". Condenser: Shell & Tube type made of Stainless Steel. Control panel comprises of Digital Temp. Controller: 0-199.9°C, (For Steam Generator) Digital Temp. Indicator: 0-199.9°C, with multi-channel switch. Temp. Sensors: RTD PT-100, Standard make ON/Off switch, Mains Indicator etc.



HEAT TRANSFER LAB

HEAT TRANSFER ACCESSORY

Order Code - 14034 LINEAR HEAT CONDUCTION APPARATUS

Introduction: The accessory comprises a heating section and a cooling section, which is clamped together or clamped with interchangeable intermediate sections between them, as required. The temperature difference created by the application of heat to one end of the resulting wall and cooling at the other end results in the flow of heat linearly through the wall by conduction.

Specifications: Power Requirement: 230 Volt, 10%, 50 Hz. Heating section: Brass rod fitted with rod type heater inside, Rod diameter: 28-32mm, Length 80-100mm approx. Heater: Nichrome wire type approx. 100W. Cooling section: Made of aluminum/brass rod. Inlet and outlet points for water. Intermediate/test section: Three different type of sections

- Brass rod: Diameter: 28-32mm, Length 40-50mm
- Brass rod: Diameter: 20mm, Length 40-50mm
- Aluminum Rod: Diameter 28-32mm, Length 40-50mm

11 RTD type thermocouples. (3 on heating section, 3 on cooling section and 3 on intermediate section, 1 each for water inlet and water outlet) Quick release coupling for cooling water tube connection. Heater is voltage or PID controlled allowing for the temperature set-point to be achieved rapidly and maintained within 0.1°C



Order Code - 14035 RADIAL HEAT CONDUCTION APPARATUS

Introduction: The arrangement, using a solid metal disk with temperature measurements at different radii and heat flow radially outward from the center to the periphery, enables the temperature distribution and flow of heat by radial conduction to be investigated. The accessory comprises a solid disk of material, which is heated at the center and cooled at the periphery to create a radial temperature difference with corresponding radial flow of heat by conduction.

Specifications: Power Requirement: 230 Volt, 10%, 50 Hz. Heater: Nichrome wire type approx. 100W. 6 RTD type thermocouples. Brass disk: Diameter 100-120mm

Radial distance between each thermocouple 10mm. Quick release coupling for cooling water tube connection. Heater is voltage or PID controlled allowing for the temperature set-point to be achieved rapidly and maintained within 0.1°C.



Order Code - 14036 THERMAL RADIATION APPARATUS

Introduction: The equipment supplied comprises an arrangement of energy sources, measuring instruments, aperture plates, filter plates and target plates, which are mounted on a linear track, in different combinations to suit the laboratory teaching exercise chosen. The track consists of a rigid aluminum frame with twin horizontal rails which incorporates sliding carriages to enable the positions of the instrumentation, filters and plates to be varied. The heat source consists of a flat copper plate 100mm diameter, which is heated from the rear by an insulated electric heating element operating at low voltage for increased operator safety. Heater can be voltage or PID controlled allowing for the temperature set-point to be achieved rapidly and maintained within 0.1°C. The front of the plate is coated with a heat-resistant matte black paint which provides a consistent emissivity close to unity. The surface temperature of the plate is measured by a thermocouple, which is attached to the front of the plate. Radiation from the heated plate is measured using a heat radiation detector (radiometer), which can be positioned along the graduated track on the carriage. Metal plates with different surface finishes are supplied to demonstrate the effect of emissivity on radiation emitted and received. Two black plates, one grey plate and one polished plate, supplied together with a track-mounted carrier which positions the plates in front of the heat source. Each plate incorporates a thermocouple to indicate the surface temperature of the plate. The radiation from the light source is measured using a light meter which can be positioned along the graduated track on the carriage. Filter plates of varying opacity and thickness are supplied to demonstrate the laws of absorption.

Specifications: A heat source with radiometer and a light source with light meter are used where appropriate to demonstrate the principles. The heat source consists of a flat circular plate 100mm in diameter, which incorporates a 216W electric heating element (operating at 24V DC maximum). The PID controller in the heat source allows for fast temperature set-point achievement and control to 0.1°C. The light source consists of a 60W light bulb (operating at 24V DC maximum) mounted inside a housing with a glass diffuser. The heat and light sources, instruments, filters and plates are mounted on an aluminum track with graduated scale, which is designed to stand on the benchtop.

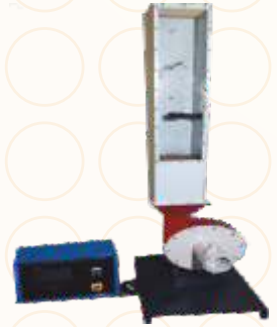


HEAT TRANSFER LAB

Order Code - 14037 FREE AND FORCED CONVECTION (ACCESSORY)

Introduction: This unit consists of a bench mounted vertical air duct positioned on the top of a centrifugal fan. The air duct incorporates an aperture positioned at the rear wall of the duct, into which three different types of heat transfer surfaces can be inserted. The three types of heat exchangers supplied are; flat plate, cylindrical pins and finned surface. Incorporating an electrical heating element, with positive thermal cut-out, and thermocouples for precise temperature measurement.

Specifications: A bench mounted unit specifically designed to demonstrate the phenomena of free and forced convection and to measure temperature profiles from three different heat transfer surfaces. Comprises a vertical air duct, with a transparent front for visibility mounted on a fan at the base of the duct, three heat transfer surfaces, air flow, and temperature probes. Technical data is included for each of the three heat transfer surfaces, which will enable students and researchers to compare practical results with theoretical analysis for free and forced convection. Three heat transfer surfaces supplied: a flat plate surface area 0.011m², pinned extended surface area 0.0525m², and finned extended surface area 0.1414m². Vertical duct incorporates a transparent front wall allowing complete visualization of the process and identification of the air flow and temperature sensors. Each heat transfer surface is fitted with its own heater (240W) and thermocouples, to enable easy interchange.



Order Code - 14038 COMBINED CONVECTION AND RADIATION (ACCESSORY)

Introduction: The equipment consists of a centrifugal fan with a vertical outlet duct. At the top of the duct there is a heated cylinder. The mounting arrangement for the cylinder in the duct is designed to minimize loss of heat by conduction to the wall of the duct. The surface of the cylinder is coated with heat-resistant paint which provides a consistent emissivity close to unity. A K-type thermocouple (T10) attached to the wall of the cylinder, at mid position, enables the surface temperature to be measured under the varying operating conditions. A K-type thermocouple (T9) in the outlet duct allows the ambient air temperature to be measured upstream of the heated cylinder. PID controller allows rapid heater's temperature set-point achievement and control to $\pm 0.1^{\circ}\text{C}$.

Specifications: A small-scale accessory to introduce students to the principles of combined convection (free and forced) with radiation from horizontal heated cylinder. Comprises a heated cylinder mounted in a vertical air duct, with a fan at the base of the duct, which can be used to provide a variable air flow over the cylinder. Heater rating 100W. K-type thermocouples measure the air temperature upstream and the surface temperature of the cylinder. Air flow velocity through the duct, under computer control. A comprehensive instruction manual is included.



Order Code - 14039 UNSTEADY STATE HEAT TRANSFER (ACCESSORY)

Introduction: The equipment consists of a heated water bath together with a set of instrumented shaped test pieces. Each of the shapes incorporates a thermocouple to measure the temperature at the center of the shape. A total of six shaped test pieces are provided, i.e. three simple shapes (a rectangular slab, a long solid cylinder and a solid sphere) each manufactured in two different materials (brass and stainless steel). Measurements taken on a shape in one material can be used to confirm the conductivity of a similar shape constructed from a different material. Transient-temperature/heat-flow charts are supplied for each of the shapes.

Specifications: The water is heated by an electric heating element in the base of the bath having a nominal rating of 3.0 Kw. An adjustable thermostat, at the base of the water heater allows the water to be heated to a predetermined temperature before taking measurements. Thermocouple at the base of the flow duct, inside the water bath, allows the temperature of the water to be monitored and adjusted to the required temperature. Comprises of a set of seven solid shapes, manufactured in three simple shapes and two materials. Each sample has a permanently installed K-type thermocouple inside. The thermocouple mounted on the shape holder contacts the hot water at the same instant as the solid shape and provides an accurate datum for temperature/time measurements. The resolution of all temperature readings is 0.7°C . A circulating pump mounted alongside the water bath draws water from the bath and returns it to the base of the vertical cylindrical flow duct. A comprehensive instruction manual is included.



HEAT TRANSFER LAB

Order Code - 14040 RADIATION ERROR IN TEMPERATURE MEASUREMENT (ACCESSORY)

Introduction: Radiative heat transfer between a thermometer and its surroundings may significantly affect temperature readings obtained from the thermometer, especially when the temperature of a gas is to be measured while the thermometer 'sees' surrounding surfaces at a higher or lower temperature than the gas.

Specifications: A small-scale accessory to demonstrate how temperature measurements can be influenced by sources of thermal radiation. Comprises three K-type thermocouples with different styles of bead mounted in a vertical air duct. A fan at the base of the duct provides a variable air flow over the cylinder. A band heater heats the duct wall adjacent to the thermocouple beads. Heater rating 200W appx. RTD PT-100 type thermocouples measure the air temperature upstream and the surface temperature of the heated duct section. Air flow is electronically adjustable over the range of 0-9 m/s by a variable-speed centrifugal blower. The air flow rate is measured by a vane-type anemometer in the outlet duct. A radiation shield can be lowered over the thermocouples to demonstrate the improvement in reading accuracy when the thermocouples are shielded from the source of radiation. A comprehensive instruction manual is included.



Order Code - 14041 THERMAL CONDUCTIVITY OF LIQUIDS AND GASES (ACCESSORY)

Introduction: The Conductivity of Liquids and Gases unit has been specifically designed to enable to measure and compare the thermal conductivities of various liquids and gases. It's designed to facilitate quick and effective cleaning and to minimise thermal losses.

The unit comprises a cylindrical, electrically heated, nickel-plated aluminium core surrounded by a nickel-plated aluminium sleeve. The core and the sleeve are arranged so that a uniform narrow annular gap is created between the two parts, which is filled by the liquid or gas to be analysed.

Specifications: A small-scale accessory to allow students to measure the thermal conductivity k of various liquids and gases. Comprises a water-cooled, aluminium outer sleeve surrounding a heated aluminium core creating an annular gap 0.5mm wide that is filled with the fluid under test. Nominal heat transfer area $1.225 \times 10^{-2} \text{ m}^2$. Gas or liquid sample volume 6.126ml. Heater power is variable up to 200W. Heater can be voltage or PID controlled allowing for the temperature set-point to be achieved rapidly and maintained within 0.1°C . Two PT100-type thermocouples measure the temperature gradient across the liquid or gas under test. Nickel-plated surfaces to minimise radiation losses, narrow annular gap to minimise convection losses and thermally insulated to minimise heat exchange with the atmosphere. A comprehensive instruction manual describing how to carry out the laboratory teaching exercises to measure thermal conductivity as well as installation and commissioning is included.



Order Code - 14042 EXTENDED SURFACE HEAT TRANSFER (ACCESSORY)

Introduction: The rod is manufactured from brass and coated with a heat-resistant matte black paint, which provides a consistent emissivity close to unity. It is mounted horizontally with support at both ends positioned to avoid the influence of adjacent surfaces. It is heated by an electric heating element, which operates at low voltage for increased operator safety and is protected by a thermostat to prevent damage from overheating. Eight thermocouples are attached to the surface of the rod at equal intervals of 50mm, giving an overall instrumented length of 350mm.

Specifications: A small-scale accessory designed to demonstrate the temperature profiles and heat transfer characteristics surroundings. for an extended surface when heat flows along the rod by conduction and heat is lost along the rod by combined convection and radiation to the. The extended surface comprises a 10mm-diameter long solid brass rod mounted horizontally and heated at one end with a 20W, 24V DC heater. Eight thermocouples mounted at 50mm intervals along the rod provide the temperature distribution. PID controller allowing for a rapid heat temperature set-point achievement and controlled within 0.1°C . The temperature of the ambient air is measured by an independent thermocouple. The accessory is mounted on a PVC baseplate, which is designed to sit on and connect to the Heat Transfer Service Unit without the need for tools. A comprehensive instruction manual is included.



FLUID MECHANICS LAB

➡ CLOSED CIRCUIT SYSTEM

Order Code - 14043 BERNOULLI'S THEOREM APPARATUS

Introduction: The equipment is designed and fabricated to demonstrate the Bernoulli's theorem. It consists of a test section made of acrylic. It has convergent and divergent sections. Pressure tapings are provided at different locations in convergent and divergent section. Present set-up is self-contained water re-circulating unit, provided with a sump tank, centrifugal pump etc. An arrangement is done to conduct the experiment on different flow rates. Flow rate of water is measured with the help of measuring tank and stopwatch.

Specifications: Test Section: Material Acrylic (One Piece). Piezometer Tubes: Material P.U. Tubes (7 Nos.) Water Circulation: FHP Pump, Crompton make. Flow Measurement: Using Measuring Tank with Piezometer, Capacity 25 Ltr. Sump Tank: Capacity 70 Ltrs. Inlet Tank: Capacity 20 Ltrs. Stop Watch: Electronic. Control Panel Comprises of: Standard make On/Off Switch, Mains Indicator, etc. Tanks will be made of Stainless Steel.



Order Code - 14044 FLOW THROUGH ORIFICE & MOUTHPIECE

Introduction: It consists of a tank provided with inlet supply diffuser, overflow. Provision for fitting Orifice or Mouthpiece at the outlet of tank. An arrangement is done to vary head and keep it constant at desired level. A pointer gauge arrangement for measuring X-Y co-ordinates of Jet is also fitted. Present set-up is self-contained water re-circulating unit, provided with a sump tank and a centrifugal pump etc. Flow rate of water is measured with the help of measuring tank and stop watch.

Specifications: Set of Orifices: Material Acrylic (2 Nos.) Dia. 10mm and 15 mm Set of Mouthpieces: Material Acrylic (3 Nos.) Dia 10 mm (L/D = 1) Dia 10 mm (L/D = 2.5) Dia 10 mm (L/D = 4) Constant Head tank: 35 Ltrs. Pointer Gauge: To measure X-Y co-ordinates of Jet. Water Circulation: FHP Pump, Crompton make. Flow Measurement: Using Measuring Tank with Piezometer, Capacity 25 Ltrs. Sump Tank: Capacity 70 Ltrs. Stop Watch: Electronic. Control Panel Comprises of: Standard make On/Off Switch, Mains Indicator.



Order Code - 14045 DISCHARGE OVER NOTCHES

Introduction: The setup consists of a channel having sufficient length and width in which water is supplied from the bottom. Required Notch is fitted at one end of this channel. A pointer gauge with Vernier scale is fitted to measure the height of fluid in flow channel. Arrangement for fixing interchangeable notches is made. Set of three notches, i.e. rectangular notch, 60° V notch & 45° V notch is provided along with the set-up. Present set-up is self-contained water re-circulating unit, provided with a sump tank and a centrifugal pump

Specifications: Channel Test Section: Size 600 x 250 x 180 mm. Notches: Material Brass Rectangular Notch 45° V Notch 60° V Notch Pointer Gauge: With Vernier scale. Water Circulation: FHP Pump Crompton makes. Flow Measurement: Using Measuring Tank with Piezometer, Capacity 25 Ltrs. Sump Tank: Capacity 50 Ltrs. Stop Watch: Electronic. Control Panel Comprises of: Standard make On/Off Switch, Mains Indicator, etc.



Order Code - 14046 IMPACT OF JET ON VANES

Introduction: The setup consists of a clear Acrylic fabrication section. Water is fed through a nozzle and discharged vertically to strike a target carried on a stem, which extends through the cover. A weight carrier is mounted on the upper end of the stem. The dead weight of the moving parts is counter balanced by a compression spring. The vertical force exerted on the target plate is measured for applied weights. Two targets cups are provided with the setup.

Specifications: Target (2 Nos.): Flat Plate and Hemispherical Cup Nozzle: Material Brass Jet Enclosure: Made of Acrylic Water Circulation: FHP Pump, Standard make Flow Measurement: Using Measuring Tank with Piezometer, Capacity 25 Ltrs. Sump Tank: Capacity 50 Ltrs. Stop watch: Electronic. Control Panel Comprises of: Standard make On/Off Switch, Mains Indicator, etc. Instruction Manual: An ENGLISH instruction manual will be provided along with the Apparatus Tanks will be made of Stainless Steel. The whole set-up is well designed and arranged in a good quality painted structure.



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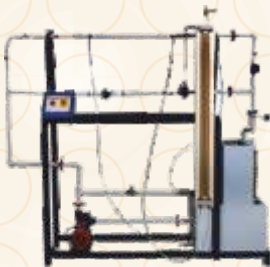
Order Code - 14047 LOSSES DUE TO FRICTION IN PIPE LINES

Introduction: The setup consists of 2 pipes of different diameters, which are connected in parallel. Pressure tapings are provided on each pipe to measure the pressure losses with the help of a Differential Manometer. Control valves are fitted on each pipe, which enables to use one pipe at a time for experiment. Present set-up is self-contained water re-circulating unit, provided with a sump tank and a centrifugal pump.

Specifications: Pipe Test Section: (i) Dia $\frac{1}{2}$ ", Length : 1m, Material G.I.(ii) Dia $\frac{3}{4}$ ", Length: 1.25m, Material G.I. Water Circulation: FHP Pump, Crompton/godrej/G.E makes. Flow Measurement: Using Measuring Tank with Piezometer, Capacity 25 Ltrs. Sump Tank: Capacity 50 Ltrs. Stop Watch: Electronic. Control Panel Comprises of : Standard make On/Off Switch, Mains Indicator.



Order Code - 14048 LOSSES DUE TO PIPE FITTINGS, SUDDEN ENLARGEMENT & CONTRACTION



Introduction: The setup consists of 2 pipes of different diameters, which are connected in parallel. Pressure tapings are provided on each pipe to measure the pressure losses with the help of a Differential Manometer. Control valves are fitted on each pipe, which enables to use one pipe at a time for experiment. Present set-up is self-contained water re-circulating unit, provided with a sump tank and a centrifugal pump.

Specifications: Manometer Fluid: Mercury (Hg) - 250 gm. Sudden Enlargement: From 15mm to 25mm. Sudden Contraction: From 25mm to 15mm. Bend: $\frac{1}{2}$ " Elbow: $\frac{1}{2}$ " Ball valve: $\frac{1}{2}$ " Gate valve: $\frac{1}{2}$ ". Water Circulation: FHP Pump, Crompton makes. Flow Measurement: Using Measuring Tank with Piezometer, Capacity 25 Ltrs. Pressure Drop Measurement: Differential Manometer. Sump Tank: Capacity 50 Ltrs. Stop Watch: Electronic.

Order Code - 14049 DISCHARGE THROUGH ORIFICEMETER

Introduction: The apparatus consists of a pipeline emerging out from a common manifold. This pipe line contains an Orifice. The pressure tapings from the orifice meter are taken to differential manometer to measure pressure difference. The flow can also be regulated by the valve provided. Present set-up is self-contained water re-circulating unit, provided with a sump tank and a centrifugal pump etc.

Specifications: Orifice meter : Orifice plate made of Stainless Steel and housing made of Clear Acrylic compatible to 1" Dia. Pipe. Water Circulation: FHP Pump, Crompton make. Flow Measurement: Using Measuring Tank with Piezometer (Capacity 25 Ltr.) and Electronic Stop Watch Sump Tank: Capacity 50 Ltr. Instruction Manual: An ENGLISH instruction manual will be provided along with the Apparatus Tanks will be made of Stainless Steel. The whole set-up is well designed and arranged in a good quality painted structure.



Order Code - 14050 DISCHARGE THROUGH ROTAMETER



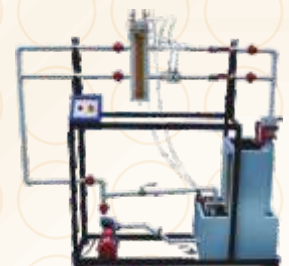
Introduction: The apparatus consists of a pipeline emerging out from a common manifold. This pipe line contains a Rota meter. . Present set-up is self-contained water re-circulating unit, provided with a sump tank and a centrifugal pump.

Specifications: Rotameter: Compatible Range. Eureka makes. Water Circulation: FHP Pump, Crompton makes. Flow Measurement: Using Measuring Tank S.S (304 Grade) (Capacity 25 ltrs.) and Electronic Stop Watch. Sump Tank: S.S (304 Grade) Capacity 50 Ltrs. Control Panel Comprises of: Standard makes On/Off Switch, Mains Indicator, etc. Instruction Manual: An ENGLISH instruction manual will be provided along With the Apparatus.

Order Code - 14051 DISCHARGE THROUGH VENTURIMETER & ORIFICEMETER

Introduction: The Venturimeter and Orifice meter are connected in parallel and any one of them can be put in operation by operating valves provided at the downstream. The flow can also be regulated by these valves. Present set-up is self-contained water re-circulating unit, provided with a sump tank and a centrifugal pump etc.

Specifications: Venturimeter: Material Clear Acrylic compatible to 1" Dia. Pipe. Orifice meter: Orifice plate made of Stainless Steel and housing made of Clear Acrylic compatible to 1" Dia. Pipe. Water Circulation: FHP Pump, Crompton make. Flow Measurement: Using Measuring Tank with Piezometer (Capacity 25 Ltrs.) and Electronic Stop Watch Sump Tank: Capacity 50 Ltrs. Control Panel Comprises of: Standard make On/Off Switch, Mains Indicator, etc.

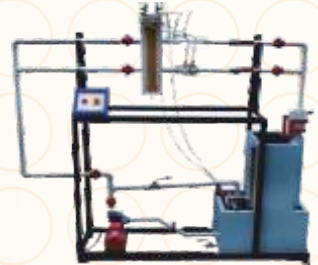


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Order Code - 14052 DISCHARGE THROUGH VENTURIMETER

Introduction: The apparatus consists of a pipeline emerging out from a common manifold. The pressure tapings from the Venturimeter are taken to differential manometer to measure pressure difference. Present set-up is self-contained water re-circulating unit, provided with a sump tank and a centrifugal pump.

Specifications: Venturimeter: Material Clear Acrylic compatible to 1" Dia. Pipe. Pressure Measurement: Differential Pressure Manometer. Water Circulation: 0.5 HP Pump, Crompton/kirloskar make. Flow Measurement: : Measuring Tank Material: Stainless steel, 304 grade, 1.2 mm thick with Piezometer, Capacity: 25 Ltr, Measuring Tank with Piezometer (Capacity 25 Ltrs.) and Electronic Stop Watch Sump Tank: : Material: Stainless steel 304 grade, 1.2 mm thick, Capacity: 50 Ltr. All ball Valves Operating Temperature Range: -400F to 3020 F. Valves working pressure: In range of 600psi, vacuum pressure up to 2×10⁻⁵psi. Instruction Manual: An ENGLISH instruction manual will be provided along with the Apparatus.



Order Code - 14053 NOZZLE METER TEST RIG

Introduction: The apparatus consists of a Nozzle meter made of stainless steel houses in Acrylic Test Section. Present set-up is self-contained water re-circulating unit, provided with a sump tank and a centrifugal pump. Flow control valve and by-pass valve are fitted in water line to conduct the experiment on different flow rates. Flow rate of water is measured with the help of measuring tank and stop watch.

Specifications: Nozzle meter : Nozzle of Stainless Steel, Housing of Clear Acrylic. Compatible to 1" dia pipe. Water Circulation : FHP Pump, Crompton make Flow Measurement : Using Measuring Tank, (Capacity 25 Ltrs. (approx.) and Electronic Stop Watch Sump Tank : Capacity 55 Ltrs. (approx.) Control Panel Comprises of : Standard make On/Off Switches, Mains Indicator, etc.



Order Code - 14054 REYNOLD'S APPARATUS

Introduction: The apparatus consists of a glass tube with one end having bell mouth entrance; connected to a constant head water tank, at the other end a valve is provided to vary the flow rate. The tank is of sufficient capacity to store water. A capillary tube is introduced centrally in the bell mouth for feeding dye from a small container placed at the top of tank, through polythene tubing.

Specifications: Nozzle meter : Nozzle of Stainless Steel, Housing of Clear Acrylic. Compatible to 1" dia pipe. Water Circulation : FHP Pump, Crompton make Flow Measurement : Using Measuring Tank, (Capacity 25 Ltrs. (approx.) and Electronic Stop Watch Sump Tank : Capacity 55 Ltrs. (approx.) Control Panel Comprises of : Standard make On/Off Switches, Mains Indicator, etc.



Order Code - 14055 PITOT TUBE SETUP

Introduction: The apparatus consists of a glass tube with one end having bell mouth entrance; connected to a constant head water tank, at the other end a valve is provided to vary the flow rate. The tank is of sufficient capacity to store water. A capillary tube is introduced centrally in the bell mouth for feeding dye from a small container placed at the top of tank, through polythene tubing.

Specifications: Nozzle meter : Nozzle of Stainless Steel, Housing of Clear Acrylic. Compatible to 1" dia pipe. Water Circulation : FHP Pump, Crompton make Flow Measurement : Using Measuring Tank, (Capacity 25 Ltrs. (approx.) and Electronic Stop Watch Sump Tank : Capacity 55 Ltrs. (approx.) Control Panel Comprises of : Standard make On/Off Switches, Mains Indicator, etc.



Order Code - 14056 CAVITATION APPARATUS

Introduction: The apparatus has been designed to demonstrate the phenomena of Cavitation. The present set-up consists of a test section made of Acrylic having contraction and diversion section. Pressure tapings at appropriate position are provided. This test section is having one control valve at upstream side to regulate the water flow rate. Two pressure gauges are connected to these tapping which give the pressure readout at the time of flow passing through this test section.

Specifications: Test Section : Material Acrylic Pressure Gauge: 0-4 kg/cm² Vacuum Gauge: 0-760 mmHg Water Circulation: By Pump Crompton make. Flow Measurement : Measuring Tank (Capacity : 40 liters) & Electronic Stop Watch Sump Tank : Capacity : 60 liters Control Panel Comprises of : Standard make On/Off Switch, Mains Indicator, etc.

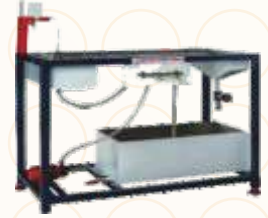


FLUID MECHANICS LAB

Order Code - 14057 LAMINAR FLOW TABLE

Introduction: The present set-up is designed to visualize the ideal flow around immersed body. It consists of a flow table in which flow of water is circulated in between two transparent sheets with a small gap between them. Water is supplied to the table and a colored dye is injected in the inlet of flow at different location.

Specifications: Flow Table Length : 750 mm (approx.)Width : 500 mm (approx.)Material : Stainless Steel
Transparent Sheets : Material Glass/Acrylic (Qty: 2 Nos.)Water Circulation : FHP Pump Champion/ godrej make.Sump Tank Capacity : 40-50 LtrsMaterial : Stainless Steel Dye Vessel Capacity: 1 Ltrs Material : Stainless Steel Instruction Manual.



Order Code - 14058 METACENTRIC HEIGHT APPARATUS

Introduction: A pontoon is allowed to float in a small tank having a transparent side. Removable steel strips placed in the model for the purpose of changing the weight of the model. Displacement of weight is measured with the help of a scale. By means of a pendulum (consisting of a weight suspended to a long pointer) the angle of tilt can be measured on a graduated arc.

Specifications: Pontoon: Size 300 x 300 mm (approx.) with a Horizontal Guide Bar for aliding weight and Removable Strips, Graduated Arc with Pointer with moveable hanger and set of weights.Water Tank : Size 550 x 500x 400 mm (approx.)Front Window of Tank : Made of Glass/Perspex.A set of weights is supplied with the apparatus.



Order Code - 14059 CENTER OF PRESSURE APPARATUS

Introduction: The Centre of Pressure Apparatus has been designed to determine the static thrust exerted by a fluid on a submerged surface and allow comparison of the measured magnitude and position of this force with simple theory.

Specifications: Tank capacity: 5 litres (approx).Distance between suspended mass & fulcrum : 275mm
Cross-sectional area of quadrant (torroid) : (100 x 100) mm² Total depth of completely immersed quadrant : 160 mm Height of fulcrum above quadrant : 100 mm Instruction Manual : An ENGLISH instruction manual will be provided along with the Apparatus The whole set-up is well designed and arranged in a good quality painted structure.



Order Code - 14060 FORCED VORTEX APPARATUS

Introduction: The experimental set up consist of a circular transparent cylindrical tank in which plate is rotated with the help of a variable speed motor so that the cylinder rotates about its vertical axis with the help of a V belt and forced vortex is formed. An upper probe can be transversed horizontally & vertically across full diameter of the vessel so that water surface profile can be measure.

Specifications: Cylinder: Material Acrylic. Dia. 200 mm (approx.)Height: 200mm approx.Motor: Variable Speed, DC Motor, Compatible capacity.Control Panel Comprises of : Speed Control Unit, Standard make On/Off Switch, Mains Indicator, etc.



Order Code - 14061 DISCHARGE THROUGH VENTURIMETER, ORIFICEMETER & ROTAMETER

Introduction: The Venturimeter, Orifice meter and Rota meter are connected in parallel and any one of them can be put in operation by operating valves provided at the downstream.

Specifications: Venturimeter:Material Clear Acrylic compatible to 1" Dia. Pipe.Orificemeter:Orifice plate made of Stainless Steel and housing made of Clear Acrylic compatible to 1" Dia. Pipe.Rota meter: Compatible Range.Eureka makes.Water Circulation: FHP Pump, Crompton makes.Flow Measurement: Using Measuring Tank (Capacity 25 ltrs.) and Electronic Stop Watch.Sump Tank:Capacity 50 Ltrs.Control Panel Comprises of:Standard makes On/Off Switch, Mains Indicator, etc.



FLUID MECHANICS LAB

Order Code - 14062 FREE VORTEX APPARATUS

Introduction: The experimental set up consist of a circular transparent cylindrical tank in which four circumferential jets are placed along the circumference of the cylinder near its bottom which helps in the formation of free vortex. It is assumed that the torque exerted by these jets is negligible. A pointer can be transversed horizontally & vertically across full diameter of the vessel so that water surface profile can be measure.

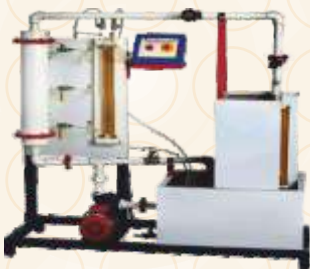
Specifications: Cylinder: Material Acrylic. Dia. 200 mm (approx). Height: 200mm approx Water Circulation: FHP Pump, Crompton make. Flow Measurement: Using Rota meter. Sump Tank: Made of Stainless Steel, Compatible capacity. Control Panel Comprises of: Standard make On/Off Switch, Mains Indicator.



Order Code - 14063 DARCY'S LAW APPARATUS

Introduction: The set-up consists of a cylindrical test section filled with pourous medium. Pressure tappings are provided in the test section to measure the pressure drop with the help of differential manometer. Present set-up is self-contained water re-circulating unit, provided with a sump tank and a centrifugal pump etc. Flow control valve and bypass valve are fitted in water line to conduct the experiment on different flow rates.

Specifications: Test Section : Material Stainless Steel Dia 120 mm approx., Height 500 mm. Water Circulation: FHP Pump, Crompton make. Flow Measurement : Using Measuring Tank (Capacity 25 Ltrs. (approx.) and Electronic Stop Watch Sump Tank : Capacity 50 Ltrs. Control Panel Comprises of : Standard make On/Off Switches/Starter, Mains Indicator etc. Instruction Manual : An ENGLISH instruction manual will be provided along with the Apparatus Tanks will be made of Stainless Steel. The whole set-up is well designed and arranged in a good quality painted structure.



Order Code - 14064 STUDY OF PRESSURE MEASUREMENT

Introduction: The set-up consists of a cylindrical test section filled with pourous medium. Pressure tappings are provided in the test section to measure the pressure drop with the help of differential manometer. Present set-up is self-contained water re-circulating unit, provided with a sump tank and a centrifugal pump etc.

Specifications: Test Section : Material Stainless Steel Dia 120 mm approx., Height 500 mm. Water Circulation: FHP Pump, Crompton make. Flow Measurement : Using Measuring Tank (Capacity 25 Ltrs. (approx.) and Electronic Stop Watch Sump Tank : Capacity 50 Ltrs. Control Panel Comprises of : Standard make On/Off Switches/Starter, Mains Indicator etc. Instruction Manual : An ENGLISH instruction manual will be provided along with the Apparatus Tanks will be made of Stainless Steel. The whole set-up is well designed and arranged in a good quality painted structure.



Order Code - 14065 BEND METER TEST RIG

Introduction: The apparatus consists of a pipeline that contains one Bend meter. The pressure tapings from the Bend meter is taken to differential manometer to measure pressure difference. Present set-up is self-contained water re-circulating unit, provided with a sump tank and a centrifugal pump etc. Flow control valve and by-pass valve are fitted in water line to conduct the experiment on different flow rates.

Specifications: Bend meter : Material Stainless steel Compatible to 1" Dia. Pipe. Water Circulation : FHP Pump, Crompton make Flow Measurement : Using Measuring Tank (Capacity 25 Ltrs. (approx.)) and Electronic Stop Watch Sump Tank : Capacity 50 Ltrs. (approx.) Control Panel Comprises of : Standard make On/Off Switch, Mains Indicator, etc. Instruction Manual : An ENGLISH instruction manual will be provided along with the Apparatus Tanks will be made of Stainless Steel. The whole set-up is well designed and arranged in a good quality painted structure.



Order Code - 14066 FREE & FORCED VORTEX APPARATUS

Introduction: The free vortex experimental set up consist of a circular transparent cylindrical tank in which four circumferential jets are placed along the circumference of the cylinder near its bottom which helps in the formation of free vortex. It is assumed that the torque exerted by these jets is negligible.

Specifications: Cylinder: Material Acrylic, Dia. 200 mm (approx.) Height of Cylinder: 200 mm (approx.) Drive: FHP Variable Speed. An ENGLISH instruction manual consisting of experimental procedure, block diagram etc. will be provided along with apparatus. The whole set-up is well designed and arranged on a rigid structure painted with industrial PU Paint.



FLUID MECHANICS LAB

Order Code - 14067 PIPE SURGE & WATER HAMMER APPARATUS

Introduction: The equipment is self-contained and is close circuit system. It consists of two test sections, one for pipe surge and other for water hammer phenomenon.

Specifications: Test section: material stainless steel Size: 20 mm ID (approx), length :3m (approx.) Surge shift : material clear acrylic. Size: 40mm ID (approx), Height: 800mm (approx) with graduated scale. Water circulation : centrifugal pump Flow measurement: flow sensor output 4-20 MA. Constant head tank : material stainless steel, suitable capacity. Sump tank: material stainless steel, suitable capacity. Pressure measurement: pressure sensor 0-7 bar, output 4-20 mA (for water hammer Level measurement : level sensor, output 4-20 mA (for pipe surge) Control panel consists of: standard make on/off switch , mains indicator, etc.



Order Code - 14068 FLUID PROPERTIES & HYDROSTATIC BENCH

Introduction: Water is stored in a tank situated on the lower shelf of the bench. The water can be transferred by a pump to an elevated open storage tank connected to a number of glass tubes for free surface studies, or to a recessed into the working surface so that bench top experiments may be conducted without spillage.

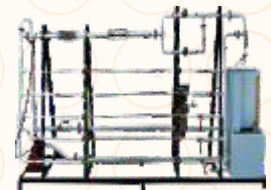
Specifications: Universal hydrometer: Range 0.70-2.00, subdivided in 0.01 intervals. Falling sphere viscometer: 40mm tube diameter Hydrostatic pressure apparatus: Comprises counter-balanced precision quadrant pivoted on knife edges at its centre of arc. Direct reading barometer: With compensated silvered metal scale. Range 585-790mm subdivided in 1mm intervals. 100mm dial pressure gauge: Range 0-200 kN/m² (kPa) and equivalent head of water in metres. Deadweight pressure gauge calibrator: With 2 x 0.5kg, 1kg and 2.5kg weights.



Order Code - 14069 FLUID FRICTION APPARATUS

Introduction: The present set-up is designed to study the friction head losses through pipes, fittings, and flow metering devices. Four different ID sizes smooth pipes and one artificially roughened pipe is connected in parallel. A valve arrangement is provided to operate the one pipe at a time.

Specifications: Pipes (5 No Fittings): 4 smooth bore and one roughened bore. Size range between ID 4.5mm. Valves: 90° bend (small), 90° bend (large), 90° elbow, 90° mitre, 45° elbow 45° y 90° t, sudden enlargement & contraction, gate valve, ball valve, globe valve Flow Meters: venturimeter, orifice DPT: for measuring differential pressure, 0-1000 mm of wc output 4-20 Ma.



HYDRAULIC BENCH & ACCESSORIES

Order Code - 14070 HYDRAULIC BENCH

Introduction: The present set-up is a self-contained, water re-circulating unit provided with a top tray and a sump tank. Various hydraulics experiments can be conducted on this set up. AFHP Centrifugal Pump is fitted for water circulation.

Specifications: Top Tray: Size 1000 x 700 x 100mm (approx) Water Circulation: 1 HP Pump, Crompton/Kirloskar make. Flow Measurement: Using Measuring Tank, Capacity 40Ltrs. Sump Tank: Capacity 100Ltrs. Stop Watch: Electronic. Control Panel Comprises of : Standard make On/Off Switch, Mains Indicator, etc. Tanks and Top Tray will be made of Stainless Steel.



Order Code - 14071 FLOW OVER NOTCHES (HB ACCESSORY)

Introduction: The lab set up consists of a channel with deepened entry section having sufficient length and width in which water is supplied from the bottom. Required Notch is fitted at the end of this channel.

Specifications: Channel Test Section: 600 x 250 x 180mm made of stainless steel. Notches: Material Brass (3 Nos.) 1. Rectangular Notch, 2. 45° V Notch, 3. 60° V Notch Pointer Gauge: With Venire scale. An ENGLISH instruction manual consisting of experimental procedures, block diagram etc. will be provided along with the Apparatus The whole set-up is well designed and arranged on a rigid structure painted with industrial PU Paint.



Order Code - 14072 REYNOLD'S APPARATUS (HB ACCESSORY)

Introduction: The Osborne Reynolds experiment is used to display laminar and turbulent flow. With this unit the streamlines during laminar or turbulent flow are displayed. The experimental unit consists of a transparent pipe section through which water flows, with flow optimised inlet.

Specifications: Water tank capacity: 200mL, Pipe section length: 675mm, Inside diameter: 10mm, Tank for ink capacity: 250mL approx.



FLUID MECHANICS LAB

Order Code - 14073 VENTURIMETER & ORIFICEMETER (HB ACCESSORY)

Introduction: The apparatus consists of two pipelines emerging out from a common manifold. One pipe line contains a Venturimeter and other contains an Orifice. The pressure tapings from the Venturimeter and orifice meter are taken to differential manometer to measure pressure difference. The Venturimeter and Orifice meter are connected in parallel and any one of them can be put in operation by operating valves provided at the downstream.

Specifications: Venturimeter: Material Clear Acrylic compatible to 1" Dia. Pipe. Orifice meter : Orifice plate made of Stainless Steel and housing made of Clear Acrylic compatible to 1" Dia. Pipe. Water Circulation: FHP Pump, Crompton make. Flow Measurement: Using Measuring Tank with Piezometer (Capacity 25 Ltrs.) and Electronic Stop Watch. Sump Tank: Capacity 50 Ltrs.



Order Code - 14074 BERNOULLI'S THEOREM APPARATUS (HB ACCESSORY)



Introduction: The equipment is designed and fabricated to demonstrate the Bernoulli's theorem. It consists of a test section made of acrylic. It has convergent and divergent sections. Pressure taps are provided at different locations in convergent and divergent section. The set-up can be connected to Hydraulic Bench with flexible pipe line.

Specifications: Test section : Material Acrylic (One Piece). Piezo meter Tubes : Material P.U. Tubes. Inlet Tank : Capacity 20 Ltrs. Tanks will be made of Stainless Steel. An ENGLISH instruction manual consisting of experimental procedures, block diagram etc. will be provided along with the Apparatus. The whole set-up is well designed and arranged on a rigid structure painted with industrial PU Paint.

Order Code - 14075 FLOW THROUGH ORIFICE & MOUTH PIECE (HB ACCESSORY)

Introduction: It consists of a tank provided with inlet supply diffuser, over flow outlet. Provision for fitting Orifice or Mouthpiece at the same position is provided. An arrangement is done to vary head and keep it constant at desired level. A Hook/pointer gauge arrangement for measuring X-Y co-ordinates of Jet Trajectory is also fitted. The set-up can be connected to Hydraulic Bench by flexible pipe line.

Specifications: Set of Orifices: Material Acrylic (2 Nos.), Dia. 10mm and 15 mm. Set of Mouthpieces: Material Acrylic (3 Nos.) Dia 10 mm, L/D = 2.5, Dia 10 mm, L/D = 4, Dia 10 mm, L/D = 1. Pointer Gauge: To measure X-Y co-ordinates of Jet. Water Tank: Suitable Capacity, having arrangement to vary water head and keep it constant. Tanks will be made of Stainless Steel.



Order Code - 14076 IMPACT OF JET ON VANES (HB ACCESSORY)



Introduction: The set up consists of a two sided clear fabrication section. Water is fed through a nozzle and discharged vertically to strike a target carried on a stem which extends through the cover. A weight carrier is mounted on the upper end of the stem. The dead weight of the moving parts is counter balanced by a compression spring.

Specifications: Test Plates: Material Brass (2 Nos.) Flat Plate & Hemispherical Cup. Nozzle: Material Brass. Glass Cylindrical test section. An ENGLISH instruction manual consisting of experimental procedures, block diagram etc. will be provided along with the Apparatus. The whole set-up is well designed and arranged on a rigid structure painted with industrial PU Paint.

Order Code - 14077 LOSSES DUE TO FRICTION IN PIPE LINES (HB ACCESSORY)

Introduction: The set up consists of 2 pipes of different dia, which are connected in parallel. Pressure tapings are provided on a pipe to measure the pressure losses with the help of a Differential Manometer. Control valves are fitted on each pipe, which enables us to use one pipe at a time for experiment. The set-up can be connected to Hydraulic Bench by flexible pipe line.

Specifications: Pipes (2 Nos.): Material GI of 1/2" & 3/4" diameter. Pipe Test Section: Length 1 m. An ENGLISH instruction manual consisting of experimental procedures, block diagram etc. will be provided along with the Apparatus. The whole set-up is well designed and arranged on a rigid structure painted with industrial PU Paint.



FLUID MECHANICS LAB

Order Code - 14078 LOSSES IN PIPE FITTINGS, SUDDEN ENLARGEMENT & CONTRACTION (HB ACCESSORY)

Introduction: The set up consists of a 1/2" bend and elbow, sudden expansion & sudden contraction fitting from 15 mm to 25 mm, ball valve and gate valve. Pressure tapings are provided at inlet and outlet of these fittings under test. A differential manometer fitted in the line gives pressure loss of individual fittings. The set-up can be connected to Hydraulic Bench by flexible pipe line.

Specifications: Top Tray: Size 1000 x 700 x 100mm (approx) Water Circulation: 1 HP Pump, Crompton/ Kirlo skar make. Flow Measurement: Using Measuring Tank, Capacity 40Ltrs. Sump Tank: Capacity 100Ltrs. Stop Watch: Electronic. Control Panel Comprises of: Standard make On/Off Switch, Mains Indicator, etc. Tanks and Top Tray will be made of Stainless Steel.



Order Code - 14079 METACENTRIC HEIGHT APPARATUS (HB ACCESSORY)



Introduction: A pontoon is allowed to float in a small tank having a transparent side. Removable steel strips placed in the model for the purpose of changing the weight of the model. Displacement of weight is measured with the help of a scale. By means of a pendulum (consisting of a weight suspended to a long pointer) the angle of tilt can be measured on a graduated arc. For tilting the ship model, a cross bar with movable hanger is fixed on the model.

Specifications: Pontoon: Size 300 x 300 mm (approx.) with a Horizontal Guide Bar for aliding weight and Removable Strips, Graduated Arc with Pointer with moveable hanger and set of weights. Water Tank : Size 550 x 500x 400 mm (approx.) Front Window of Tank : Made of Glass/Perspex. A set of weights is supplied with the apparatus.

Order Code - 14080 PITOT TUBE SET-UP (HB ACCESSORY)

Introduction: A Pitot tube is used to measure the local velocity at a given point in the flow stress. A Pitot tube of standard design made of copper /Stainless Steel is supplied and is fixed below a vernier scale. The vernier scale is capable to measure the position of Pitot tube in transparent pipe section. The pipe has a flow control valve to regulate the flow. An U-tube manometer is provided to determine the velocity head.

Specifications: Pitot Tube: Material Copper/SS of compatible size. Hook/Pointer Gauge: With Vernier Scale. Test Section: Material Clear Acrylic, compatible to 1" Dia. Pipe. An ENGLISH instruction manual consisting of experimental procedures, block diagram etc. will be provided along with the Apparatus The whole set-up is well designed and arranged on a rigid structure painted with industrial PU Paint.



Order Code - 14081 STUDY OF PRESSURE MEASUREMENT (HB ACCESSORY)



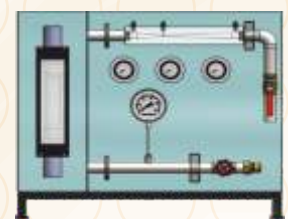
Introduction: The set –up consists of different pressure measurement devices fitted in a pipe line, in which an Orifice is fitted to create the pressure difference. The students can have good in sight of the devices. The set-up can be connected to Hydraulic Bench with flexible pipe line.

Specifications: Single Wall Manometer: Single Tube Type Differential Manometer: U Tube Type. Sensitive Manometer.: Inclined Tube Type Pressure Gauge: Bourdon Type An ENGLISH instruction manual consisting of experimental procedures, block diagram etc. will be provided along with the Apparatus The whole set-up is well designed and arranged on a rigid structure painted with industrial PU Paint.

Order Code - 14082 CAVITATION APPARATUS (HB ACCESSORY)

Introduction: The apparatus has been designed to demonstrate the phenomena of Cavitation. The present set-up consists of a test section made of Acrylic having conversion and diversion section. Pressure tapings at appropriate position are provided. This test section is having one control valve at upstream side to regulate the water flow rate.

Specifications: Test Section : Material Acrylic Pressure Gauge: 0-4 kg/cm² Vacuum Gauge: 0-760 mmHg Water Circulation: By Pump Crompton make. Flow Measurement : Measuring Tank (Capacity : 40 liters) & Electronic Stop Watch Sump Tank : Capacity : 60 liters Control Panel Comprises of : Standard make On/Off Switch, Mains Indicator, etc.



FLUID MECHANICS LAB

Order Code - 14083 CENTRIFUGAL PUMP DEMONSTRATION (HB ACCESSORY)

Introduction: The present Centrifugal Pump Test Rig is a self-contained unit operated on closed circuit basis containing a sump tank. The set-up consists of a Centrifugal pump coupled with a DC Motor. Power input to the DC Motor is varied by means of a Thyristor controlled DC Drive to vary the RPM of motor.

Specifications: Pump: Kirloskar Make, Capacity 1 HP, Speed 2800 RPM (max.), Head 12 m (max.), Medium Flow: Clear Water, Drive: 1 HP DC Motor with Thyristor controlled DC drive for variable speed, Sump Tank: Capacity 110 Ltrs., Flow Measurement: Using Measuring Tank with Piezo meter, Capacity 70 Ltrs., Stop watch: Electronic, Pressure Gauge: Bourdon type, The whole set-up is well designed and arranged in a good quality painted structure.



Order Code - 14084 ORIFICEMETER DISCHARGE (HB ACCESSORY)

Introduction: The apparatus consists of a pipeline emerging out from a common manifold. This pipe line contains an Orifice. The pressure tapings from the orifice meter are taken to differential manometer to measure pressure difference. The flow can also be regulated by the valve provided.

Specifications: Orifice meter: Orifice plate made of Stainless Steel and housing made of Clear Acrylic compatible to 1" Dia. Pipe. Water Circulation: FHP Pump, Crompton make. Flow Measurement: Using Measuring Tank with Piezometer (Capacity 25 Ltrs.) and Electronic Stop Watch Sump Tank: Capacity 50 Ltrs. Instruction Manual: An ENGLISH instruction manual will be provided along with the Apparatus Tanks will be made of Stainless Steel. The whole set-up is well designed and arranged in a good quality painted structure.



Order Code - 14085 FREE AND FORCED VORTEX APPARATUS (HB ACCESSORY)

Introduction: The free vortex experimental set up consist of a circular transparent cylindrical tank in which four circumferential jets are placed along the circumference of the cylinder near its bottom which helps in the formation of free vortex. It is assumed that the torque exerted by these jets is negligible.

Specifications: Cylinder: Material Acrylic, Dia. 200 mm (approx.) Height of Cylinder: 200 mm (approx.) Drive: FHP Variable Speed An ENGLISH instruction manual consisting of experimental procedure, block diagram etc. will be provided along with apparatus.



Order Code - 14086 BOYLE'S LAW APPARATUS

Introduction: Two sealed glass cylinders with access valves are mounted on a base board and connected via a tube. One cylinder performs the measuring function and the other is used to pressurise the volume of gas contained above oil in the measuring cylinder. The measuring cylinder is fitted with a compound gauge designed to measure the gas pressure both above and below atmospheric pressure. The height of oil and hence the volume of gas in the measuring cylinder is measured using a graduated scale. A thermometer in the measuring cylinder allows the temperature of the gas in the measuring cylinder to be determined. A small *electric compressor provides a means of adjusting the pressure of the test gas above and below atmospheric pressure. The compressor is mounted on the base board and controlled by a panel mounted switch. A pressure switch and relief valves ensure operator safety.

Specifications: Glass cylinder volume: 1 litre. Glass cylinder: \varnothing 100mm x 220mm high. Measured height displayed by the scale: 200mm. Compressor: 500W.



FLUID MECHANICS LAB

Order Code - 14087 FLOW OF COMPRESSIBLE FLUIDS

Introduction: The experimental unit is used to investigate air flow in various ranges of velocity. A radial fan with infinitely variable speed control draws in air from the environment. At the intake the air flow is accelerated in a measuring nozzle. Further down the measuring section the air flows through interchangeable measuring objects. Drawing in the air and the arrangement of the measuring objects on the intake side of the fan minimize turbulence when flowing into the measuring objects.

Specifications: Radial fan max. speed: 31000min⁻¹ max. volumetric flow rate: 226m³/h max. head: 318mbar max. power consumption: 1,8kW Measuring objects pipe section: 1m Ø 16, 24, 34mm 90° pipe elbow

2 nozzles, inner diameter: 12...34mm with sudden enlargement with gradual enlargement (de Laval nozzle) orifice with orifice disks Ø 12, 19, 25, 32mm throttle valve: Ø 34mm

Measuring ranges

speed: 0...99999min⁻¹ pressure: 1x 0...25mbar 1x 0...600mbar 1x 0...1000mbar velocity: 0...65m/s.



Order Code - 14088 FLUID MECHANICS TRAINER

Introduction: An important task in the construction of pipelines is to determine the pressure and flow rate in complex piping systems. In practice, the calculation of the total pressure losses serves as a foundation for the design of suitable drive units for heating and air conditioning systems, drinking water supply systems and parts of wastewater systems. Knowledge of pressure losses is also used to optimise operation.

Specifications: Pump=power consumption: 250W max. flow rate: 9m³/h max. head: 7.6m Pipe network, max. flow rate: 4.8m³/h Pipe sections, length 700mm each 1x Ø 25x1.9mm 2x Ø 20x1.5mm 2x Ø 16x1.2mm Tank for water: 180L Tank for flow rate measurement small measuring range: 10L large measuring range: 40L Stopwatch: 1/100s Measuring ranges differential pressure: 1x 0...1bar 1x 0...100mbar.



Order Code - 14089 FLOW VISUALIZATION (Heleshaw) APPARATUS

Introduction: The setup is allowing the user to visualize the ideal flow around the immersed bodies of different types.

Specifications: Working Section: Made of two laminated glass / acrylic sheets which are closely spaced and fixed in a leak proof moulding. Flow table: Width = minimum 300mm, Length = minimum 500mm, Dye Tank With Flow Control: Stainless steel tank with minimum 1L capacity Dye injection facility Obstacles: Different shapes- circle, aero-foil, rectangular etc. The whole assembly is housed in a good quality painted structure.



Order Code - 14090 PIPE NETWORK APPARATUS

Introduction: This unit enables the construction and investigation of various pipe networks, such as parallel and series connections of pipes, their branching and merging, and the study of individual pipes. In analogy to Kirchhoff's laws of electricity, it is possible to conduct nodal analysis.

Specifications: Pump=power consumption: 250W max. flow rate: 9m³/h max. head: 7.6m Pipe network, max. flow rate: 4.8m³/h Pipe sections, length 700mm each 1x Ø 25x1.9mm 2x Ø 20x1.5mm 2x Ø 16x1.2mm Tank for water: 80L Tank for flow rate measurement small measuring range: 10L large measuring range: 40L Stopwatch: 1/100s Measuring ranges differential pressure: 1x 0...1bar 1x 0...100mbar.



FLUID MECHANICS LAB

ORDER CODE - HD150 - BASE MODULE FOR FLUID MECHANICS

A base module for experiments in fluid mechanics containing large and small stepped measuring tanks for volumetric measurement of large and small flow rates. The complete unit is closed circuit comes with wheels for easy mobility.



ORDER CODE - HD150.01

PIPE FRICTION FOR LAMINAR/TURBULENT FLOW

Measurement of pressure losses in laminar /turbulent flow

Determining the critical Reynolds's number and pipe friction factor

Comparing the actual pipe friction factor with theoretical friction factor

ORDER CODE - HD150.03 - PLATE WEIRS (NOTCHES)

Discharge Measurement in open channel using three different measuring weirs

HD150 Hydraulic Bench required for experimentatio .



FLUID MECHANICS LAB

ORDER CODE - HD150.04 - CENTRIFUGAL PUMP

Determining the characteristics of a typical centrifugal pump.



ORDER CODE - HD150.05

HYDROSTATIC PRESSURE IN LIQUIDS

Investigation of fluid pressure on vessel walls.

ORDER CODE - HD150.06

STABILITY OF FLOATING BODIES

Determination of metacenter and buoyancy using a rectangular hull section



FLUID MECHANICS LAB

ORDER CODE - HD150.07 - BERNOULLI'S PRINCIPLE

Static pressure and total pressure distribution along the venture nozzle

Recommended for water supply

HD150 - HYDRAULIC BENCH



ORDER CODE - HD150.08 - MEASUREMENT OF JET FORCES

Demonstration of the principle of linear momentum and impact forces on interchangeable deflectors with different deflection angles.

Recommended for water supply

HD150 - HYDRAULIC BENCH

ORDER CODE - HD150.09 - HORIZONTAL FLOW FROM A TANK

Recording the trajectory of the water jet at different outlet velocities.

Recommended for water supply

HD150 - HYDRAULIC BENCH



FLUID MECHANICS LAB

ORDER CODE - HD150.10 VERTICAL FLOW FROM A TANK

Determination of different flow measuring methods and determining the flow coefficients for different flow meters.

Recommended for water supply

HD150 - HYDRAULIC BENCH



ORDER CODE - HD150.11 - LOSSES IN A PIPE SYSTEM

pressure losses in pipes, piping elements and fittings

how the flow velocity affects the pressure loss

determining resistance coefficients

opening characteristics of angle seat valve and gate valve

familiarisation with various measuring objects for determining flow rate:

Venturi nozzle

orifice plate flow meter and measuring nozzle

ORDER CODE - HD150.12 - VORTEX APPARATUS

Recognition of surface profiles for free and forced vortex.

Recommended for water supply

HD150 - HYDRAULIC BENCH



FLUID MECHANICS LAB

ORDER CODE - HD150.13
METHODS OF FLOW MEASUREMENT

Comparison of different flow measuring methods and determining the flow coefficients for different flow meters.

HD150 - HYDRAULIC BENCH



ORDER CODE - HD150.14 HYDRAULIC RAM

Formation and effect of water hammer. Pumping of water using hammer
Recommended for water supply

HD150 - HYDRAULIC BENCH



ORDER CODE - HD150.15
SERIES AND PARALLEL CONFIGURATION OF PUMPS

Determining the characteristics curve and hydraulic power output and comparison of series and parallel operating modes.

Recommended for water supply.

HD150 - HYDRAULIC BENCH



FLUID MECHANICS LAB

ORDER CODE - HD150.16 - OSBORNE REYNOLD'S EXPERIMENT

Visualization of laminar and turbulent flow

Recommended for water supply

HD150 - HYDRAULIC BENCH



ORDER CODE - HD150.17

OPERATING PRINCIPLES OF PELTON TURBINE

An impulse turbine with adjustable nozzle ; determination of characteristics curves and efficiency.

Recommended for water supply

HD 150 - HYDRAULIC BENCH

ORDER CODE - HD150.18

OPERATING PRINCIPLES OF FRANCIS TURBINE

A Reaction turbine with adjustable guide vanes ; determination of characteristics curves and efficiency.

Recommended for water supply

HD150 - HYDRAULIC BENCH



FLUID MECHANICS LAB

ORDER CODE - HD150.19

ENERGY LOSSES IN PIPING ELEMENTS

Pressure losses in various pipe fittings and valves.

Recommended for water supply

HD 150 - HYDRAULIC BENCH



ORDER CODE - HD150.20

OPERATING PRINCIPLES OF KAPLAN TURBINE

Demonstrating and studying the operational behavior and characteristics of a Kaplan turbine.

Recommended for water supply

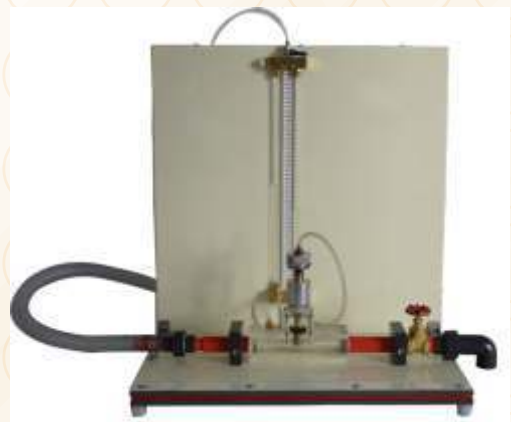
HD150 - HYDRAULIC BENCH

ORDER CODE - HD150.21 - PITOT STATIC TUBE MODULE

Demonstrate the pitot static tube operation as measuring instrument and to draw the velocity profiles in a pipe.

Recommended for water supply

HD150 - HYDRAULIC BENCH



FLUID MECHANICS LAB

HD 150.22- VISUALISATION OF STREAMLINES IN OPEN CHANNEL

Flow around various drag bodies and incident flow of weirs, ink used as contrast medium

Recommended for water supply

HD 150 - HYDRAULIC BENCH



HD 150.23- CAVITATION DEMONSTRATOR

Visualization of the formation of vapor bubbles in a venturi nozzle and to find the cavitation number.

Recommended for water supply

HD 150 - HYDRAULIC BENCH

HD 150.24- PIPE NETWORK APPARATUS

Pressure losses at various piping elements and pipe networks;
parallel and series connection of pipe sections

Recommended for water supply

HD 150 - HYDRAULIC BENCH



FLUID MECHANICS LAB

ORDER CODE - HD150.126 - CALIBRATION OF ROTAMETER

Flow measurement

To plot the characteristics and calibration curve



ORDER CODE - HD150.27 FUNDAMENTAL OF PRESSURE MEASUREMENT

Measurement of positive and negative pressure with different measuring devices.

ORDER CODE - TF101 - VAPOUR PRESSURE OF WATER - MARCET BOILER

Pressure and temperature measurement in a steam boiler



ORDER CODE - TF102 FUNDAMENTAL OF TEMPERATURE MEASUREMENT

Experimental introduction to temperature measurement:
methods, areas of application, characteristics

FLUID MECHANICS LAB

ORDER CODE - HD115 - HYDROSTATIC BENCH

Experiments on buoyancy, density, capillarity etc.;
various methods of pressure measurement



ORDER CODE - HD122 - LOSSES IN PIPE

fundamentals of flow measurement
fundamentals of pressure measurement
determination of the friction factor for different pipe materials
and diameters
resistance coefficients of pipe bends, enlargements and contrac
tions
pressure losses and opening characteristics of valves and fittings



ORDER-CODE - HD126

DETERMINATION OF SETTLING VELOCITY (STOKE'S LAW)

Vertically falling body in liquid using specimens of different
sizes and different materials



FLUID MECHANICS LAB

ORDER CODE - HD140 - ADVANSED HYDROLOGICAL

- investigating transient processes
 - effect of rainfall of varying duration on the discharge
 - storage capacity of a soil
- investigating steady processes
 - seepage flow
 - effects of wells on the groundwater level over time
 - flow behavior of rivers, obstacles in the river bed, sediment transport in rivers



ORDER CODE - HM142 - VISUALISATION OF SEEPAGE FLOW

- determining flow nets in permeable media graphically
 - streamlines under a sheet pile
 - streamlines through an earth dam
 - drainage at an open ditch
- determining the pressure curve at a foundation
- determining the pressure curve at a retaining wall
- groundwater levels over time in various models

ORDER CODE - HD143

TRANSIENT DRAINAGE PROCESSES IN RESERVOIRS

Demonstration of the function of a rainwater retention basin and a dam



ORDER CODE - HD152 - POTENTIAL FLOW

Visualization of streamlines in a Hele-Shaw cell using ink as contrast medium

FLUID MECHANICS LAB

ORDER CODE - HD156 - PIPE SURGE AND WATER HAMMER APPARATUS

Transient flow conditions in pipe systems by means of experimentation

demonstrating water hammer in pipes

determining the wave propagation velocity in water

understanding how a surge chamber works natural frequency in the surge chamber



ORDER CODE - HD157 - DEMONSTRATION INFILTRATION APPARATUS

Demonstration of the effect of crusting on infiltration

Understand the effects of soil texture and structure on infiltration

Understand the effects of existing soil moisture conditions on infiltration

Demonstration of relationship between soil type and infiltration and penetration rates

Demonstration of the relationship between soil particle size and infiltration

The effect of organic matter content on infiltration and penetration rate

The effect of non-homogeneous soil strata on infiltration and penetration rates

The effect of moisture content on infiltration and penetration rates

The effect of straw mulch on infiltration rate



ORDER CODE - HD158

OPEN CHANNEL SEDIMENT TRANSPORT

Observation of bed formation;

visualization of flow with contrast medium

FLUID MECHANICS LAB

ORDER CODE - HD159 - EXPERIMENTAL FLUME 100 X 300 mm

Experimental section with lengths of 2.5m or 5m available,

Closed water circuit and inclination adjustment

uniform and non-uniform discharge

flow formulae

flow transition (hydraulic jump)

energy dissipation (hydraulic jump, stilling basin)

flow over control structures: weirs (sharp- crested, broad-crested, ogee-crested),

discharge under gates

flow-measuring flumes

local losses due to obstacles

transient flow: waves

vibrating piles

sediment transport



ORDER CODE - HD160 - EXPERIMENTAL FLUME (309 X 450MM)

Experimental section for performing flow experiments in open flumes with lengths of 5m, 7,5m, 10m or 12,5m Available, closed water circuit and inclination adjustment

WITH THE AVAILABLE ACCESSORIES FOLLOWING EXPERIMENTS ARE POSSIBLE

uniform and non-uniform discharge

flow formulae

flow transition (hydraulic jump)

energy dissipation (hydraulic jump, stilling basin)

flow over control structures: weirs (sharp-crested, broad-crested, ogee-crested)

flow over control structures: discharge under gates

flow-measuring flumes

local losses due to obstacles

transient flow: waves

vibrating piles sediment transport



FLUID MECHANICS LAB

ORDER CODE - HD161 - EXPERIMENTAL FLUME (409 X 500MM)

Experimental section for performing flow experiments in open flumes with lengths of 5m, 7,5m, 10m or 12,5m Available, closed water circuit and inclination adjustment

WITH THE AVAILABLE ACCESSORIES FOLLOWING EXPERIMENTS ARE POSSIBLE

uniform and non-uniform discharge

flow formulae

flow transition (hydraulic jump)

energy dissipation (hydraulic jump, stilling basin)

flow over control structures: weirs (sharp-crested, broad-crested, ogee-crested)

flow over control structures: discharge under gates

flow-measuring flumes

local losses due to obstacles

transient flow: waves

vibrating piles sediment transport



FLUID MECHANICS LAB

ORDER CODE - HD162 - EXPERIMENTAL FLUME (600 X 800)

Experimental section for performing flow experiments in open flumes of 16m, 21 m length, closed water circuit, inclination adjustment.

Features:

experimental section with transparent side walls, length 16m, 21m.

homogeneous flow through carefully designed inlet element

control with PLC via two touch panels models from all fields of hydraulic engineering available as accessories



Accessories available as optional

- | | | |
|-----------------------|---------------------------------|-------------------------------------|
| 1. Sluice gate | 10. culvert | 19. closed sediment circuit |
| 2. Radial gate | 11. set of piers | 20. sediment trap |
| 3. Set of palte weirs | 12. flume bed with pebble stone | 21. sediment feeder |
| 4. Broad crested weir | 13. venture flume | 22. level gauge |
| 5. Crump weir | 14. parshall flume | 23. digital level gauge |
| 6. Siphon | 15. trapezoidal flume | 24. velocity meter |
| 7. rake | 16. wave generator | 25. pitot static tube |
| 8. ogee crested weir | 17. set of beaches | 26. multi tube manometers |
| 9. Sill | 18. vibrating piles | 27. electronic pressure measurement |
| | | 28. instrument carrier |

FLUID MECHANICS LAB

ORDER CODE - HD163 - EXPERIMENTAL FLUME (1000 X 800)

Experimental section for performing flow experiments in open flumes of 16m, 21 m length, closed water circuit, inclination adjustment.

Features:

experimental section with transparent side walls, length 16m, 21m.

homogeneous flow through carefully designed inlet element

control with PLC via two touch panels models from all fields of hydraulic engineering available as accessories



Accessories available as optional

- | | | |
|-----------------------|---------------------------------|-------------------------------------|
| 1. Sluice gate | 10. culvert | 19. closed sediment circuit |
| 2. Radial gate | 11. set of piers | 20. sediment trap |
| 3. Set of palte weirs | 12. flume bed with pebble stone | 21. sediment feeder |
| 4. Broad crested weir | 13. venture flume | 22. level gauge |
| 5. Crump weir | 14. parshall flume | 23. digital level gauge |
| 6. Siphon | 15. trapezoidal flume | 24. velocity meter |
| 7. rake | 16. wave generator | 25. pitot static tube |
| 8. ogee crested weir | 17. set of beaches | 26. multi tube manometers |
| 9. Sill | 18. vibrating piles | 27. electronic pressure measurement |
| | | 28. instrument carrier |

FLUID MECHANICS LAB

ORDER CODE - HD167 - GROUND WATER FLOW

determining the groundwater level
lowering of groundwater level via two wells
groundwater flow on excavation pits groundwater studies under
concentric load on the substrate



ORDER CODE - HD168 - SEDIMENT TRANSPORT IN RIVER COURSES

Investigation of sediment migration with and without
structures

ORDER CODE - HD169 - SEPARATION SEDIMENTATION IN TANKS

basic principle for the separation of solids from
suspensions in a sedimentation tank
determine the hydraulic loading rate
influence of the following parameters on the
separation process:
concentration of solids
flow rate
flow velocity in the inlet
water level in the sedimentation tank

investigation of the flow conditions
how lamellas affect the sedimentation process

FLUID MECHANICS LAB

ORDER CODE - HD170 - OPEN WIND TUNNEL

experiments with accessories
 determine drag and lift coefficients for different models
 pressure distribution on bodies immersed in a flow
 boundary layer analysis
 investigation of flutter
 wake measurement
 in conjunction with the fog generator
 visualization of streamlines

ACCESSORIES AVAILABLE AS OPTIONA ITEMS

HD170.01	PITOT STATIC TUBE
HD170.02	BOUNDARY LAYER ANALYSIS WITH PITOT TUBE
HD170.03	TWO COMPONENT FORCE SENSOR
HD170.04	THREE COMPONENT FORCE SENSOR
HD170.05	FOG GENERATOR FOR FLOW VISUALISATION
HD170.06	SYSTEM FOR DATA ACQUISITION
HD170.07	ELECTRONIC PRESSURE MEASUREMENT FOR WIND TUNNEL
HD170.08	ELECTRONIC DISPALCEMENT MEASUREMENT
HD170.09	DIFFERENTIAL PRESSURE MANOMETER
HD170.10	ACCESSORIES FOR DRAG FORCE
HD170.11	ACCESSOTIES FOR LIFT FORCE



FLUID MECHANICS LAB

ORDER CODE - HD172 - SUPERSONIC WIND TUNNEL

pressure curves in supersonic nozzles (Laval nozzle)

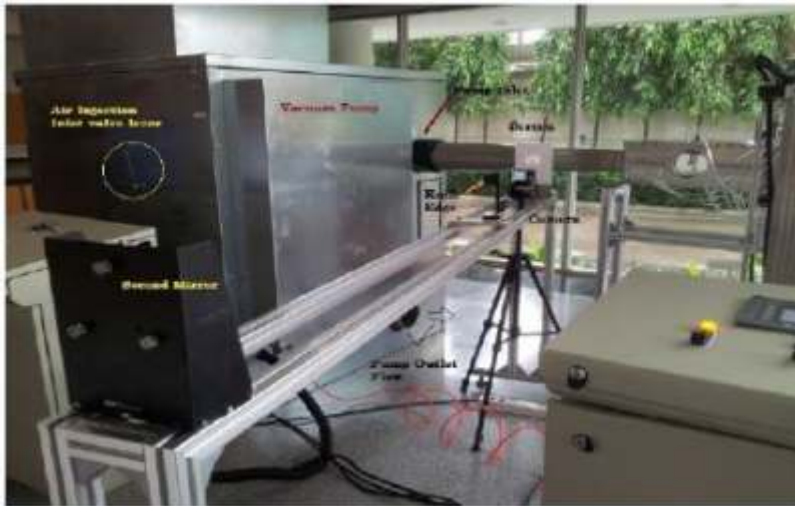
pressure curves and losses in tunnel flows with Mach >1

observe shock waves in drag bodies using Schlieren optics

determining the Mach number from the angle of the shock

waves

comparison of theory and experiment



FLUID MECHANICS LAB

ORDER CODE - HD225 - AERODYNAMIC TRAINER

Together with appropriate accessories: experiments from the field of flow around bodies
 velocity measurement of flows with Pitot tube
 boundary layer analysis on a flat plate with flow along the plate
 drag of bodies
 demonstration of the Coanda effect
 visualisation of streamlines
 together with appropriate accessories: experiments from the field of steady incompressible flow
 velocity measurement of flows with Pitot tube and Pitot static probe
 free jets
 flow in a pipe elbow
 proof of Bernoulli's principle



ACCESSORIES FOR AERODYNAMIC TRAINER (OPTIONAL AVAILABLE)

HD225.01	BOUNDARY LAYERS
HD225.02	DRAG FORCES
HD225.03	COANDA EFFECT
HD225.04	VISUALISATION OF STREAMLINES
HD225.05	BERNOULLI'S PRINCIPLE
HD225.06	FLOW IN A PIPE BEND
HD225.07	FREE JET

ORDER CODE - HD226 - SMOKE TUNNEL FOR FLOW VISUALISATION

visualisation of streamlines
 flow around or through differently shaped models
 flow separation and turbulence
 stall as a function of the angle of attack

FLUID MACHINERY LAB

➡ PUMPS & TURBINES

Order Code - 14091 CENTRIFUGAL PUMP TEST RIG

Introduction: The present Centrifugal Pump Test Rig is a self-contained unit operated on closed circuit basis containing a sump tank. The set-up consists of a Centrifugal pump coupled with a swinging frame type DC Motor which permits direct torque measurement with the help of a spring balance. Power input to the DC Motor is varied by means of a Thyristor controlled DC Drive to vary the RPM of motor.

Specifications: Pump : Kirlosker Make, Capacity 1 HP Speed 2800 RPM (max.) Medium Flow : Clear Water Drive : 1 HP DC Motor swinging frame type with Thyristor controlled DC Drive for variable speed. Spring Balance : Dial type. Sump Tank : Capacity 110 Ltrs. Flow Measurement : Using Measuring Tank with Piezometer, Capacity 70 Ltrs. Stop watch : Electronic. Pressure Gauge : Bourdon type The whole set-up is well designed and arranged in a good quality painted structure.



Order Code - 14092 MULTI STAGE, VARIABLE SPEED SERIES & PARALLEL CENTRIFUGAL PUMP TEST RIG

Introduction: The present Centrifugal Pump Test Rig is a self-contained unit operated on closed circuit basis containing a sump tank. The set-up consists of two Centrifugal pumps. Both pump are coupled with individual Motors. Speed Control facility is provided to vary the RPM of motor. RPM Indicator with Proximity sensor indicates the RPM of Pump.

Specifications: Pump (2 Nos.) : Centrifugal Type, 2800 RPM (max.) Medium Flow : Clear Water Drive: Variable speed. Sump Tank : Made of Stainless Steel, Compatible capacity Measuring Tank : Made of Stainless Steel, Compatible capacity Stop Watch : Electronic Pressure Gauge : Bourdon type, Range: 0-4 kg/cm² Vacuum Gauge : Bourdon type, Range: 0-760 mm of Hg Compound Gauge : Bourdon type, Range: -760 mm of Hg to 2 kg/cm² The whole set-up is well designed and arranged in a good quality painted structure.



Order Code - 14093 RECIPROCATING PUMP TEST RIG

Introduction: The present Reciprocating Pump Test Rig is a self-contained unit operated on closed circuit basis containing a sump tank. The set-up consists of a Double acting, Single Cylinder Reciprocating Pump coupled with a DC Motor. Flow of water is measured by using measuring tank and stopwatch.

Specifications: Pump : Double acting, Single Cylinder, Capacity 1 HP Speed 250 RPM (max.) and Head 5 kg/cm²(max.) Medium Flow : Clear Water Drive: 1HP Crompton make motor. Sump Tank: Material Stainless Steel, Capacity 65 Ltrs. Flow Measurement: Using Measuring Tank (made of stainless steel & Cap. 40 Ltrs.) and Electronic Stop Watch Pressure Gauge: Bourdon type. The whole set-up is well designed and arranged in a good quality painted structure. OPTIONAL: Digital Tachometer.



Order Code - 14094 GEAR PUMP TEST RIG

Introduction: The present Gear Pump Test Rig is a self-contained unit operated on closed circuit basis containing a sump tank. The set-up consists of a Gear Pump having a pair of meshed gears, coupled with a swinging frame type DC Motor which permits direct torque measurement with the help of a spring balance.

Specifications: Electricity Supply: Single Phase, 220 V AC, 50 Hz, 5-15 amp combined socket with earth Connection. Oil: SAE 20W 40(30 Lt.) Drain required Floor Area Required: 1.5 x 0.75 m. Flow Measurement: Using Measuring Tank with Piezometer, Capacity 70 Ltrs. Stop watch: Electronic. Pressure Gauge : Bourdon type The whole set-up is well designed and arranged in a good quality painted structure.



Order Code - 14095 SUBMERSIBLE PUMP TEST RIG

Introduction: The present Submersible Pump Test Rig is a self-contained unit operated on closed circuit basis containing a sump tank. The set-up consists of a Submersible Pump, which is mounted horizontally with sump tank. Flow of fluid is measured by using measuring tank and stop watch.

Specifications: Pump : Submersible, Capacity 1 HP. Medium Flow : Clear Water. Sump Tank : Capacity 120 Ltrs. Flow Measurement : Using Measuring Tank (Capacity 90 Ltrs.) & Electronic Stop Watch Pressure Gauge : Bourdon type The whole set-up is well designed and arranged in a good quality painted structure.



FLUID MACHINERY LAB

Order Code - 14096 JET PUMP TEST RIG

Introduction: The present Jet Pump Test Rig is a self-contained unit operated on closed circuit basis containing a sump tank. The set-up consists of a monoblock Jet Pump. Flow of fluid is measured by using measuring tank and stop watch. Vacuum gauge is fitted on suction line and Pressure gauge is fitted on delivery line to measure the pressure.

Specifications: Pump : Monoblock jet pump of size 32mm x 25m x 25mm Capacity 1 HP. Medium Flow : Clear Water. Sump Tank : Capacity 100 Ltrs. Flow Measurement : Using Measuring Tank (Capacity 70 Ltrs.) & Electronic Stop watch Pressure Gauge : Bourdon type. The whole set-up is well designed and arranged in a good quality painted structure.



Order Code - 14097 PELTON WHEEL TURBINE TEST RIG (1kw-3kw)

Introduction: Pelton Wheel Turbine is only impulse water turbine now in common use named in honour of Sir L. A. Pelton (1829-1908) of California, USA. It is a tangential flow impulse turbine. The water strikes the buckets along the tangent of the runner. The energy available at the inlet of the turbine is only kinetic energy. The pressure at the inlet and outlet of the turbine is atmospheric.

Specifications: Output Power: 1kw-3kw. Discharge: 400 LPM (Approx.) Supply Head: 25 m Speed: 1000 RPM (Approx.) Nozzle: Material Stainless Steel. Spear: Material Stainless Steel. Dynamometer: Rope Brake type. Sump Tank: Capacity 200-400 Ltrs. Water Circulation: Centrifugal Pump, Standard make, Capacity 5HP-15HP, Three Phase, 2800 RPM Discharge Measurement: Pitot tube with Manometer With the Apparatus Tanks will be made of Stainless Steel. The whole set-up is well designed and arranged in a good quality painted structure.



Order Code - 14098 FRANCIS TURBINE TEST RIG (1kw-3kw)

Introduction: Francis Turbine is a reaction turbine, which was developed by an English born American Engineer Sir J. B. Francis. The water enters the turbine through the outer periphery of the runner in the radial direction and leaves the runner in axial direction and hence it is called a mixed flow turbine. As the water flows to the runner, a part of pressure energy goes on changing into kinetic energy.

Specifications: Output Power: 1kw-3kw Discharge: 2000 LPM (Approx.) Supply Head: 15 m (Approx.) Speed: 1500 RPM (Approx.) Runner: Having Curved Vanes. Dynamometer: Rope Brake type, Dia 300 mm. Sump Tank: Capacity 200-400 Ltrs. Water Circulation: Centrifugal Pump, Kirlosker Make, Capacity 5HP-15HP Three Phase. Discharge Measurement: Pitot Tube with Manometer. Flow Measurement: using Venturimeter. Stop watch: Electronic. Pressure Gauge : Bourdon type The whole set-up is well designed and arranged in a good quality painted structure.



Order Code - 14099 KAPLAN TURBINE TEST RIG (1kw-3kw)

Introduction: Kaplan Turbine is an axial flow reaction turbine named in honour of Dr. B. Kaplan, a German Engineer. This turbine is suitable for low head. The power produced by a turbine is proportional to QH. As the head (H) Decreases the discharge (Q) must increase to produce the same power. The present set-up consists of a scroll casing housing a runner. Water enters the turbine through the stationary guide vanes and passes through the runner axially.

Specifications: Output Power : 1kw-3kw Discharge : 1000 LPM Supply Head : 5-8 M Normal Speed : 2000 RPM Dynamometer : Rope Brake type. Water Circulation : Centrifugal Pump, CRI/Standard Make, Capacity 5HP-15 HP, 3 Phase. Discharge Measurement : Venturimeter Sump Tank : Capacity 200-400 Ltrs. Pressure Measurement : Pressure Gauge & Vacuum Gauge Piping & Fittings : Pipes & fittings with flow control valves of suitable size with the Apparatus Tanks will be made of Stainless Steel. The whole set-up is well designed and arranged in a good quality painted structure.



Order Code - 14100 HYDRAULIC RAM TEST RIG

Introduction: Hydraulic Ram is used for pumping small quantity of water at high head, when large quantity of water at small head is available. It operates on the principle that if flowing water is suddenly brought to rest in a long pipe, a phenomena known as water hammer occurs, wherein a pressure wave travels along the pipe.

Specifications: Ram: Supply Head 1.0 m, Delivery Head 4 m (Max.) Water Circulation: FHP Pump, Crompton make. Sump Tank : Capacity 140 Ltrs. (approx.) Overhead Tank : Capacity 50 Ltrs. (approx.) Air Vessel: Suitable Capacity. Flow Measurement : Using Measuring Tank & Electronic Stop Watch for waste water and for useful water Pressure Gauge : Bourdon type. The whole set-up is well designed and arranged in a good quality painted structure.



FLUID MACHINERY LAB

➡ AIR FLOW STUDIES

Order Code - 14101 CENTRIFUGAL BLOWER TEST RIG

Introduction: 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 Power input to the DC Motor is varied by means of a Thyristor controlled DC Drive to vary the RPM of motor. A RPM Indicator with Proximity sensor indicates the RPM of Blower.

Specifications: Variable Speed : DC motor with Thyristor controlled DC Drive for variable speed. Blower : Centrifugal, Forced Draft Type Impeller (3 Nos.): Forward Curved, Backward Curved & Radial Curved Pitot Tube (with manometer) : For Static, Dynamic & Differential Pressure measurement. Stop watch: Electronic Control Panel Comprises of: Standard make On/Off Switch, Mains Indicator, etc. Energy measurement: Electronic Energy meter, L&T make. RPM measurement: Digital RPM Indicator with Proximity sensor.



Order Code - 14102 AXIAL FAN TEST RIG

Introduction: This equipment comprises of a Axial Flow Fan coupled to a AC Motor. A Pitot tube is provided in the delivery line of Axial fan for static, dynamic and differential pressure measurement.

Specifications: Axial Fan : Compatible Capacity. Drive: 1 HP motor. Pitot Tube (with manometer): For Static, Dynamic and Differential Pressure measurement. Stop watch : Electronic Control Panel Comprises of: Energy measurement: Electronic Energy meter, L&T make. MCB: For overload protection. Standard make On/Off Switch, Mains Indicator, etc. An ENGLISH instruction manual consisting of experimental procedures, block diagram etc. will be provided along with the Apparatus The whole set-up is well designed and arranged on a rigid structure painted with industrial PU Paint.



Order Code - 14103 WIND TUNNEL TEST RIG

Introduction: WIND TUNNEL has been developed to perform various experiments of aerodynamics and fluid flow. This is an open circuit Wind Tunnel provides a region of controlled air flow into which models can be fitted at downstream of working section.

Specifications: Variable Speed : 3HP Crompton make motor with Speed Controller Type : Open Type Wind Tunnel. Test Section : 250 x 250 x 1000 mm. Blower : Compatible Capacity Air Velocity : Maximum 30 m/s (in Test Section). Digital Force Indicator : For Lift and Drag force Multiple Manometer : 0-40° inclination with vertical axis. U Tube Manometer : Length 500 mm. Inclined manometer : 300 mm Pitot Static Tube : For Velocity Measurement Micro-Pitot Tube : For Boundary Layer Experiment.



Order Code - 14104 SINGLE STAGE AIR COMPRESSOR TEST RIG

Introduction: Single Stage Air Compressor Test Rig consists of a single stage reciprocating type air compressor driven by 1 HP motor through a belt. The outlet of the air compressor is connected to reservoir (Tank) and suction is connected to another air tank with an orifice plate and a water manometer.

Specifications: Compressor : single stage, capacity 4 CFM (max.) Working pressure 5kg/cm² max. Drive : 1 hp Crompton make motor Manifold Tank : suitable capacity Flow Measurement : orifice meter with manometer Temp. Measurement : RTD PT-100 type sensor (2nos.) RPM measurement: RPM Indicator with proximity sensor. Air Tank: capacity 90 ltrs .with safety valve shut off valve. Pressure Gauge : bourdon type Control Panel Comprises of: Energy measurement: Electronic Energy meter, L&T make. MCB: For overload protection. Standard make On/Off Switch, Mains Indicator, etc.



Order Code - 14105 DOUBLE STAGE AIR COMPRESSOR TEST RIG

Introduction: Two Stage Air Compressor Test Rig consists of a double Stage reciprocating type air compressor driven by 2 HP Motor through a belt. The outlet of the air compressor is connected to reservoir (Tank) and suction is connected to Another air tank with a calibrated orifice plate and a water Manometer. Bellows is fitted on one side of the air tank to Regulate the flow.

Specifications: Compressor: Double Stage Double Cylinder, Make: Kirloskar Capacity 6.9 CFM max. Working Pressure: Max. 7 kg/cm Motor : 2 HP Crompton/Standard make, Swinging Field type Spring balance : 10 kg, Dial type Flow measurement : Orifice meter with Manometer Temperature measurement: RTD PT-100 type sensor (4 nos.) Air tank : Capacity 150 Ltrs. with safety valve, shut off valve, Pressure gauge: Bourdon Type. Control Panel Comprises of: RPM measurement: RPM Indicator with Proximity sensor. MCB : For overload protection.



FLUID MACHINERY LAB

HYDROLOGY & FLOW CHANNEL LAB

Order Code - 14106 TILTING BED FLOW CHANNEL

Introduction: This apparatus consists of a Flow channel. Channel is fabricated from transparent Toughened Glass and Stainless Steel together. The equipment is designed to study the various phenomenon of flow with the help of various types Of blocks, gates, weirs, and other many types of accessories (Optional). The channel section is transparent by which user can observe the various flow patterns of fluid in the channel and photographs can be taken.

Specifications: Flow Channel Material:Toughened Glass and Stainless Steel Width:150 mm Depth:250 mm Length:5 m Water Circulation:Centrifugal Pump, compatible capacity. Flow Regulation Valve:Hand wheel operated butterfly Valve Pointer Gauge:Provided. Sump Tank:Suitable Capacity. Tanks will be made of Stainless Steel.



ACCESSORIES FOR FLOW CHANNEL

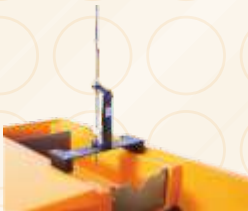
Order Code - 14107 BASIC HYDROLOGY SYSTEM (FLOW CHANNEL ACCESSORY)

Introduction: The apparatus is a self-contained unit for studying basic hydrology. It consists of a large stainless steel rectangular tank with adjustable tilting mechanism. The tank is filled with a granular medium. Two separate sets of spray nozzles above the tank simulate rain fall on the catchments.

Specifications: Tank: Stainless steel 100cm wide x 19cm high. Inclination: 0-3%. End compartments 2. Wells 2. Spray nozzles: 8 nozzles with separate shutoff valves. Flow Measurement: Rain Water: Variable area flow meter. Run off: Calibrated Weir. Manometer:1, Upper walls: Clear acrylic, Accessories: 1x Rectangular ring, 1 x circular ring, 1 x confined aquifer(closed circular ring), 1x cylinder pier, 2x canal banks, 1x scraper, Power supply: 220v, 1 Ph, 50 HZ. Other power supply is available on request.



Order Code - 14108 V-NOTCH WEIR (FLOW CHANNEL ACCESSORY)



Introduction: V-Notch Weir and Tanks are used to measure seepage water flows in open streams, channels or tanks are used mainly as part of Dam Safety Monitoring programs. The V-notch weir uses the principle of flow of water over a triangular or rectangular notched weir plate.

Specifications: Brass make (3mm), 45° 60°,90° Notch, Easily removable, Comes with rubber packing at sides to fit inside the flow channel, Stable at higher flow rate, Size varies as per the cross sectional channel.

Order Code - 14109 RECTANGULAR NOTCH WEIR (FLOW CHANNEL ACCESSORY)

Introduction: This calculates the water flow rate over a rectangular contracted weir. This weir has a rectangular opening where the sides are straight up and down. A contracted weir means that the ditch or canal leading up to the weir is wider than the weir opening itself.

Specifications: Rectangular make (3mm), Easily removable, Comes with rubber packing at sides to fit inside the flow channel, Stable at higher flow rate, Size varies as per the cross sectional channel.



Order Code - 14110 PITOT TUBE & MANOMETER BOARD (FLOW CHANNEL ACCESSORY)



Introduction: The Pitot tube is inserted into the duct with the tip pointed toward the airflow. The positive port of the manometer is connected to the total pressure port (Pt) and the negative to the static pressure port (Ps). The manometer will then display velocity pressure which can be converted to velocity.

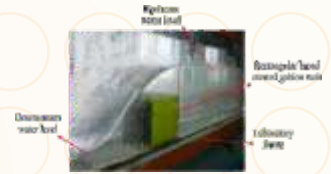
Specifications: PITOT TUBE:SS make pitot tube,Hole diameter 2mm,L shape,Manometer:Transparent tube to be used with mercury,Necessary ball valves given to release air,Fixed on SS sheet,Wooden scale given to measure pressure head.

FLUID MACHINERY LAB

Order Code - 14111 RECTANGULAR OVERSHOT WEIR/BROAD CRESTED WEIR (FLOW CHANNEL ACCESSORY)

Introduction: A board-crested weir supports the flow in the longitudinal direction (direction of flow) so that the nappe flowing across the weir does not spring free from its upstream face.

Specifications: Acrylic make (5mm thick), Easily removable, Comes with rubber packing at sides to fit inside the flow channel, Stable at higher flow rate, Size varies as per the cross sectional channel.



Order Code - 14112 VENTURIFLUME (FLOW CHANNEL ACCESSORY)



Introduction: Venturi flume is used to measure discharge of fluid. Venturi flume works on Bernoulli's principle. The venturi flume is the small loss of head required for purpose of measuring the flow for the V-notch flume the lost head for the different discharges obtained with different depths of water.

Specifications: SS makes (2 mm sheet), Easily removable, Comes with rubber packing at sides to fit inside the flow channel, Stable at higher flow rates, Size varies as per the cross-sectional area of the channel.

Order Code - 14113 STANDING WAVE (FLOW CHANNEL ACCESSORY)

Introduction: If the throat velocity exceeds the critical velocity, it is called a standing wave flume or critical depth flume. Standing waves will be formed at the throat of the flume. Since the velocity is critical, the downstream variations in depth do not affect the upstream depth till the submergence ratio exceeds 0.7. The standing wave method requires a small movable car at the end of the tube to move a microphone probe inside the tube used to detect the maximum and minimum sound pressure at the specific tone frequency of interest. When the width of the throat (B) is known we can calculate the discharge in the standing wave flume using the formula. $Q = 1.7 \times C_d \times B \times H^{3/2}$ where $C_d = 0.95$ to 1.



Order Code - 14114 HUMP (FLOW CHANNEL ACCESSORY)

Introduction: It is a streamline construction provided at the bed of channel. It is a local rise given to the channel bed. When the water or fluid is flowing over the hump the behavior of free surface is sharply different according to whether the approach flow is sub-critical or super-critical.

Order Code - 14115 RECTANGULAR STREAMLINED WEIR (FLOW CHANNEL ACCESSORY)

Introduction: Weirs are a type of Hydraulic Structures that are used in water supply systems and irrigation networks for different purposes. The streamlined weirs are a special type of weirs, designed based on the airfoil theory. These weirs have some merits compared to the other types of weirs. They have high discharge coefficient, more stability and less fluctuations of water free surface.

Specifications: SS make (1.5 mm sheet), Easily removable, Comes with rubber packing at sides to fit inside the flow channel, Stable at higher flow rates, Size varies as per the cross-sectional area of the channel.



Order Code - 14116 RECTANGULAR SHARP CORNERED WEIR (FLOW CHANNEL ACCESSORY)



Introduction: A sharp-crested weir consists of a vertical flat plate with a sharp edge at the top (the crest), placed in an open channel so that the liquid must flow over the crest in order to drop into the pool below the weir.

Specifications: Brass Make (2 mm sheet), Easily removable, Comes with rubber packing at sides to fit inside the flow channel, Stable at higher flow rates, Size varies as per the cross-sectional area of the channel.

FLUID MACHINERY LAB

Order Code - 14117 SPILLWAY (FLOW CHANNEL ACCESSORY)

Introduction: A spillway is a structure used to provide the controlled release of water downstream from a dam or levee, typically into the riverbed itself. Other uses of spillway is to bypass of dam outlets of channels used during high water. Water normally flows over a spillway only during flood periods, when the reservoir has reached its capacity.

Specifications: Acrylic make (5 mm thick), Easily removable, Comes with rubber packing at sides to fit inside the flow channel, Stable at higher flow rates Size varies as per the cross-sectional area of the channel.



Order Code - 14118 SLUICE GATE (FLOW CHANNEL ACCESSORY)

Introduction: Sluice gate are one of the most common hydraulic structures in controlling flow rate and water level in open channel such as river and canals. They could also be used to measure the flow.

Specifications: SS make (1.5 mm thick sheet), Hand wheel given to move the gate up and down, Moves vertically along the sliding channel, Can be used to produce hydraulic jump, Size varies as per the cross-sectional area of the channel.

Order Code - 14119 CRUMP WEIR (FLOW CHANNEL ACCESSORY)

Introduction: A Crump weir is a two dimensional triangular weir with a horizontal crest in the transverse direction and a triangular crest shape in the stream-wise direction. The upstream slope is 1 (vertical) in 2 (horizontal) and the downstream slope is from 1:5 to 1:2. The intersection of the two sloping surfaces forms a straight horizontal crest at right angles to the flow direction in the approach flow channel.

Specifications: SS make (1.5 mm thick sheet), Easily removable, Comes with rubber packing at sides to fit inside the flow channel, Stable at higher flow rates, Size varies as per the cross-sectional area of the channel.



Order Code - 14120 SYPHON SPILLWAY (FLOW CHANNEL ACCESSORY)

Introduction: A siphon spillway is a type of spillway in which surplus water is disposed to downstream through an inverted U shaped conduit. It is generally arranged inside the body or over the crest of the dam. In both types of siphon spillways, air vents are provided at the bent portion of the upper passageway to prevent the entrance of water when the water level is below the normal pool level.

Specifications: Acrylic make, Easily removable, Comes with rubber packing at sides to fit inside the flow channel, Stable at higher flow rates, Size varies as per the cross-sectional area of the channel.



Order Code - 14121 ARTIFICIAL ROUGHENED BED (FLOW CHANNEL ACCESSORY)

Introduction: Artificial beds are used to create different conditions inside flow channel that exists in reality. The importance of the study is to predict the complexity of the flow behavior due to unsteadiness under extreme flood events or flash floods. The combined effect of bed roughness and emergent rigid vegetation makes the flow process complicated in real field applications. So, the present laboratory study simplifies the real field case.

Specifications: SS BED, Different size artificial grass and rocks are place on the bed, Size varies as per the cross section of the flow channel.



Order Code - 14122 PARSHALL FLUME (FLOW CHANNEL ACCESSORY)

Introduction: A Parshall Flume relies on the conservation of energy principle. The sum of the kinetic and potential energy at a given point must be equal to the energy at any other point along the stream. The total energy or head must be equal.

Specifications: SS Make (1.5mm thick sheet), Smooth conversion and diversion section, Easily removable, Comes with rubber packing at sides to fit inside the flow channel, Stable at higher flow rates, Size varies as per the cross-sectional area of the channel.

Order Code - 14123 CURRENT METER (FLOW CHANNEL ACCESSORY)

Introduction: In the simplest method, a current meter turns with the flow of the river or stream. The current meter is used to measure water velocity at predetermined points (subsections) along a marked line, suspended cableway, or bridge across a river or stream. The depth of the water is also measured at each point.



THERMODYNAMICS LAB

➡ DIESEL ENGINES

Order Code - 14124 SINGLE CYLINDER FOUR STROKE WATER COOLED DIESEL ENGINE TEST RIG

Introduction: IC engines are widely used in automobile, domestic and industrial sector. They are classified according to cycle, number of cylinders, arrangement of cylinders, fuel used, type of ignition, valve arrangement, cooling system. Test rigs are used to find out the performance of an IC engine.

Specifications: Type of Engine : Single cylinder, four stroke, vertical water cooled, crank start, Diesel engine developing 5 HP at 1500 Type of Loading: Rope Brake Dynamometer Eddy Current Dynamometer Fuel Measuring System: Fuel measuring system consists of a fuel tank, a burette and a three way cock arrangement. Air Intake Measuring System: Air tank fitted with orifice and water manometer. Measurement of Heat Carried: It consists of inlet outlet piping with flow control valve and temperature sensor. Temperature Measurement : Digital Temperature Indicator with multi-channel switch Temperature Sensors : RTD PT-100 type.



Order Code - 14125 FOUR CYLINDER FOUR STROKE DIESEL ENGINE TEST RIG

Introduction: IC engines are widely used in automobile, domestic and industrial sector. They are classified according to cycle, number of cylinders, arrangement of cylinders, fuel used, type of ignition, valve arrangement, cooling system. Test rigs are used to find out the performance of an IC engine.

Specifications: Engine : Multi Cylinder, Four stroke, water cooled Diesel Engine Type of Loading : Hydraulic Brake Dynamometer Rope brake dynamometer Eddy Current dynamometer Fuel Measuring System: Fuel measuring system consists of a fuel tank, a burette and a three way cock arrangement. Air Intake Measuring System: Air tank fitted with orifice and water manometer. Measurement of Heat Carried: It consists of inlet-outlet piping with flow control valve, Rotameter to measure the rate of flow of cooling water Temperature Sensors are provided to measure the Temperature of water Inlet & Outlet, exhaust inlet and outlet. Temperature Measurement : Digital Temperature Indicator with multi-channel switch Temperature Sensors : RTD PT-100 type Panel Board Arrangement: Panel Board Arrangement consisting of ignition & starting switch.



Order Code - 14126 VARIABLE COMPRESSION RATIO SINGLE CYLINDER FOUR STROKE WATER COOLED DIESEL ENGINE TEST RIG

Introduction: IC engines are widely used in automobile, domestic and industrial sector. They are classified according to cycle, number of cylinders, arrangement of cylinders, fuel used, type of ignition, valve arrangement, cooling system. Test rigs are used to find out the performance of an IC engine. It consists of an IC Engine, dynamometer, fuel measuring, air intake measuring and various other arrangements. Provision for more test is done.

Specifications: ENGINE KIRLOSKAR (Brand New), Diesel Type, Four stroke, water cooled engine, developing 3.5 KW at 1500 rpm. Compression ratio: 12:1 to 18:1 Electric Start with battery and charger Tilting head type arrangement to vary the compression ratio of the engine. DYNAMOMETER: a) ROPE BRAKE DYNAMOMETER, b) EDDY CURRENT DYNAMOMETER, c) HYDRAULIC BRAKE DYNAMOMETER, d) ELECTRIC BRAKE DYNAMOMETER. PROPELLER SHAFT: With universal joints, reputed make. AIR BOX: M.S. Fabricated, Air Intake Measuring System; Air tank fitted with orifice and water manometer. FUEL MEASUREMENT: Consists of a fuel tank 10L capacity, a burette and a 3-way cock arrangement. CALORIMETER: Shell and tube type calorimeter or Pipe in pipe with asbestos and ceramic wool insulation, SS material. TEMPERATURE SENSOR: RTD type PT100 and thermocouple, Type K with temperature transmitter: type 2 wire, Input RTD PT100, Range 0-100 deg C, Output 4-20mA, and type two wire Input thermocouple. Rotameter for engine cooling and calorimeter, Eureka make 40-400 LPH. Instruction Manual: An ENGLISH instruction manual will be provided along with the Apparatus.



THERMODYNAMICS LAB

➡ PETROL ENGINES

Order Code - 14127 SINGLE CYLINDER FOUR STROKE

PETROL ENGINE TEST RIG

Introduction: IC engines are widely used in automobile, domestic and industrial sector. They are classified according to cycle, number of cylinders, arrangement of cylinders, fuel used, type of ignition, valve arrangement, cooling system. Test rigs are used to find out the performance of an IC engine. It consists of an IC Engine, dynamometer, fuel measuring, air intake measuring and various other arrangements.

Specifications: Type of Engine : Single cylinder, four stroke, air cooled, Hand start, self Lubricating, petrol engine. Type of Loading : Rope Brake Dynamometer Eddy Current Dynamometer Fuel Measuring System: Fuel measuring system consists of a fuel tank, a burette and a three way cock. Air Intake Measuring System: Air tank fitted with orifice and water manometer. Instruction Manual : An ENGLISH instruction manual will be provided along with the Apparatus The whole setup is well designed and supported by a good quality painted rigid M.S. Structure.



Order Code - 14128 FOUR CYLINDER FOUR STROKE

PETROL ENGINE TEST RIG

Introduction: IC engines are widely used in automobile, domestic and industrial sector. They are classified according to cycle, number of cylinders, arrangement of cylinders, fuel used, type of ignition, valve arrangement, cooling system. Test rigs are used to find out the performance of an IC engine.

Specifications: Engine : Multi Cylinder, Four stroke, water cooled Petrol Engine Type of Loading : Hydraulic Brake Dynamometer Fuel Measuring System: Fuel measuring system consists of a fuel tank, a burette and a three way cock arrangement. Air Intake Measuring System: Air tank fitted with orifice and water manometer. Measurement of Heat Carried: It consist of inlet outlet piping with flow control valve, Temperature Sensors are provided to measure the Temperature of Inlet & Outlet Temperature Measurement : Digital Temperature Indicator with multi-channel switch Temperature Sensors : RTD PT-100 type Panel Board Arrangement : Panel Board Arrangement consisting of ignition & starting switch, a high voltage knife switch assembly for cutting off each cylinder for Morse test. Instruction Manual : An ENGLISH instruction manual will be provided along with the Apparatus.



Order Code - 14129 VARIABLE COMPRESSION RATIO SINGLE CYLINDER FOUR STROKE PETROL ENGINE TEST RIG

Introduction: IC engines are widely used in automobile, domestic and industrial sector. They are classified according to cycle, number of cylinders, arrangement of cylinders, fuel used, type of ignition, valve arrangement, cooling system. Test rigs are used to find out the performance of an IC engine.

Specifications: ENGINE KIRLOSKAR (Brand New), Petrol Type, Four stroke, water cooled engine, developing 3.5 KW at 1500 rpm. Compression ratio: 9:1 to 16:1 (This one is actually diesel engine but is converted to the petrol engine) Electric Start with battery and charger Tilting head type arrangement to vary the compression ratio of the engine. DYNAMOMETER: a) ROPE BRAKE DYNAMOMETER, b) EDDY CURRENT DYNAMOMETER, c) HYDRAULIC BRAKE DYNAMOMETER, d) ELECTRIC BRAKE DYNAMOMETER. PROPELLER SHAFT: With universal joints, reputed make. AIR BOX: M.S. Fabricated, Air Intake Measuring System; Air tank fitted with orifice and water manometer. FUEL MEASUREMENT: Consists of a fuel tank 10L capacity, a burette and a 3-way cock arrangement. CALORIMETER: Shell and tube type calorimeter or Pipe in pipe with asbestos and ceramic wool insulation, SS material. TEMPERATURE SENSOR: RTD type PT100 and thermocouple, Type K with temperature transmitter: type 2 wire, Input RTD PT100, Range 0-100 deg C, Output 4-20mA, and type two wire Input thermocouple. WATER FLOW METER: Rotameter for engine cooling and calorimeter, Eureka make 40-400 LPH.



THERMODYNAMICS LAB

MISCELLANEOUS

Order Code - 14130 SEPARATING CALORIMETER & THROTTLING CALORIMETER

Introduction:

Separating: It consists of two concentric chambers, the inner chamber and the outer chamber, which communicates with each other through an opening at the top. As the steam discharges through the metal basket, which has a large number of holes, the water particles due to their heavier momentum get separated from the steam and collect in the chamber.

Throttling: It consists an arrow throat (Orifice). Pressure and temperature are measured by pressure gauge and thermometer. The steam after throttling process passes through the heat exchanger and condensate is collected. Steam Generator is also provided to supply the saturated steam (Max) at 2kg/cm2 pressure.

Specifications: Separating Chamber:Compatible capacity made of Stainless Steel insulated with Ceramic wool with water level indicator.Throttling Chamber:Compatible capacity provided with gauge to measure in let Pressure before throttling Heat Exchanger:For Condensing steam after throttling chamber Steam Generator:Compatible capacity with digital temperature controller to control the temperature inside the steam generator.Differential pressure:By manometer Measurement Steam pressure measurement:By Pressure gauge.



Order Code - 14131 EDUCATION PEM FUEL CELL

Introduction: The fuel cell module incorporates a unique plate stack assembly with a highly intricate optimized internal fuel path geometry and specialized membrane and is mounted in a reinforced plastic panel with a transparent window that clearly shows the main components. The educational unit is designed to allow the estimation of the exothermic heat generated in the stack as power is generated and water formed, and in addition to this, the instrumentation allows the key energy performance indicators e.g. power output, fuel consumption, efficiency, oxidant excess (air) etc. to be determined for the unit.

Specifications: Power output 0.75kW An all air system: no need for cooling water or heat exchangers.An ambient pressure system with integral fan. Utilisation of a single air stream: the coolant and oxidant streams are the same stream Operated at ambient temperature: -20°C to +52°C

Stack temperature: +38°C to +66°C Compact Fuel Cell size: 103 × 352mm² footprint, 13kg weight.Ambient humidity operation: no additional humidification is required.An integral variable load, allowing the stack to be operated over its full capacity.



Order Code - 14132 JET ENGINE TEST RIG

Introduction: Jet engines are gas turbines which generate thrust. Jet engines are used on aircraft for propulsion due to their low weight and high performance.This trainer investigates the behaviour during operation of a jet engine. It includes the following components: jet engine (with compressor, annular combustion chamber, turbine, and propelling nozzle), fuel system, starter and ignition system, and measurement and control equipment. The gas turbine works as an open cyclic process, with the ambient air being drawn out and fed back in.

Specifications: Jet engine

max. thrust: 80N at 12000min-1 speed range 35000...120000min-1 fuel consumption: max. 22L/h (full load)exhaust gas temperature: 610°C sound level at 1m distance: max. 130dB(A)Fuel: kerosene or petroleum + turbine oil Starting system: electric starter 1 tank for fuel: 5L

Measuring ranges

differential pressure: 0...150mbar pressure: 0...2,5bar (combustion chamber)temperature: 2x 0...1200°C / 1x 0...400°C speed: 0...120000min-1 consumption: 0...25L/h (fuel)force: 0...±200N.



CUT SECTION MODELS



CUT SECTION SINGLE CYLINDER 2 STROKE DIESEL ENGINE



CUT SECTION MODEL OF ACTUAL SINGLE CYLINDER TWO STROKE PETROL ENGINE



CUT SECTION SINGLE CYLINDER 4 STROKE PETROL ENGINE



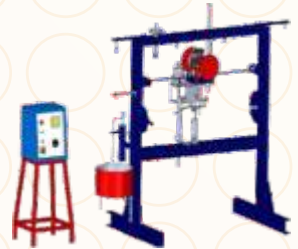
CUT SECTION SINGLE CYLINDER 4 STROKE DIESEL ENGINE

THEORY OF MACHINE LAB

Order Code - 14133 UNIVERSAL VIBRATION APPARATUS

Introduction: The apparatus provided comprehensive unit to perform the vibration experiments. A universal frame is provided upon which quick and easy assembly of various experiments can be done. The unit is self-contained to safely store spares. The students can easily assemble the experiments and study the theory of vibrations practically.

Specifications: Exciter Unit : With FHP DC Motor with Speed Control Facility RPM measurement: Digital RPM Indicator with Proximity sensor. Ordinary Chart recorder: For recording Frequency and Amplitude of Vibration. Stop Watch: Electronic Stop Watch. Instruction Manual : An ENGLISH instruction manual will be provided along with the Apparatus.



Order Code - 14134 CAM ANALYSIS APPARATUS

Introduction: The setup is a motorized unit consisting of a camshaft driven by a variable speed motor. The free end of the camshaft has a facility to mount the cam easily. The follower is properly guided in gunmetal bushes and the type of follower can be changed according to the cam under test.

Specifications: Cam Shaft : Material Stainless Steel Cams: Tangent, Eccentric, Circular Arc, made of hardened alloy – steel. Followers: Roller, Knife edge, Mushroom, made of hardened alloy – steel. Compression Spring : Provided Weights : 1 kg., 500gm, 200 gm & 100gm Motor : Variable speed DC Motor with speed controller Dial Gauge : Baker & Mercer/Standard Make Instruction Manual : An ENGLISH instruction manual will be provided along with the Apparatus



Order Code - 14135 WHIRLING OF SHAFT DEMONSTRATOR

Introduction: The set up is designed to study the whirling of shafts. The set-up consists of a sturdy frame, bearing holders, variable speed motor etc. to drive the shaft along with speed control unit. Different bearing can be fitted in bearing block to have different end conditions i.e. (i) both end fixed, (ii) one end free and one end fixed etc. As the test is destructive, hence the shaft cannot be used again.

Specifications: Test Shafts Length: 1000 mm each. Diameter: 3.2, 4.8 & 6.4 mm (approx.) Quantity: Two each. Kinematic coupling bearing for fixed or free ends without restraint. Drive motor, 5000 rpm, FHP. Supplied with a speed control unit. Instruction Manual: An ENGLISH instruction manual will be provided along with the Apparatus



Order Code - 14136 STATIC & DYNAMIC BALANCING DEMONSTRATOR

Introduction: This equipment is designed for carrying out the experiment for balancing a rotation mass system. The apparatus consists of a stainless steel shaft fixed in a rectangular frame. A set of four blocks with a clamping arrangement is provided. For static balancing, each block is individually clamped on shaft.

Specifications: Drive Motor: FHP Motor, variable speed, with speed controller. Balancing weight: 4 Nos. of Stainless Steel with different sized eccentric mass for Varying unbalance. Rotating Shaft: Material Stainless Steel Instruction Manual: An ENGLISH instruction manual will be provided along with the Apparatus.



Order Code - 14137 MOTORIZED GYROSCOPE

Introduction: The set up consists of stainless steel disc mounted on a horizontal shaft, rotated by a variable speed motor. The rotor shaft is coupled to a motor mounted on a trunion frame having bearings in a yoke frame, which is free to rotate about vertical axis.

Specifications: Disc: Material: Stainless Steel, Dia 300 mm x 10 mm thick precisely balanced which can be rotated in 3 mutually perpendicular axis. Motor: Variable speed of standard make. Supplied with Speed Control Unit. Weights: 2 kg, 1 kg, 500 gms. Stop Watch : Electronic Accurately marked scale & pointer to measure precession rate. Instruction Manual : An ENGLISH instruction manual will be provided along With the Apparatus.



Order Code - 14138 JOURNAL BEARING APPARATUS

Introduction: The apparatus consists of a plain steel shaft excavated in a bearing and directly driven by a FHP Motor. The bearing is freely supported on the shaft and sealed at the motor end. The speed of the motor is controlled by the speed control unit.

Specifications: Exciter Unit : With FHP DC Motor with Speed Control Facility RPM measurement: Digital RPM Indicator with Proximity sensor. Ordinary Chart recorder: For recording Frequency and Amplitude of Vibration. Stop Watch: Electronic Stop Watch. Instruction Manual : An ENGLISH instruction manual will be provided along with the Apparatus.



THEORY OF MACHINE LAB

Order Code - 14139 UNIVERSAL GOVERNOR APPARATUS

Introduction: The set-up is designed to study the working of different governors normally used to control the speed. It consists of a main spindle, mounted vertically on the base plate. This spindle is driven by a variable speed Motor which is also mounted vertically on the same base plate.

Specifications: Spindle : Material Stainless Steel Governor Mechanism : Four different types of governor mechanism with spring and weights. Watt Governor Porter Governor Hartnell Governor Proell Governor Motor: Variable speed, Standard Make, FHP Motor. Control Panel: For speed control of motor. Instruction Manual : An ENGLISH instruction manual will be provided along with the Apparatus.



Order Code - 14140 CORIOLLI'S COMPONENT OF ACCELERATION APPARATUS

Introduction: The set-up is designed to study Coriolli's Component of Acceleration of a slider crank mechanism. Here the mechanical slider system is replaced by a continuous stream of water flowing through a steady rotating pair of tubes. These tubes can be rotated at various speeds by using a swinging field motor which also acts as dynamometer.

Specifications: Water Tank: Made of Stainless Steel Rotating Arms: 9mm/6mm orifice diameter, Length 300 mm. Rota meter: 250 to 2500 LPH Electric Motor: Swinging field, Variable speed. Pump: FHP for water circulation. Control Panel Comprises of: RPM measurement: RPM Indicator with Proximity sensor. Speed Control Unit. Standard make On/Off Switch, Mains Indicator, etc. Instruction Manual: An ENGLISH instruction manual will be provided along with the Apparatus The whole set-up is well designed and arranged in a good quality painted structure.



Order Code - 14141 SLIP & CREEP MEASUREMENT APPARATUS

Introduction: This apparatus is useful for measurement of power transmitted for various input power conditions with varied belt tension. Belt slip or creep also can be measured. The apparatus consists of a variable speed motor, driving pulley and driven pulley of equal diameters.

Specifications: Motor: Variable speed motor, 1HP, 1500 RPM. Pulleys: Driving and driven pulleys of equal diameters (flat pulleys) Loading Arrangement: Brake drum along with spring balance and rope arrangement is provided to load the system. Belts: Flat belts of fixed length of two different belt materials Belt tightening arrangement: Bearing block is sliding and dead weight can be applied to set the initial tension in belt. Speed Indicator: 2 Channel digital speed indicator with switch to change the channel. Instruction Manual: An ENGLISH instruction manual will be provided along With the Apparatus.



Order Code - 14142 EPICYCLIC GEAR TRAIN APPARATUS

Introduction: Gear Train is any combination of gear wheels by which motion is transmitted from one shaft to another shaft. In epicyclic gear trains, the axes of shafts on which the gears are mounted may move relative to a fixed axis. It is a motorized unit consisting of a SUN gear mounted on input shaft.

Specifications: Internal Type Epicyclic Gear Train A Compact gear train (industrial) Motor: Variable speed motor, 1 HP. RPM Measurement: Digital RPM Indicator with proximity switch. Speed Control Unit: Variable Speed Drive for varying the speed of motor. Rope brake arrangement to measure output torque and holding torque. Instruction Manual: An ENGLISH instruction manual will be provided along With the Apparatus.



Order Code - 14143 TRI-FILAR SUSPENSION SYSTEM

Introduction: The present set up consists of MS disc (plate) hanged vertically with the help of nylon rope to another identical disc (Fixed) attached to the frame. Hooks are provided at three equidistant positions to tighten the nylon rope.

Specifications: Disc: material Mild steel, 2 Nos. Size: 300 mm (approx), weights: 200 gms, 500 gms, 0.750 gms Nylon rope: for hanging disc from three ends. An ENGLISH instruction manual will be provided along with the Apparatus. The whole set-up is well designed and arranged on a rigid structure painted with industrial PU Paint.



REFRIGERATION & AIR-CONDITIONING LAB

Order Code - 14144 REFRIGERATION TEST RIG / VAPOUR COMPRESSION CYCLE TRAINER

Introduction: The set up demonstrates the students about the basic principal of a refrigeration cycle. The test rig is designed for the study of thermodynamics of Vapor Compression Refrigeration cycle by way of demonstration and experimentation. It has a facility to measure various parameters for experimentation.

Specifications: Compressor: Hermitically sealed compressor. Capacity 1/3 ton, Kirloskar make. Agitator: Compatible capacity. Condenser: Air cooled compatible to 1/3 ton compressor. Condenser cooling fan: compatible capacity with permanent lubricated motor. Evaporator: Made of Stainless Steel, Insulated with ceramic wool/ P.U.F. Flow Measurement: Using Flow Meter. Expansion Device: Capillary Tube, Compatible Capacity. Pressure Gauges: 02 Nos. Safety Control: Overload and over current protectors for compressor and time delay circuit. Temperature Sensor: RTD PT-100 Type.



Order Code - 14145 AIR CONDITIONER TEST RIG

Introduction: The Air Conditioning Test Rig unit is required to conduct experiments and demonstrate the process of cooling of atmospheric air. The unit will be fitted with all instruments facilities so that temperature, pressure etc. may be measured at different points in the air conditioning system

Specifications: Compressor: Hermitically sealed compressor Capacity: 1 Ton, Kirloskar make. Condenser: Air cooled compatible to 1 Ton compressor. Condenser Cooling fan: Compatible capacity with permanent lubricated motor. Pressure Gauges: 2 Nos. Evaporator: Compatible to 1 Ton, made of copper tube and aluminium fins fitted with compatible capacity fan. Safety Control: over load and over current protection for Compressor with Time delay circuit. Expansion Device: Capillary Tube compatible capacity. Temperature Sensor: RTD PT-100 Type. Temperature Measurement: Digital Temperature Indicator with multi-channel switch.



Order Code - 14146 SPLIT AIR CONDITIONING TEST RIG

Introduction: The Split Air Conditioning Test Rig unit is required to conduct experiments and demonstrate the process of cooling of atmospheric air. The unit will be fitted with all instruments facilities so that temperature, pressure etc. may be measured at different points in the split air conditioning system.

Specifications: Compressor: Hermitically sealed compressor. Capacity 1 Ton, Kirloskar make. Condenser : Air cooled compatible to 1 Ton compressor. Condenser Cooling fan: Compatible capacity with permanent lubricated motor. Pressure Gauges: 2 Nos. Evaporator: Compatible to 1 Ton, made of copper tube and aluminium fins fitted with compatible capacity fan. Safety Control: over load and over current protection for Compressor with Time delay circuit. Expansion Device: Capillary Tube compatible capacity. Temperature Sensor: RTD PT-100 Type. Temperature Measurement: Digital Temperature Indicator with multi-channel switch.



Order Code - 14147 WINDOW AIR CONDITIONING TEST RIG

Introduction: The Air Conditioning Test Rig unit is required to conduct experiments and demonstrate the process of cooling of atmospheric air. The unit will be fitted with all instruments facilities so that temperature, pressure etc. may be measured at different points in the air conditioning system.

Specifications: Compressor: Hermitically sealed compressor. Capacity 1 Ton, Kirloskar make. Condenser: Air cooled compatible to 1 Ton compressor. Condenser Cooling fan: Compatible capacity with permanent lubricated motor. Pressure Gauges: 2 Nos. Evaporator: Compatible to 1 Ton, made of copper tube and aluminium fins fitted with compatible capacity fan. Safety Control: over load and over current protection for Compressor with Time delay circuit. Expansion Device: Capillary Tube compatible capacity. Temperature Sensor: RTD PT-100 Type. Temperature Measurement: Digital Temperature Indicator with multi-channel switch.



Order Code - 14148 AIR WASHER TEST RIG

Introduction: The Air Washer Test Rig unit is required to conduct experiments and demonstrate the process of conditioning of atmospheric air. Various process like humidification, dehumidification, heating and cooling are performed using this apparatus.

Specifications: Water Bath installed with pump of compatible capacity. Refrigeration Unit: For cooling of Water. Compressor: Hermitically sealed compressor, Capacity 1/3 Ton, Emerson Copeland make. Condenser: Air cooled compatible to 1/3 Ton compressor. Condenser Cooling fan: Compatible capacity with permanent lubricated motor. Pressure Gauges: 2 Nos. Directly cooled evaporator of 3/8" diameter, water tank of SS304 of litre capacity Hot and cold water pump Immersion heater of 500W Spray jets with heater arrangement Eliminator of coil or filets AC duct suitable for handling water spray Blower and motor to the capacity Safety Control: over load and over current protection for Compressor with Time delay circuit. Expansion Device: Capillary Tube compatible capacity. Temperature Sensor: RTD PT-100 Type. PID Controller for setting water temperature. Temperature Measurement: Digital Temperature Indicator with multi-channel switch.



REFRIGERATION & AIR-CONDITIONING LAB

Order Code - 14149 AIR COOLER TEST RIG

Introduction: Desert Cooler Trainer works on the principle of evaporative cooling. It is used mostly in the dry hot regions; it consists of a fan which sucks the air from atmosphere through the pads which are used in desert coolers very frequently.

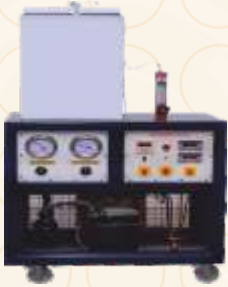
Specifications: Fan connected to 1/2 HP motor. Air Cooler Pump to circulate water. DBT & WBT. Measuring Thermometer at inlet and outlet. Orifice meter with manometer to measure the air flow. Overload Protector With Overload circuit With MCB, A technical manual accompanies the unit.



Order Code - 14150 ICE PLANT TRAINER

Introduction: The unit enables the students to study the Basic Principles of ice plant cycle within a short period. The test rig is designed for the study of thermodynamics of vapour Compression refrigeration cycle by way of demonstration and experimentation.

Specifications: Compressor: Hermetically sealed compressor, Kirloskar make. Tank : The inner tank shall be fabricated out of stainless steel. Condenser : Air cooled compatible to compressor. Condenser Cooling fan : Compatible capacity with permanent lubricated motor. Evaporator: Made of Stainless Steel, Insulated with ceramic wool/puf. Expansion Device: Capillary Tube Compatible capacity. Pressure Gauges: 2 Nos. Safety Control: overload and over current protectors for compressor and Time delay circuit. Temperature Sensor: RTD PT-100 Type. MControl Panel comprises of: Digital Voltmeter: 0-300 V, Digital Ammeter: 0-5 Amp. Temperature Measurement: Digital Temperature Indicator with multi-channel switch.



Order Code - 14151 WATER TO WATER HEAT PUMP

Introduction: Heat Pump and the refrigerating machine basically work on one and the same principle and with the same components. Heat pump is a machine, which delivers heat at a temperature suitable for domestic, Industrial and Commercial purposes.

Specifications: Compressor: Hermetically sealed compressor. Capacity 1/3 Ton, Kirloskar make. Condenser: Water cooled type shell and coil condenser with refrigerant inside the tube. Water flow measurement: Provided with individual rota meters and four temperature Sensor for both condenser and evaporator. Expansion Valve: Capillary Tube, Compatible Capacity. Safety Control: Overload and over current protectors for compressor and Time Delay circuit. Evaporator: Water cooled Compatible capacity. Temperature Sensor: RTD PT-100 Type. Control Panel comprises of: Digital Voltmeter: 0-300 V, Digital Ammeter: 0-5 Amp. Temperature Measurement: Digital Temperature Indicator with multi-channel switch.



Order Code - 14152 AIR TO WATER HEAT PUMP

Introduction: Air-to-water heat pumps use radiators or underfloor heating to heat or cool a whole house and are often also used to provide domestic hot water.

Specifications: Compressor: Hermetically sealed compressor (ISI Mark). Condenser: Air cooled compatible to above compressor, std make. Condenser Cooling Fan: Compatible capacity with permanent lubricated motor. Evaporator (Cold Water: Made of Stainless Steel, Cap. 40 ltrs. Chamber) Insulated with ceramic wool/P.U.F. Expansion Device: Capillary Tube, Compatible Capacity, std make. Pressure Gauges: 2 Nos, std make. Safety Control: overload and over current protectors for compressor and Time delay circuit. Temperature Sensor: RTDPT-100 Type. Refrigerant Flow Measurement: By Rota meter, smack Eureka, Compatible Range. Water Flow Measurement: By Rota meter, make Eureka, Compatible Range. Drier Danfoss make, std make. Control Panel comprises of: Digital Voltmeter: 0-300 V 2Nos. Digital Ammeter: 0-5 Amp. 2Nos. Temperature Measurement: Digital Temperature Indicator with multi-channel switch. Energy meter ISI-Std make.



Order Code - 14153 THERMO-ELECTRIC REFRIGERATION (PELTIER ELEMENT)

Introduction: Peltier elements utilise the thermoelectric effect of some semiconductors. The thermoelectric effect is the reverse of the known thermopower effect which is e.g. used when measuring temperatures using thermocouples. If current flows through a Peltier element, one end of the semiconductor becomes hot and the other cold. By a suitable connection of p- and n-doped semiconductor materials the refrigeration capacity can be increased sufficiently to be usable.

Specifications: Water circulation: Using low flow rate FHP pump. Water Tank: 15-20 L, SS304 Material. Rotameter: For hot side flow and cold side flow. (0-26LPH) PELTIER ELEMENT: 200Watt appx. Temperature Sensor: RTD PT100 type; 5 number.



REFRIGERATION & AIR-CONDITIONING LAB

Order Code - 14154 WATER TO AIR HEAT PUMP

Introduction: Air to Water Heat Pump" uses outdoor air to absorb (or reject) heat depending on the operating mode, heating or cooling.

Specifications: Compressor: Hermetically sealed compressor (ISI Mark). Condenser: Air cooled compatible to above compressor, std make. Condenser Cooling Fan: Compatible capacity with permanent lubricated motor. Evaporator (Cold Water: Made of Stainless Steel, Cap. 40 ltrs. Chamber) Insulated with ceramic wool/P.U.F. Expansion Device: Capillary Tube, Compatible Capacity, std make. Pressure Gauges: 2 Nos, std make. Safety Control: overload and over current protectors for compressor and Time delay circuit. Temperature Sensor: RTDPT-100 Type. Refrigerant Flow Measurement: By Rota meter, smack Eureka, Compatible Range. Water Flow Measurement: By Rota meter, make Eureka, Compatible Range. Drier Danfoss make, std make. Control Panel comprises of: Digital Voltmeter: 0-300 V 2Nos. Digital Ammeter: 0-5 Amp. 2Nos. Temperature Measurement: Digital Temperature Indicator with multi-channel switch. Energy meter ISI-Std make.



Order Code - 14155 AIR TO AIR HEAT PUMP

Introduction: Heat Pump and the refrigerating machine basically work on one and the same principle and with the same components. Heat pump is a machine, which delivers heat at a temperature suitable for domestic, Industrial and Commercial purposes.

Specifications: Compressor: Hermetically sealed compressor. Capacity 1/3 Ton, Kirlosker make. Condenser: air cooled type with fan motor. Expansion Valve: Capillary Tube, Compatible Capacity. Safety Control: Overload and over current protectors for compressor and Time Delay circuit. Evaporator: fin type heat exchange installed in a duct. Temperature Sensor: RTD PT-100 Type. Control Panel comprises of: Digital Voltmeter: 0-300 V Digital Ammeter: 0-5 Amp. Temperature Measurement: Digital Temperature Indicator with multi-channel switch.



Order Code - 14156 ELECTROLUX REFRIGERATOR TEST RIG / VAPOUR ABSORPTION CYCLE TRAINER

Introduction: This set up demonstrates the students about the basic principal of a vapour absorption refrigeration cycle. The test rig designed for the study of thermo dynamics of vapor absorption refrigeration cycle by measuring temperature at different position.

Specifications: Sealed Circuit: The System has no moving parts at all, which makes it Silent and very durable. Refrigerant: Mixture of three fluid system Ammonia (NH₃) + Water (H₂O) + Hydrogen (H₂)

Gases: Non-CEC, Non-HCFC, Non-FCKW, Non-Freon Mode of System: Externally heated by electric resistance Temperature Evaporator: Coil Type evaporator with facility to determine Performance efficiency ratio (PER) Volume of Cabinet: 41 Ltrs., Voltage Input-65Watts, Electrical Consumption/24Hrs.-0.8 kWh, Auto Defrost Fuzzy Logic System, Voltage-Single Phase, 220Volts, AC 50 Hz. Temperature Sensor: RTDPT-100 Type Control Panel comprises of: Digital Voltmeter: 0-300 V Temperature Measurement: Digital Temperature Indicator with multi-channel switch



Order Code - 14157 VORTEX TUBE TRAINER

Introduction: A vortex tube creates cold air and hot air by forcing compressed air through a generation chamber, which spins the air at a high rate of speed (1,000,000 rpm) into a vortex. The high speed air heats up as it spins along the inner walls of the tube toward the control valve.

Specifications: Material of construction of the vortex tube: brass. Brass Tube Arrangement for air flow measurement: Provided. Air flow variation: Valve provided. Temperature measurement: Digital led display provided. Pressure measurement: Dial type pressure gauge provided or manometer. General arrangement: Integral unit mounted on suitable panel. Supply: Compressed air supply at 10 bars. Vortex cooling device Inlet pressure: 5.5bar Air consumption: max. 420L/min Refrigeration capacity: approx. 200W. Minimum temperature: -40°C, Maximum temperature: 110°C, Measuring ranges Temperature: 3x (-50-150°C), Pressure: 0 - 10bar.



Order Code - 14158 CASCADE REFRIGERATION TEST RIG

Introduction: Cascade Refrigeration ISA SYSTEM which employs 2 or more individual refrigeration cycles operating at different temperatures and pressures. This test rig is used to find the COP of individual Refrigeration cycle.

Specifications: High Pressure Side Compressor: Hermetically sealed compressor having cooling capacity of (3/4 ton), Make: Emerson/Kirloskar. Low Pressure Side Compressor: Hermetically sealed compressor having cooling capacity of (1/4 ton), Make: Emerson or Equivalent. Evaporator: Copper Coil immersed in insulated water tank (shell) of stainless steel water tank, Capacity of 75 liters. Agitator: Compatible capacity. Condenser: Air-cooled condenser with copper fins. This is a tube type condenser, FHP fan motor with fan blade is provided. Cascade Condenser: Tube and Tube type Condenser with copper tubes. Expansion device: 2 Nos. Capillary Tube: Diameter: Suitable Material: copper Rota meter: 2 No, for measuring flow rate of liquid refrigerant. Refrigerant: (R-22) & (R-404a). Pressure Gauges: 2 Nos. Control Panel comprises of: Digital Voltmeter: 0-300 V Digital Ammeter: 0-5 Amp. Multipoint Digital Temperature Indicator: 2 No, to measure temperatures at various salient points of the refrigeration cycle. HP/LP cut-out: 2 No. Danfoss or equivalent. Service valve: 4 nos. Brass type. Filter / Drier: 2 nos. Danfoss or equivalent make.



CHEMICAL REACTION ENGINEERING

Order Code - 14159 CONTINUOUS STIRRED TANK REACTOR

Introduction: This set-up is used to study a non-catalytic homogeneous second order liquid phase reaction under ambient condition. The set up consists of two feed tanks through which two reactants are fed to the reactor. Rota meters are provided to measure the individual flow of Chemicals.

Specifications: Reactor: Material Stainless Steel, Capacity 2 Ltr (Approx).Stirrer: Stainless Steel Impeller and shaft coupled with FHP Motor. Feed Tank (2Nos.): Material Stainless Steel, Capacity - 20 Ltrs, Feed Circulation: By compressed air. Flow Measurement: Rota meter 2Nos. (one each for Reactants).Piping: Stainless Steel and PVC. Pressure Regulator: 0-2 Kg/cm²,Pressure Gauge: Bourdon type 0-2 Kg/cm²,Stop Watch: Electronic. The whole set-up is ingeniously designed and schematically arranged on a powder-coated rigid structure.



Order Code - 14160 ISOTHERMAL CONTINUOUS STIRRED TANK REACTOR (ISOTHERMAL C.S.T.R)

Introduction: In an ideal CSTR (i.e. an ideal steady state flow reactor) the contents in reactor are well mixed and have uniform composition throughout. Thus the exit stream has the same composition as the fluid within the reactor. This type of REACTOR is known as mixed flow reactor.

Specifications: Reactor: Material Stainless Steel, Capacity 2 Ltrs. (Approx).Water Bath: Material Stainless Steel, Double wall, insulated with Ceramic Wool Heater: Nichrome wire Heater.Stirrer (2Nos.): Stainless Steel Impeller and shaft coupled with FHP motor.(One each for Water Bath and Reactor).Feed Tank (2Nos.): Material Stainless Steel, Capacity - 20 Ltrs.Feed Circulation: By compressed air.Flow Measurement: Rotameter 2 Nos. one each for Reactants.Piping: Stainless Steel and PVC.Pressure Regulator: 0-2 Kg/cm².Pressure Gauge: Bourdon type 0-2 Kg/cm².Stop Watch: Electronic.



Order Code - 14161 CASCADE CONTINUOUS STIRRED TANK REACTOR (CASCADE C.S.T.R)

Introduction: In an ideal CSTR (i.e. an ideal steady state flow reactor) the contents in reactor, this set-up are used to study a non-catalytic homogeneous second order liquid phase reaction under ambient condition. The setup consists of three CSTR arranged in series and two feed tanks through which two reactants are fed to the reactor.

Specifications: Reactor (3Nos.): Material Stainless Steel, Capacity 1Ltr. (Approx).Stirrer (3Nos.): Stainless Steel Impeller and shaft coupled with FHP Motor.Feed Tank (2Nos.): Material Stainless Steel, Capacity - 20Ltrs.Feed Circulation: By compressed air.Flow Measurement: Rotameter 2 Nos. (one each for Reactants).Piping: Stainless Steel and PVC.Pressure Regulator: 0-2 Kg/cm². Pressure Gauge: Bourdon type 0-2 Kg/cm².Stop Watch: Electronic.The whole set-up is ingeniously designed and schematically arranged on a powder-coated rigid structure.



Order Code - 14162 R.T.D STUDIES CONTINUOUS STIRRED TANK REACTOR (CASCADE C.S.T.R)

Introduction: Real reactors do not satisfy the idealized flow patterns, back mix flow or plug flow deviation from ideality can be due to channeling of fluid through the vessel, recycling of fluid within the vessel or due to the presence of stagnant region or pockets of fluid in the vessel.

Specifications: Reactor: Material Stainless Steel, Capacity 2Ltrs. (approx.)Stirrer: Material Stainless Steel Impeller and shaft coupled with FHP motor Feed Tank: Material Stainless Steel, Capacity - 20Ltrs.Feed Circulation: By compressed air.Flow Measurement: Rota meter.Piping: Stainless Steel and PVC.Pressure Regulator: 0-2 Kg/cm².Pressure Gauge: Bourdon type 0-2 Kg/cm².Stop Watch: Electronic.The whole set-up is ingeniously designed and schematically arranged on a powder-coated rigid structure.



CHEMICAL REACTION ENGINEERING

Order Code - 14163 PLUG FLOW TUBULAR REACTOR

(STRAIGHT TUBE TYPE)

Introduction: In an ideal Plug Flow Reactor (PFTR) there is no mixing in the direction of flow and complete mixing perpendicular to direction of flow. Concentration of reactants varies along the length of reactor but not in radial direction. This set-up is used to study a non-catalytic homogeneous reaction under ambient condition.

Specifications: Reactor: Material Borosilicate Glass, OD-32mm, ID-25mm, Length-1200mm. Feed Tank (2Nos.): Material Stainless Steel, Capacity - 20Ltrs. Feed Circulation: By compressed air. Flow Measurement: Rotameter 2 Nos. (One each for Reactants). Piping: Stainless Steel and PVC. Pressure Regulator: 0-2 Kg/cm². Pressure Gauge: Bourdon type 0-2 Kg/cm². Stop Watch: Electronic. The whole set-up is ingeniously designed and schematically arranged on a powder-coated rigid structure.



Order Code - 14164 PLUG FLOW TUBULAR REACTOR

(COILED TUBE TYPE)

Introduction: The set up consists of two feed tanks through which two reactants are fed to the reactor. Rotameters are provided to measure the individual flow of Chemicals. The flow rate can be adjusted by operating the needle valves provided on respective Rota meter.

Specifications: Reactor: Material Stainless Steel, OD-16mm, ID-13mm approx. Feed Tank (2Nos.): Material Stainless Steel, Capacity - 20 Ltrs. Feed Circulation: By compressed air. Flow Measurement: Rotameter 2 Nos. (one each for Reactants). Piping: Stainless Steel and PVC. Pressure Regulator: 0-2 Kg/cm². Pressure Gauge: Bourdon type 0-2 Kg/cm². Stop Watch: Electronic. The whole set-up is ingeniously designed and schematically arranged on a powder-coated rigid structure.



Order Code - 14165 ISOTHERMAL PLUG FLOW TUBULAR REACTOR (COILED TUBE TYPE)

Introduction: In an ideal Plug Flow Reactor (PFTR) there is no mixing in the direction of flow and complete mixing perpendicular to direction of flow. Concentration of reactants varies along the length of reactor but not in radial direction.

Specifications: Reactor: Material Stainless Steel, Capacity 0.7 Ltrs. (approx) (Helical Coiled Tube Type) Water Bath: Material Stainless Steel, Double wall, insulated with Ceramic Wool. Heater: Nichrome wire Heater Stirrer (Water Bath): Material SS Impeller and shaft coupled with FHP motor Feed Tank (2Nos.): Capacity - 20 Ltrs. Feed Circulation: By compressed air. Flow Measurement: Rotameter 2Nos. one each for Reactants Piping: Stainless Steel and PVC. Pressure Regulator: 0-2 Kg/cm² Pressure Gauge: Bourdon type 0-2 Kg/cm² Stop Watch: Electronic. The whole set-up is ingeniously designed and schematically arranged on a powder-coated rigid structure.



Order Code - 14166 R.T.D STUDIES IN PLUG FLOW TUBULAR REACTOR (COILED TUBE TYPE)

Introduction: Real reactors do not satisfy the idealized flow patterns, back mix flow or plug flow deviation from ideality can be due to channeling of fluid through the vessel, recycling of fluid within the vessel or due to the presence of stagnant region or pockets of fluid in the vessel.

Specifications: Reactor: Material Stainless Steel, Capacity 0.7 Ltrs. (Approx) (Helical Coiled Tube Type) Feed Tank: Material Stainless Steel, Capacity - 20 Ltrs. Feed Circulation: By compressed air. Flow Measurement: Rotameter. Piping: Material Stainless Steel and PVC. Pressure Regulator: 0-2 Kg/cm² Pressure Gauge: Bourdon type 0-2 Kg/cm² Stop Watch: Electronic The whole set-up is ingeniously designed and schematically arranged on a powder-coated rigid structure.



CHEMICAL REACTION ENGINEERING

Order Code - 14167 COMBINED FLOW REACTOR

Introduction: This set-up is used to study a non-catalytic homogeneous second order liquid phase reaction under ambient condition in a combined reactor. It consists of two reactors connected in series, one is plug flow reactor and another mixed flow reactor. In an ideal Plug Flow Reactor (PFTR) there is no mixing in the direction of flow and complete mixing perpendicular to direction of flow.

Specifications: 1st Reactor: Material Stainless Steel, Capacity 0.7 Ltrs. (approx) 2nd Reactor: Material Stainless Steel, Capacity 2 Ltrs (Approx). Stirrer for MFR: Stainless Steel Impeller and shaft coupled with FHP motor Remi/Eltek make. Feed Tank (2Nos.): Material Stainless Steel, Capacity - 20 Ltrs. Feed circulation: By compressed air. Flow Measurement: Rotameter 2 Nos. (one each for Reactants) Eureka/IEPL make. Piping : Stainless Steel and PVC Pressure Regulator: 0-2 Kg/cm² Janetics/Shavo Norgren make. Pressure Gauge: Bourdon type 0-2 Kg/cm² Mass/Pricol make. The whole set-up is ingeniously designed and schematically arranged on a powder-coated rigid structure.



Order Code - 14168 ISOTHERMAL BATCH REACTOR

Introduction: A batch reactor is a closed system with no input and output streams. A batch reactor can operate under conditions like Isothermal (Temperature of Reaction Mass remains constant), perfectly mixed (composition of reaction mixture is uniform throughout), and constant volume (volume of the reaction mixture within the reactor remains constant, there is no appreciable change in the density of reaction mass).

Specifications: Reactor: Material Stainless Steel, Volume- 1 Ltrs. (Approx.) Water Bath: Material Stainless Steel, Double wall, insulated with Ceramic Wool. Heater: Nichrome wire Heater Stirrer (2 Nos.): Stainless Steel Impeller and shaft coupled with FHP motor. Stop Watch: Electronic Temp. Sensor: RTD PT-100 type. The whole set-up is ingeniously designed and schematically arranged on a powder-coated rigid structure.



Order Code - 14169 ISOTHERMAL SEMI BATCH REACTOR

Introduction: An isothermal semi-batch reactor is a semi-closed system with one input stream. It is operated under conditions like Isothermal (Temperature of Reaction Mass remains constant) and perfectly mixed (composition of reaction mixture is uniform throughout). This set-up is used to study a non-catalytic homogeneous reaction under isothermal condition.

Specifications: Reactor: Material Stainless Steel, Capacity 3 Ltrs. (approx). Water Bath: Material Stainless Steel, Double wall, insulated with Ceramic Wool. Heater: Nichrome wire Heater Stirrer: Material Stainless Steel Impeller and shaft coupled with FHP motor Feed Tank (1Nos.): Material Stainless Steel, Capacity - 20 Ltrs. Feed Circulation: By compressed air. Flow Measurement: Rota meter. Piping: Material Stainless Steel and PVC. Pressure Regulator: 0-2 Kg/cm² Pressure Gauge: Bourdon type 0-2 Kg/cm² Stop Watch: Electronic Temp. Sensor: RTD PT-100 type. The whole set-up is ingeniously designed and schematically arranged on a powder-coated rigid structure.



Order Code - 14170 PACKED BED REACTOR

Introduction: The setup consists of a glass column packed with Ranche Rings and two feed tanks. Reactants are fed to the reactor through liquid distributor, fitted at the bottom of the column. Rota meters are provided to measure the individual flow of Chemicals. The flow rate can be adjusted by operating the needle valves provided on respective Rotameter.

Specifications: Reactor: Material Stainless Steel, Capacity 3 Ltrs. (approx). Water Bath: Material Stainless Steel, Double wall, insulated with Ceramic Wool. Heater: Nichrome wire Heater Stirrer: Material Stainless Steel Impeller and shaft coupled with FHP motor Feed Tank (1Nos.): Material Stainless Steel, Capacity - 20 Ltrs. Feed Circulation: By compressed air. Flow Measurement: Rota meter. Piping: Material Stainless Steel and PVC. Pressure Regulator: 0-2 Kg/cm² Pressure Gauge: Bourdon type 0-2 Kg/cm² Stop Watch: Electronic Temp. Sensor: RTD PT-100 type. The whole set-up is ingeniously designed and schematically arranged on a powder-coated rigid structure.



CHEMICAL REACTION ENGINEERING

Order Code - 14171 R.T.D. STUDIES IN PACKED BED REACTOR

Introduction: Axial diffusion and dispersion of fluid in packed beds are important for design and operation of separation equipment and Chemicals reactors. The tracer technique, the most widely used method for the study of axial dispersion. In stimulus response experimentation, we perturb the system using pulse input of tracer and then see how the system reacts or responds to this stimulus.

Specifications: Reactor Column: Material Borosilicate Glass Packing: Rasching Rings, Material Borosilicate Glass, Size 8-10mm (approx) Feed Tank: Material Stainless Steel, Capacity - 20 Ltrs. Feed Circulation: By compressed air. Flow Measurement: Rotameter. The whole set-up is ingeniously designed and schematically arranged on a powder-coated rigid structure.



Order Code - 14172 ADIABATIC BATCH REACTOR

Introduction: An adiabatic batch reactor is a closed system with no input and output streams. This reactor is operated under conditions like adiabatic (Temperature of Reaction Mass keep on changing), perfectly mixed (composition of reaction mixture is uniform throughout), and constant volume (volume of the reaction mixture within the reactor remains constant, there is no appreciable change in the density of reaction mass).

Specifications: Reactor: Material Stainless Steel, Capacity 1Ltrs. (Approx) Insulated with Ceramic wool. Stirrer: Teflon Impeller and Stainless Steel shaft coupled with FHP motor. Temperature Sensors: RTD PT-100 type. The whole set-up is ingeniously designed and schematically arranged on a powder-coated rigid structure.



Order Code - 14173 LIQUID PHASE CHEMICAL REACTOR

Introduction: Present set-up consists of a reactor vessel fitted with variable speed agitator and detachable baffles. This unit is designed to study chemical kinetics. Reactants are fed to the reactor, using pump and flow is regulated and monitored by individual Rota meter.

Specifications: Reactor Material: Acrylic/SS/Glas Capacity: Adjustable from 1 – 2 Ltrs Agitator: Variable speed with speed control facility 0-150 RPM Impeller: 4 Square bladed (1 No.) Material: Stainless Steel. Baffles: Detachable. Piping: PVC. Feed Tank (2 Nos.) Material : Acrylic/Stainless Steel/PVC Capacity: 20Ltrs. Each Discharge Tank: One No. Material: PVC Capacity: 40Ltrs. Water Bath: Material stainless steel 304 Grade, Double wall insulated with ceramic wool Heater: Nichrome wire Heater Pumps (3 Nos.): 2 Nos. for Chemical, 1 No. for hot water circulation. The whole set-up is ingeniously designed and schematically arranged on a powder-coated rigid structure.



Order Code - 14174 KINETICS OF DISSOLUTION OF BENZOIC ACID

Introduction: The setup consists of a Reactor in which solid cylinder of Benzoic Acid is placed and water is stirred by means of a variable speed mixer. Baffles are also provided. The Reactor is made of Stainless Steel. A Peltizer is provided to make the solid cylinder of size 1" diameter and 2" height of Benzoic Acid.

Specifications: Chamber: Material Stainless Steel, Capacity 1 Ltrs. (approx) Peltizer: 1" Diameter, 2" Height (approx). Stirrer: Material Stainless Steel Impeller and shaft coupled with FHP motor The whole unit is assembled rigidly on a base plate and mounted on a stand. Stop Watch 1 Spanner OJDE 30-32-1 The whole set-up is ingeniously designed and schematically arranged on a powder-coated rigid structure.



Order Code - 14175 HYDRODYNAMICS OF TRICKLE BED REACTOR

Introduction: The set-up consists of a glass column. Arrangement is made for changing the glass column conveniently and filling it with any type of packing required. Air from a regulated pressure vessel passes through a sparker and allowed to enter in the column at the top.

Specifications: Packed Bed : Material Borosilicate Glass Dia. 80mm, Height 600mm Packing's : Glass Beads Dia. 3mm/Rasching Rings, size 8-10mm Flow measurement: Rotameter one each for water and air. Liquid Feed Tank: Material Stainless Steel Capacity 60 Ltrs. Feed Circulation: Centrifugal Pump capacity ¼ HP Crompton/Sharp make. Air Tank: Compatible Capacity. Pressure Regulator (2 Nos.): 1. Operating range 0-2 kg/cm² and 0-10 Kg/cm² Pressure Gauge: Bourdon Type. Mixing Chamber: Material Stainless Steel of Compatible Capacity for Air & Water. Liquid Catch Pot: Material Stainless Steel of Compatible Capacity. Solenoid Valve: 2 Nos. (One each at Liquid and air inlet). Manometers: Compatible capacity. Piping: Material Stainless Steel and PVC. ½" Line size.



CHEMICAL REACTION ENGINEERING

Order Code - 14176 UV-PHOTO REACTOR

Introduction: The set-up is used to study a photo/photocatalytic reaction using a UV source provided in the form of a UV tube. This set-up can be used to carry out a parameter study under batch/continuous flow condition. A photo catalyst like TiO₂ can be used.

Specifications: UV Source : 30 W / 16 W Reactor: With inside reflective surface. Effective volume of reactor 1.5 Ltrs. Feed Tank: Material Stainless Steel, Capacity 5 Ltrs. Feed circulation: Magnetic Pump made of Polypropylene. Maximum working temperature is 80°C. Flow Measurement : Rotameter Sampling points are provided at inlet & outlet of reactant line. The whole set-up is ingeniously designed and schematically arranged on a powder-coated rigid structure.



Order Code - 14177 RECYCLE BED REACTOR

Introduction: The setup consists of catalyst packed column of Stainless Steel. Reactant from a feed tank is fed to the reactor through liquid distributor, fitted at one end of the column. Some part of product is recycled to the reactor using a low capacity sophisticated pump or by over head tank system.

Specifications: Packing : Catalyst (Fluid Bed Type) Feed Tank (1Nos.): Material Stainless Steel, Capacity - 20Ltrs. Flow Measurement: Rota meter 2Nos. (One each for feed & recycled product). Piping: Stainless Steel and PVC. Size ¼" Feed Circulation: Magnetic Pump of Polypropylene. Hot water tank: Made of Stainless steel, Double wall, insulated with Ceramic Wool. Capacity 10-15ltrs. Hot water Circulation: Magnetic Pump of Polypropylene to circulate hot (in outer Jacket) Water maximum working temp. 85° C The whole set-up is ingeniously designed and schematically arranged on a powder-coated rigid structure.



Order Code - 14178 SPINNING BASKET REACTOR

Introduction: Any catalytic liquid-liquid or liquid-gas reaction involving the use of a catalyst placed in basket can be studied in this set-up. Kinetic parameter of a specific reaction can be estimated & parametric studies can be conducted. The set-up consists of a reactor centrally having one spinning basket derived through a variable speed motor.

Specifications: Reactor vessel: material stainless steel, Effective volume : 1000ml, Basket: material stainless steel, capacity-10ltrs. Drive for basket: dc motors with thyristor controlled dc drive for variable speed. Packing: catalyst. Feed tank: material stainless steel, capacity-10 ltrs. Flow measurement: rota meter. Pressure regulator: operating range 0-2kg/cm². Pressure gauge : bourdon type 0-2kg/cm² standard make Receiver: material stainless steel, capacity 10ltrs. Stainless steel pvc. Piping: magnetic pump of polypropylene to circulate hot. Hot water circulation: water maximum working temp. 85° c made of stainless steel, double wall insulated (in outer jacket) with ceramic wool. Capacity: 10-15 ltrs. Hot water tank: nichrome wire heater 750-1000 w approx.



Order Code - 14179 EMULSION POLYMERISATION SET-UP

Introduction: The set-up is used to carry out the emulsion polymerization involving polymerization of an unsaturated monomer like Styrene. Emulsion is of the type: oil in water, monomer is oil soluble & the initiator is water-soluble & an emulsifier is used to create a stable emulsion.

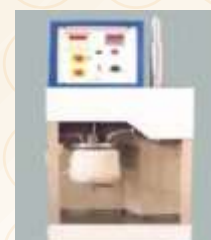
Specifications: Reactor: Material Stainless Steel, Total volume of Reactor 1.5 - 2 Ltrs. (approx.) Agitator : Material Stainless Steel Impeller (2 paddles) fitted with Stainless Steel Shaft coupled to DC Motor with Thyristor controlled DC Drive. Flow Measurement: Rota meter for Nitrogen Gas. De-Oxygenation Column : Compatible capacity. Hot Water Tank: Material Stainless Steel, Double Wall, insulated with ceramic wool. Hot water circulation: Magnetic Pump made of Polypropylene. Maximum working temperature is 80°C. Heaters: Nichrome wire heater. Initiator Reservoir: Capacity 25-50. Temperature sensors : RTD PT-100 type 5 Nos. The whole set-up is ingeniously designed and schematically arranged on a powder-coated rigid structure.



Order Code - 14180 CONDENSATION POLYMERISATION SET-UP

Introduction: Condensation Polymerization kettle is used to carry out a condensation polymerization reaction under batch condition. Polymerization reaction can be acid catalyzed or self-catalyzed. The set-up can be used to measure the extent of reaction & also the reaction rate constant.

Specifications: Condenser : 18 long 1., Concentric tube type Reactor: Material Stainless Steel, Volume- 1 Ltrs. (Approx.) Water Bath: Material Stainless Steel, Double wall, insulated with Ceramic Wool. Heater: Nichrome wire Heater Stirrer (2 Nos.): Stainless Steel Impeller and shaft coupled with FHP motor. Stop Watch: Electronic Temp. Sensor: RTD PT-100 type, The whole set-up is ingeniously designed and schematically arranged on a powder-coated rigid structure.



MOMENTUM TRANSFER LAB

Order Code - 14181 PRESSURE DROP THROUGH PACKED BED

Introduction: The set-up consists of a glass column packed with packing material i.e. Rasching rings, SS mesh to support the packing and with calming section. Pressure drop across packed bed can be measured by a manometer.

Specifications: Packed Column : Material Borosilicate Glass with both end made of Stainless Steel. Packing : Material Borosilicate Glass Rasching rings Size 8-10mm approx. Water tank : Material Stainless Steel, Capacity 30 Ltrs. Water Circulation : FHP Pump Crompton/Sharp make. Flow Measurement: Rotameter for water Pressure Drop Measurement : By Manometer.



Order Code - 14182 HYDRODYNAMICS OF PACKED BED

Introduction: The set up is capable to study the loading and flooding characteristics. It is a packed column packed with Rasching Rings where the Air is counter currently fed to the column. Liquid holdup in the column increases the weight of column and also reduces the effective porosity of packing.

Specifications: Packed Column: Material Borosilicate Glass and Stainless Steel. OD 50 mm (approx.), Length 750 mm (approx.) Packing : Material Borosilicate Glass Rasching rings Size 8-10 mm (approx.) Water tank: Material Stainless Steel, Capacity 30 Ltrs. Water Circulation: FHP Pump. Flow Measurement: Rotameters 2 Nos. (one each for air and water) Pressure. Drop Measurement : By Manometer.

Order Code - 14183 FLUIDIZED BED CHARACTERISTICS

Introduction: The set up is capable to study the loading and flooding characteristics. It is a packed column packed with Rasching Rings where the Air is counter currently fed to the column. Liquid holdup in the column increases the weight of column and also reduces the effective porosity of packing.

Specifications: Column: Material Borosilicate Glass. Packing : Glass Beads, Water tank : Material Stainless Steel, Capacity 30Ltrs. Water Circulation : FHP Pump, Crompton make. Flow Measurement : Rota meter for water, Pr. Drop Measurement : By Differential Manometer. An ENGLISH instruction manual consisting of experimental procedures, block diagram etc.



Order Code - 14184 FIXED & FLUIDIZED BED APPARATUS

Introduction: The set up consists of 3 glass columns. One column is provided with glass beads for fluidization study. Two columns are packed with different packing's, i.e. one filled with Rasching Rings and other one is filled with barrels saddle. Pressure drop can be measured by manometer.

Specifications: Column: Material Borosilicate Glass (3 Nos.) Packing: Glass Beads, Rasching rings, Barrel saddle (for each of the column) Water tank: Material Stainless Steel, Capacity 30Ltrs. Water Circulation: FHP Pump, Crompton make. Flow Measurement: Rota meter for water. Pr. Drop Measurement: By Differential Manometer An ENGLISH instruction manual consisting of experimental procedures, block diagram etc. will be provided along with the Apparatus. The whole set- up is well designed and arranged on a rigid structure painted with industrial PU Paint.



Order Code - 14185 FLOW THROUGH HELICAL COIL

Introduction: Helical coils are used for heating or cooling in process tanks. When a fluid flows through a curved tube, centrifugal force acting upon the various elements of fluid moving with different velocities causes secondary circulation.

Specifications: Helical Coil: Material Stainless Steel Dia – 12". No. of Turns : 14. Coil Tube Dia : OD 21mm, ID 16mm (Approx.) Sump Tank : Material Stainless Steel, Capacity 50 Ltrs. Water Circulation : FHP Pump, Crompton/Sharp make. Pressure Drop Measurement: By Manometer. Flow measurement: Rotameter. Piping : GI and PVC.



Order Code - 14186 DRAG CO-EFFICIENT APPARATUS

Introduction: The apparatus has been designed to introduce students to the fundamental characteristics of the behaviour of the particle system, in particular the relationship between the drag coefficient of falling particles and Reynolds number.

Specifications: Tubes: Material Borosilicate Glass tube (3 Nos.) Gate Valves : 6 Nos. (2 Nos. on each Tube) Stop Watch : Electronic. Steel and glass balls of different sizes will be provided. The set-up tube light arrangement for visualization.

MECHANICAL OPERATION LAB

➡ SIZE REDUCTION

Order Code - 14187 JAW CRUSHER

Introduction: Jaw Crusher is designed to speed up the crushing of aggregates, ores, minerals, coke, chemicals and others similar materials. It is compact and of rugged construction for general laboratory or small pilot plant operations. The set-up contains two Jaws of hard steel with one Jaw stationary and other moving.

Specifications: Jaw: Size 100 x 150mm. Feed Hopper: Suitable capacity. Feed Size : 50mm (approx.) Product Discharge Size : 5mm to 15mm. Drive : Electric motor, 3 HP, Single phase. Control Panel Comprises of: Energy measurement: Electronic Energy meter. Starter: 3 HP, Single Phase. MCB: For overload protection. Instruction Manual : An ENGLISH instruction manual will be provided along with the Apparatus. The whole set-up is well designed and arranged in a good quality painted structure.



Order Code - 14188 ROLL CRUSHER

Introduction: The Lab setup is used to crush different sample and material. Two heavy Smooth faced chilled metal rolls turning on parallel horizontal axes are the working elements of the roll crusher. A hopper is provided at the top for feeding the material.

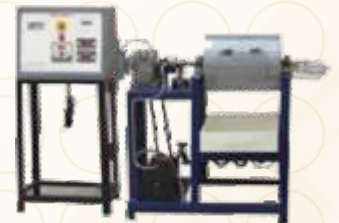
Specifications: Rolls: Material Chilled Steel, Dia. 200mm, Width 100mm. (approx.) Drive: 2 HP motor coupled with Reduction Gear Box to give 48-70 RPM. Feed Hopper: Suitable capacity. Max feed Size: 6-8mm. Product Size: 1-2mm. Control Panel Comprises of: Energy Measurement: Electronic energy meter. Starter : 2 HP, Single Phase, MCB: For overload protection. Instruction Manual: An ENGLISH instruction manual will be provided along with the Apparatus. The set-up is fitted with required guards and product collection tray. The whole set-up is well designed and arranged in a good quality painted structure.



Order Code - 14189 BALL MILL

Introduction: Ball Mills are horizontal rotating cylindrical steel chamber of half filled with steel balls. The size reduction is accomplished by the impact of balls as they fall back after being lifted by the baffles fitted in the rotating chamber. Ball Mill is fitted on a sturdy MS frame.

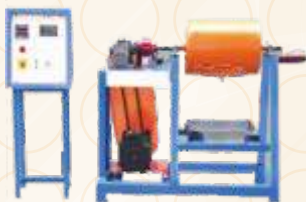
Specifications: Ball Mill: Material MS Dia 275mm, Length 350mm. Thickness 5 mm. Discharge Chute : Suitable size. Feed Size : 6 mm (approx.) Product Size : 200 mesh (approx.) Drive : ½ HP, variable speed motor and Drive, coupled to Reduction Gearbox. Product receiver : Material Stainless Steel of suitable size. Revolution Counter : Mechanical type. Control Panel Comprises of: Energy measurement : Electronic Energy meter RPM Measurement: Digital RPM Indicator, Non Contact type with Proximity sensor. Instruction Manual : An ENGLISH instruction manual will be provided along with the Apparatus The set-up is fitted with required guards. The whole set-up is well designed and arranged in a good quality painted structure.



Order Code - 14190 ROD MILL

Introduction: Rod Mills are horizontal rotating cylindrical steel chamber of half filled with steel rods of length slightly less than the length of chamber. The rods are of different diameter. The size reduction is accomplished by the impact of rods as they fall back after being lifted by the rotating chamber.

Specifications: Rod Mill: Material MS. Dia 275mm, Length 350mm. Thickness 5 mm. Discharge Chute : Suitable size. Drive : ½ HP motor coupled to Reduction Gearbox & 3 step pulley to get 40, 50 and 60 RPM (Approx.) Revolution Counter : Mechanical type. Product receiver : Material Stainless Steel of suitable size. Control Panel Comprises of: Energy Measurement: Electronic Energy meter. MCB: For overload protection. Standard make on/off switch, Mains Indicator etc. Instruction Manual: An ENGLISH instruction manual will be provided along with the Apparatus The set-up is fitted with required guards. The whole set-up is well designed and arranged in a good quality painted structure.



Order Code - 14191 HAMMER MILL

Introduction: Hammer mill consists of Pivoted hammers, mounted on a horizontal shaft. Crushing takes place by impact between the hammers and anvil plate.

Specifications: Hammer Mill Housing: Material Stainless Steel, Dia 145mm, Depth 75mm. Feed Size: 6mm approx. Product Size: 60 - 150 mesh approx. Hammers: Material Stainless Steel, Size 55mm x 15mm. Anvil Plate: Material Stainless Steel, Teethed Semi-circular. Hopper: Material Stainless Steel with discharge control arrangement. Discharge Chute: Suitable size. Drive: 2 HP Crompton motor (Three Phase) Product Receiver: Material Stainless Steel of suitable size. Starter: 2 HP Crompton make.



MECHANICAL OPERATION LAB

➡ SCREENING

Order Code - 14192 VIBRATING SCREEN

Introduction: Vibrating screens are those, which rapidly vibrates with small amplitude, are less likely to blind than gyrating screens. The vibrations may be generated mechanically or electrically. Mechanical vibrations are usually transmitted from high-speed eccentrics to the casing of the unit and from there to inclined screens.

Specifications: Vibrating Screen (3 Nos.): Width 380mm, Length 600mm. Mesh: Size-12.7mm, 9.5mm and 6.3mm (Approx.) Drive: Eccentric shaft coupled to motor Feed Hopper: Compatible Capacity with arrangement to control feed. Collecting bins: 4 Nos. of suitable capacity. Control panel Comprises of: Standard make On/Off switch, Mains Indicator etc. Instruction Manual : An ENGLISH instruction manual will be provided along with the Apparatus A good quality painted rigid MS Structure is provided to support all the parts.



Order Code - 14193 TROMMEL

Introduction: Trammel or revolving screens consists of a cylindrical screen rotated about its axis. Simple Trammel may be arranged in series with oversize of the first passing to the second Trammel and the oversize of the second passing to the third, etc.

Specifications: Raw Material for Feed. Electric Supply: Single phase, 220 V AC, 0.5 kW. Floor Area 2 m x 1 m. Weighing Balance. Trammel: Dia. 200-mm, Length 750-mm (approx.) Sieves: 3 different mesh size. Drive for Trammel : FHP motor coupled to a Reduction Gearbox & 3 step pulley to get different RPM. Feed Hopper: Compatible Capacity with arrangement to control feed. Collecting bins : 4 Nos. of suitable capacity. Special arrangement for changing the angle of inclination. Control panel Comprises of: Standard make On/Off switch, Mains Indicator etc. Instruction Manual : An ENGLISH instruction manual will be provided along with the Apparatus. A good quality painted rigid MS Structure is provided to support all the parts.



Order Code - 14194 ROTAP SIEVE-SHAKER

Introduction: The rotap sieve shaker reproduces the circular and tapping motion given to test sieves in hand sieving. The uniform, mechanical action ensures accurate and dependable test. Using the regular height 20-cm diameter sieves, one sample can be tested on a series of six sieves of different openings, all with one operation of machine.

Specifications: Sieve assembly : Compatible to sieves of 20-cm dia. (for 6-7 sieves) Drive: By ½ HP motor Control Panel comprises of : Standard make on off switch, Mains Indicator etc. Special arrangement for setting time for shaking. An ENGLISH instruction manual consisting of experimental procedures, block diagram etc. will be provided along with the Apparatus The whole set-up is well designed and arranged on a rigid structure painted with industrial PU Paint.



Order Code - 14195 GYRATORY SIEVE SHAKER

Introduction: Gyratory type shaker is driven by FHP motor through a reduction gear suitable to carry upto 7 sieves of 15 cm or 20 cm diameter. When clamped the sieve table does not rotate but it is inclined from the vertical axis and the direction of inclination changes progressively in the clockwise direction.

Specifications: Sieve assembly : Compatible to sieves of 20-cm dia. (for 6-7 sieves) Drive : By ½ HP motor Control Panel comprises of : Standard make on off switch, Mains Indicator etc. Special arrangement for setting time for shaking. An ENGLISH instruction manual consisting of experimental procedures, block diagram etc. will be provided along with the Apparatus The whole set-up is well designed and arranged on a rigid structure painted with industrial PU Paint.



Order Code - 14196 TEST SIEVES

Introduction: Gyratory type shaker is driven by FHP motor through a reduction gear suitable to carry upto 7 sieves of 15 cm or 20 cm diameter. When clamped the sieve table does not rotate but it is inclined from the vertical axis and the direction of inclination changes progressively in the clockwise direction.

Specifications: Sieve assembly : Compatible to sieves of 20-cm dia. (for 6-7 sieves) Drive : By ½ HP motor Control Panel comprises of : Standard make on off switch, Mains Indicator etc. Special arrangement for setting time for shaking. An ENGLISH instruction manual consisting of experimental procedures, block diagram etc. will be provided along with the Apparatus The whole set-up is well designed and arranged on a rigid structure painted with industrial PU Paint.



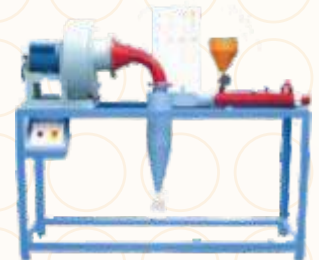
MECHANICAL OPERATION LAB

SEPARATION

Order Code - 14197 CYCLONE SEPARATOR

Introduction: A Cyclone Separator is a vertical cylinder with the inlet stream introduced tangentially near the top, giving the suspension a spinning rotation in the cylinder. The centrifugal force acting on the particles tends to throw them radically to the sides of the cylinder as they spiral downward to a conical bottom where they are removed.

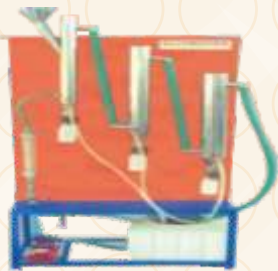
Specifications: Weighing Balance. Cyclone Separator: Material Stainless Steel, Dia 100mm. Solid Discharge Silo: Material Stainless Steel, suitable capacity with Discharge control valve. Blower: ID Fan Blower with 1 HP provided motor. Air flow measurement: Flow meter with manometer. Solids Collector: Transparent PVC container fixed with Cyclone. Fine Dust Collector: Bag of Nylon cloth fixed on exit of air. Control panel Comprises of: Standard make On/Off switch, Mains Indicator etc. Instruction Manual: An ENGLISH instruction manual will be provided along With the Apparatus. A good quality painted rigid MS Structure is provided to support all the parts.



Order Code - 14198 ELUTRIATOR

Introduction: An Elutriator is vertical tube through which a fluid passes upwardly at a specific velocity while a solid mixture, whose separation is desired, is fed into the top of the column. The large particles, which settle at a velocity higher than that of the rising fluid, are collected at the bottom of the column, and the smaller particles are carried out of the top of the column with the fluid.

Specifications: Elutriator Tubes : Material Stainless Steel, 2 Nos. of Tubes of Length 500 mm Each with successive Dia. 70mm, 96mm. Water Feed Tank: Material Stainless Steel, Capacity 60 Ltrs. Pump: FHP. Flow Measurement : Rota meter Solid Collectors (2 Nos.): Material PVC fixed to individual tube. Fine Dust Collector: Nylon cloth. Collecting Tray (2 Nos.): Material Stainless Steel, suitable capacity. Control panel Comprises of: Standard make On/Off switch, Mains Indicator etc.



Order Code - 14199 MAGNETIC SEPARATOR

Introduction: Materials, that have different magnetic at tractability, may be separated by passing them through a magnetic field. Most often, magnetic separation techniques are used to remove iron, steel or magnetic iron oxide from materials low in magnetic at tractability. These devices operate in either a continuous or a cyclic manner.

Specifications: Weighing Balance. Belts : Width 150mm, Length 500mm. Feed Hopper : Material Stainless Steel, Suitable capacity (Continuously Vibrating) Drive: FHP motor with Reduction Gear Box. Magnets: Permanent Magnets kept in a Stainless Steel chamber. Collecting Bin : 2 Nos. One each for Magnetic and Non-Magnetic Material. Control panel Comprises of: Standard make On/Off switch, Mains Indicator etc. Instruction Manual : An ENGLISH instruction manual will be provided along with the Apparatus. The set-up is fitted with required guards and product collection tray. The whole set-up is well designed and arranged in a good quality painted structure.



Order Code - 14200 FROTH FLOATING CELL

Introduction: Mixed liberated particles can be separated from each other by floatation if there is sufficient difference in their wet ability. The floatation process operates by preparing a water suspension of a mixture of relatively finely sized solids. This is usually done in an agitated chamber open at the top.

Specifications: Flotation Chamber: Material Stainless Steel, Compatible capacity. Agitator : Stainless Steel Impeller with Stainless Steel shaft coupled to FHP motor. Diffuser: Material Stainless Steel holding the impeller. Froth Collecting Tank: Material Stainless Steel, Capacity 20 Ltrs. Control panel Comprises of: Standard make On/Off switch, Mains Indicator etc. Instruction Manual : An ENGLISH instruction manual will be provided along with the Apparatus. A good quality painted rigid MS Structure is provided to support all the parts.



MECHANICAL OPERATION LAB

Order Code - 14201 CONE CLASSIFIER

Introduction: Cone types Classifiers are one of the oldest types. The conical vessel has angle of 60°. The feed is fed from the top. Water is passed at a controlled velocity. The coarse solids travel down the sides and can be removed from the bottom. Fine particles are separated by over flow.

Specifications: Classifier: Material Stainless Steel Cone Type having angle of 60°. Water Feed Tank: Material Stainless Steel, Capacity 60 Ltrs. Water Circulation: FHP Pump. Flow Measurement: Rota meter. Bottom Product Tank: Material Stainless Steel, capacity 10 ltrs (approx.). Fine Particle Collector: Nylon cloth.



Order Code - 14202 THICKNER

Introduction: Industrial sedimentation operations may be carried out batch wise and continuously in equipment called thickener. The equipment is a cylindrical tank with openings for a slurry feed and product draw off. The tank is filled with dilute slurry and slurry is permitted to settle. Continuous thickeners are large diameter, shallow depth tanks with slowly revolving rakes for removing the sludge.

Specifications: Thickener: Material Stainless Steel Dia 400 mm, Height 150 mm. Thickener Agitator : SS impeller with SS Shaft coupled to FHP Motor with reduction gearbox. Slurry Tank: Material Stainless Steel, Capacity 100 Ltrs. Slurry Tank Agitator : Stainless Steel Impeller with SS Shaft coupled to FHP Motor and Reduction Gear Box. Slurry Feed Pump: Gear Pump with FHP motor. Piping system : GI and PVC.



Order Code - 14203 WILFLEY TABLE

Introduction: The rotap sieve shaker reproduces the circular and tapping motion given to test sieves in hand sieving. The uniform, mechanical action ensures accurate and dependable test. Using the regular height 20-cm diameter sieves, one sample can be tested on a series of six sieves of different openings, all with one operation of machine.

Specifications: Sieve assembly : Compatible to sieves of 20-cm dia. (for 6-7 sieves) Drive: By ½ HP motor Control Panel comprises of : Standard make on off switch, Mains Indicator etc. Special arrangement for setting time for shaking. An ENGLISH instruction manual consisting of experimental procedures, block diagram etc. will be provided along with the Apparatus The whole set-up is well designed and arranged on a rigid structure painted with industrial PU Paint.



Order Code - 14204 MINRAL JIG

Introduction: A jig is a mechanical device used for separating materials of different specific gravity by the pulsation of a stream of liquid flowing through a bed of material. The setup consists of plunger operated by crank mechanism connected to motor coupled with reduction gear box. Sump tank with pump is provided for water circulation.

Specifications: Mineral Jig Tank: Material Stainless Steel. Sump Tank: Material Stainless Steel, Compatible Capacity. Water Circulation: FHP Pump. Product Tank: Material Stainless Steel, capacity 10 litres (approx.), 02Nos. Control panel Comprises of: Standard make On/Off switch, Mains Indicator etc.



MECHANICAL OPERATION LAB

➡ FILTERATION

Order Code - 14205 PLATE & FRAME FILTER PRESS

Introduction: Pressure filters can apply a large pressure differential across the septum to give economically rapid filtration with viscous liquids or fine solids. The most common types of pressure filters are filter press. A filter press contains a set of plates designed to provide a series of chambers or compartments in which solids may collect.

Specifications: No. of frame:6, No. of Plates:7, Size:200 mm x 200 mm. Material:Acrylic Screw Jack arrangement for tightening and removing of frames easily. Filter Medium:Filter Cloth Filtrate collection tray:Material Stainless Steel, Suitable size. Slurry Feed tank:Material Stainless Steel, Capacity 40 Ltrs. Slurry Tank Agitator:Stainless Steel Impeller with SS Shaft coupled to FHP Motor and Reduction Gear Box Slurry Feed Pump: Gear Pump with FHP motor. Piping system: GI and PVC. Filtration rate measurement: Using measuring tank. Material Stainless Steel Pressure Measurement: Bourdon type pressure gauge. Overhead water tank: Material Stainless Steel, Capacity 25 Ltrs.



Order Code - 14206 ROTARY VACUUM FILTER

Introduction: The most common types of continuous vacuum filter are the rotary drum filter. A horizontal drum with a slotted face turns at less than 2 RPM in an agitated slurry trough. A filter medium, such as canvas, covers the face of drum, which is partly submerged in the liquid. Under the slotted cylindrical face of the main drum is a second, smaller drum with a solid surface.

Specifications: Filter Drum:Material Stainless Steel, Dia. 250 mm, Length 350 mm. Mesh:Material Stainless Steel, Filter:Canvas Cloth No. of Zones:6 Nos. Drive for Drum:FHP motor coupled to a Reduction Gear Box Trough:Material Stainless Steel, Compatible capacity. Trough Agitator:Material Stainless Steel, driven by FHP motor with Reduction Gearbox. Slurry Tank : Stainless Steel, capacity 75 Ltrs.



Order Code - 14207 LEAF FILTER

Introduction: Leaf filters, sometimes called tank filters, they consists of flat filtering elements (leaves) supported in a shell. The leaves are circular, arc-sided, or rectangular, and they have filtering surface on both faces. The shell is a cylindrical tank The set-up consists of flat filtering elements (leaves) supported in a slurry tank.

Specifications: Leaf filter:Dia. 200mm with SS Mesh & filter cloth on both sides. Slurry Tank:Stainless Steel, capacity 50 Ltrs. (approx.) Agitator:Stainless Steel Impeller with SS Shaft coupled to FHP Motor and Reduction Gear Box Filtrate receiver:Stainless Steel column with water level gauge Vacuum pump:Standard make coupled to FHP motor.



➡ CONVEYORS

Order Code - 14208 BUCKET CONVEYOR

Introduction: Bucket elevators are used when the only direction of travel is vertical. There could be three type of bucket conveyors; centrifugal discharge, positive discharge, continuous discharge bucket conveyor. The present set-up is a centrifugal discharge bucket conveyor in which buckets are suitably spaced on a belt, which is driven with sufficient speed to discharge the bucket over the head wheel by the centrifugal force.

Specifications: Buckets:Material Steel./Plastic Belt:Nylon./Synthetic, Drive: ½ HP motor coupled to Reduction Gear Box. Feed Hopper: Suitable capacity with feed control arrangement. Bins:2 Nos. Collecting Bin and Distributing Bin.



Order Code - 14209 BELT CONVEYOR

Introduction: Belt conveyor as the name suggests, consists of endless belt, suitably supported and driven, which carry or transport solids from place to place. Belts are made of either canvas, reinforced rubber or strip steel etc. Belt conveyors are adopted to wide varieties and quantities of material, require relatively low power, and can transport solid for long distances.

Specifications: Belt:Material Nylon./Synthetic, Width 200mm, Length 1500mm. Drive for conveyor: ½ HP motor coupled to Reduction Gear Box. Bins:2 Nos. Collecting Bin and Distributing Bin.



MECHANICAL OPERATION LAB

Order Code - 14210 SCREW CONVEYOR

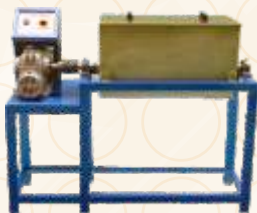
Introduction: The screw conveyor is one of the oldest and most versatile conveyor types. These are compact, requiring little headroom and no return mechanism. The material is also mixed as it passes through the conveyor. Screw or helical flight conveyors consists of a steel shaft having a spiral or helical fin fastened to the shaft and rotating in a trough without touching the trough, so that the helical fin pushes the material along the trough.

Specifications: Trough:Material Stainless Steel Length 750mm. (approx.)Screw:Material Stainless Steel Dia 75mm, Length 750mm., Pitch Scale 75mm Central Shaft for Screw: Material Stainless Steel, Length 750mm.Drive:Standard make FHP Motor with Drive coupled to Reduction Gear Box.Feed Hopper: Suitable capacity with feed control arrangement.Bins:2 Nos.Collecting Bin and Distributing Bin.Special arrangement for changing the angle of inclination 0°-30°.Control panel Comprises of:RPM Measurement: Digital RPM Indicator, Non Contact type with Proximity sensor.



➡ MIXING

Order Code - 14211 RIBBON MIXER



Introduction: A ribbon blender consists of a horizontal trough containing a central shaft and a helical ribbon agitator. Two counteracting ribbons are mounted on the same shaft, one moving the solid slowly in one direction, the other moving it quickly in other. The ribbons may be continuous or interrupted.

Specifications: Mixing trough:Material Stainless Steel Size 400x200x250mm (approx.) with semicircular bottom Ribbon:Material Stainless Steel,Double helicoids type.Cover for Trough : Material Stainless Steel Drive: ½ HP motor coupled to Reduction Gear Box.Collecting Bin:1 No. PVC Control Panel Comprises:Standard make On/Off switch, Mains Indicator etc.

Order Code - 14212 SIGMA MIXER

Introduction: The universal mixing and kneading machine consists of two counter-rotating blades in a rectangular trough curved at bottom to form two longitudinal half cylinders and a saddle section. The blades are driven by gearing at either or both ends.

Specifications: Mixing Trough:Material Stainless Steel, Double U shaped. Capacity 7 kg (approx.)Sigma Blades:Material Stainless Steel,2 Nos. moving in opposite direction.Drive : 1 HP motor coupled to Reduction Gear Box.Tilting arrangement : Using worm & gear Provided so as to tilt the container from (0-110°) even in running condition. Control Panel comprises of : Standard make on off switch, Mains Indicator etc.



Order Code - 14213 FLUID MIXING AND POWER CONSUMPTION IN AGITATED VESSEL



Introduction: For a processing vessel to be effective the volume of fluid circulated by the impellers must be sufficient to sweep out the entire vessel in a reasonable time. The velocity of the stream leaving the impeller must be sufficient to carry the current to the remotest parts of the tank. Liquids are most often mixed in some kind of tanks or vessels, usually cylindrical in form and with a vertical axis.

Specifications: Tank:Material Stainless Steel.Dia.300mm, Depth 400mm (approx.)Stirrer:SS Impeller with SS Shaft coupled to Standard make FHP.Variable Speed Motor and Drive.Agitator:Stainless Steel shaft & impellers (i.e. one propeller & one turbine)Baffles:Material Stainless Steel,4 Nos. 2" width. (detachable).Sampling point:4 Nos.at random locations.Control Panel Comprises of:RPM Measurement:Digital RPM Indicator,Non Contact type with Proximity sensor.Digital Voltmeter:0-300 Volts,Ammeter:0-5Amps.

MASS TRANSFER LAB

EXTRACTION

Order Code - 14214 LIQUID-LIQUID EXTRACTION IN PACKED BED

Introduction: The set-up consists of a glass column packed with Rasching rings. Continuous counter current contacts between the solvent and solute phases is made, which results into extract and raffinate streams. Flow meters (Rota meters) are used to note the flow of solvent & solute respectively.

Specifications: Extraction Column: Material Borosilicate Glass, Dia 55 mm, Height 750mm (approx). Packing: Rasching Rings, Material Borosilicate Glass, Feed Tanks: Material Stainless Steel, Cap. 20 Ltrs. (2 Nos.) Extract & Raffinate Tanks: Material Stainless Steel, Cap 10 Ltrs. Feed Circulation: By Compressed Air. Pressure Regulator: 0-2 kg/cm². Pressure Gauge S: Bourdon type, 0-2 kg/cm². Flow Measurement: Rota meters (One each for solvent & solute) Special arrangement for changing height of interface zone is done.



Order Code - 14215 YORK SCHREIBER'S EXTRACTION UNIT

Introduction: The York Schreiber's Column falls in the class of gravity-operated extractors with mechanical agitation. The presence of alternatively agitating and calming sections in a York Schreiber's column yield higher extraction efficiency than the conventional packed column. In the setup a continuous counter current contact between the solvent and solute phases is made which results into extract and raffinate streams.

Specifications: Extraction Column: Material Borosilicate Glass Dia. 45 mm, Height 750 mm (approx). Packing: Woven mesh of Stainless Steel. Agitator: Stainless Steel impellers with Stainless Steel shaft coupled to a Variable Speed DC Motor. RPM Measurement: Digital RPM Indicator, non contact type with proximity sensor. Feed Tank (2 Nos.): Material Stainless Steel, Capacity 20 Ltrs. Extract & Raffinate Tanks: Material Stainless Steel, Capacity 10 Ltrs. Feed Circulation: By Compressed Air. Pressure Regulator: 0-2 kg/cm². Pressure Gauge: Bourdon type, 0-2 kg/cm². Flow Measurement: Rota meters (One each for solvent & solute) Special arrangement for changing height of interface zone is done.



Order Code - 14216 SPRAY TOWER

Introduction: The experimental set-up of Spray Tower consists of a glass Column Provided with necessary accessories. It operates on a semi-batch mode. Fine spray nozzle is fitted at the top. Feeds are metered by Rota meters and derived from separate feed tanks. The liquid-liquid interface can be maintained by controlling the flow rate of extract with the help of needle valve provided on Rota meter.

Specifications: Extraction Column, Material: Borosilicate Glass, Diameter: 45 mm (approx). Height: 750 mm (approx). Feed Tank, Material: Stainless Steel, Capacity: 20 Ltrs. Quantity: 2 Nos. Extract & Raffinate Tanks Material: Stainless Steel, Capacity: 10 Ltrs. Quantity: 2 Nos. Feed Circulation: By Compressed Air, Pressure Regulator: 0-2 kg/cm². Pressure Gauge: Bourdon type, 0-2 kg/cm². Flow Measurement: Rota meters (One each for Solvent & Solute) Special arrangement for changing height of interface zone is done.



Order Code - 14217 SOLID LIQUID EXTRACTION UNIT

Introduction: The setup consists of Bonnotto type extractor of slotted circular plates arranged one above the other in opposite radial opening. The solids are introduced at the top through a hopper spread over the top plate by a rack and pushed to slot to fall to the next plate below and so on to the bottom of the column.

Specifications: Extraction Column: Material Stainless Steel Dia 150 mm, Height 750 mm (approx) Plates: Material Stainless Steel, with Radial opening. Mixer: Stainless Steel Impellers fitted on Stainless Steel Shaft coupled to a motor & reduction gear box. Screw Conveyor: Material Stainless Steel, Compatible capacity, housed in GI Pipe and driven by a motor & reduction gear box. Solvent Flow Measurement: Rota meter. Solvent Tank: Made of Stainless Steel, Capacity 30 Ltrs. Double wall. Feed circulation: Magnetic Pump made of Polypropylene to Circulate solvent. Maximum working temperature is 60°C. Heater: Nichrome wire heater. Feed Hopper: Suitable capacity. Filtration Sieve: Material Stainless Steel. Receiving Tank for: Material Stainless Steel. Extracted solid waste: Compatible capacity. Temperature Sensor: RTD PT-100 type. The whole set-up is ingeniously designed and schematically arranged on a powder-coated rigid structure.



Order Code - 14218 FLOW THROUGH PACKED BED

Introduction: The central element of the trainer is the transparent packed column. The pressures in the top, middle and bottom of the column are measured, so that the pressure losses in the fixed bed can be determined. The column can be operated with water or water and air. When operating with water, the direction of flow can be changed, so that even a fully flooded column can be studied, such as in a fixed bed reactor.

Specifications: Pump

max. flow rate: 18L/min max. head: 45m power consumption: 250W Compressor max. volumetric flow rate: 8m³/h max. pressure: 1bar rel. power consumption: 370W Packed column inner diameter: 80mm length: 2x 500mm packing height: approx. 350mm Storage tank: 55L.

Measuring ranges

flow rate: 1...10m³/h (air) flow rate: 50...600L/h (water) differential pressure: 2x 0...100mbar, 1x 0...300mbar.



MASS TRANSFER LAB

➡ ABSORPTION

Order Code - 14219 ABSORPTION IN SIEVE PLATE COLUMN

Introduction: The set up consists of a column fitted with perforated plates. Liquid is fed at the top of the column through distributor. The solute gas and air are measured separately, mixed in a mixing chamber and then passed through the perforated plates vertically upward and absorbed in liquid.

Specifications: Column: Material Stainless Steel. Dia 80mm, Length 1000mm (approx). One section of column is provided of Borosilicate glass to visualize the process. Plates: Perforated Plates made of Stainless Steel (7 Nos.) Feed Circulation: By compressed air. Pressure Regulator: 0-2 kg/cm². Pressure Gauge: Bourdon type. Feed Tank: Material Stainless Steel, Capacity 20Ltrs. Flow Measurement: Rotameters (One each for feed, air & CO₂). Collecting Tank: Material Stainless Steel, Capacity 10 Ltrs. The whole set-up is ingeniously designed and schematically arranged on a powder-coated rigid structure.



Order Code - 14220 ABSORPTION IN PACKED BED

Introduction: The set up consists of a glass column packed with Raschig rings. Liquid is fed at the top of the column through distributor. The solute gas and air are measured separately, mixed in a mixing chamber and then passed through the packed column vertically upward and absorbed in liquid.

Specifications: Column: Borosilicate Glass Dia. 55 mm, Length 750mm (approx.) Packing: Borosilicate Glass Raschig Ring. Feed Circulation: By compressed air.

Pressure Regulator: 0-2 kg/cm². Pressure Gauge: Bourdon type. Feed Tank: Material Stainless Steel, Capacity 20 Ltrs. Flow measurement: Rota meters (One each for feed, air & CO₂). Collecting Tank: Material Stainless Steel, Capacity 10 Ltrs. The whole set-up is ingeniously designed and schematically arranged on a powder-coated rigid structure.



Order Code - 14221 ABSORPTION IN WETTED WALL COLUMN

Introduction: The set up consists of a glass column. Alkaline liquid is fed at the top of the column along the walls to create a laminar liquid flow along the walls of a wetted wall column. Flow rates of Air and CO₂, are measured separately, mixed in a mixing chamber and then passed through the column vertically upward and absorbed in liquid film around the wall.

Specifications: Column: Borosilicate Glass Dia. 55 mm, Length 750mm (approx.) Packing: Borosilicate Glass Raschig Ring. Feed Circulation: By compressed air. Pressure Regulator: 0-2 kg/cm². Pressure Gauge: Bourdon type. Feed Tank: Material Stainless Steel, Capacity 20 Ltrs. Flow measurement: Rota meters (One each for feed, air & CO₂). Collecting Tank: Material Stainless Steel, Capacity 10 Ltrs. The whole set-up is ingeniously designed and schematically arranged on a powder-coated rigid structure.



➡ DIFFUSION

Order Code - 14222 VAPOUR IN AIR DIFFUSION APPARATUS

Introduction: Using a small sample of the liquid in a narrow vertical tube, and observing its rate of evaporation into stream of air passed across the top of the tube can conveniently be used to study the diffusion of vapour of a volatile liquid into air.

Specifications: Tube: Material Borosilicate Glass. Water Bath: Material Stainless Steel with two sides made of glass Capacity 8Ltrs. fitted with heater and stirrer. Heater: Nichrome Wire Heater. Stirrer: Stainless Steel, Impeller and shaft coupled with FHP motor. Air Circulation: Air Pump. Traveling Microscope: 0-150 x 0.1 mm resolution. Temperature Sensor: RTD PT-100 type. The whole set-up is ingeniously designed and schematically arranged on a powder-coated rigid structure.



Order Code - 14223 SOLID IN AIR DIFFUSION APPARATUS

Introduction: Confirming a packed bed of spherical balls of a solid in a vertical tube, and observing its rate of diffusion into stream of air passed across the top of the tube can conveniently study the diffusion of solid into air. The equipment is fitted with a vertical glass column with a mesh near the base of column to hold the spherical balls.

Specifications: Diffusion Column: Material Borosilicate Glass. Air flow Measurement: By Rota meter. The whole set-up is ingeniously designed and schematically arranged on a powder-coated rigid structure.



MASS TRANSFER LAB

➡ DISTILLATION

Order Code - 14224 BUBBLE CAP DISTILLATION COLUMN

Introduction: The column is made of Stainless Steel with seven plates for mounting the bubble caps. Each plate is provided with one bubble cap. An electrically heated reboiler is installed at the bottom of the column. The bottom product is collected in the tank.

Specifications: Distillation Column: Material Stainless Steel, Dia 110mm, seven plates. Pressure Gauge: Bourdon type. Rota meter: For cooling water flow rate measurement. Indicator, Safety valve. Steam Generator: Made of Stainless Steel, provided with Pressure Gauge & Level % Insulated with ceramic wool and Cladding with Aluminium foil. Reflux Divider: Special arrangement to change R/D ratio automatically. Condenser: Shell & Tube type made of Stainless Steel. Bottom product tank: Made of Stainless Steel, capacity 5 Ltrs. Distillate tank: Made of Stainless Steel, capacity 5 Ltrs. Heater: Nichrome wire heater. Temp. Sensors: RTD PT-100 type.



Order Code - 14225 SIEVE PLATE DISTILLATION COLUMN

Introduction: The column is made of Stainless Steel material with seven sieve trays. An electrically heated re-boiler is installed at the bottom of the column. The bottom product is collected in the tank. The vapours from the top of column are condensed in the shell and tube type condenser by cooling water supplied by laboratory overhead tank.

Specifications: Distillation Column: Material Stainless Steel, Dia 110mm, seven sieve trays. Pressure Gauge: Bourdon type, 0-2 kg/cm². Rota meter: For cooling water flow rate measurement. Steam Generator: Made of Stainless Steel, provided with Pressure Gauge & Level Indicator, Safety valve & insulated with ceramic wool and cladding with Aluminium foil. Reflux Divider: Special arrangement to change R/D ratio automatically. Condenser: Shell & Tube type made of Stainless Steel. Bottom Product Tank: Made of Stainless Steel, capacity 5Ltrs. Distillate Tank: Made of Stainless Steel, capacity 5Ltrs. Heaters: Nichrome wire heater. Temperature Sensors: RTD PT-100 type.



Order Code - 14226 PACKED BED DISTILLATION COLUMN

Introduction: The column is made of Stainless Steel material packed with Borosilicate Glass rasching rings. An electrically heated re-boiler is installed at the bottom of the column. The bottom product is collected in the tank. The vapours from the top of column are condensed in the shell and tube type condenser by circulating cooling water, supplied by laboratory overhead tank.

Specifications: Distillation Column: Material Stainless Steel, Dia 80mm, Length 900mm (approx). Packing Material: Borosilicate Glass Rasching Rings. Pressure Gauge: Bourdon type Rotameter: For cooling water flow rate measurement. Steam Generator: Made of Stainless Steel, provided with Pressure Gauge Level Indicator, Safety Valve & insulated with ceramic wool and Cladding with Aluminum foil. Reflux Divider: Special arrangement to change R/D ratio automatically. Condenser: Shell & Tube type made of Stainless Steel. Distillate tank: Made of Stainless Steel, capacity 5Ltrs. Heaters: Made of Stainless Steel, capacity 5Ltrs. Nichrome wire heater. Temperature Sensors: RTD PT-100 type. The whole set-up is ingeniously designed and schematically arranged on a powder-coated rigid structure.



Order Code - 14227 STEAM DISTILLATION SET-UP

Introduction: The equipment consists of jacketed pressure vessel for distillation. Steam from a steam generator can either be allowed to enter in the outer jacket or in the vessel. The vapours from the top of the vessel are condensed in the shell and tube type condenser by circulating cooling water, supplied by laboratory overhead tank.

Specifications: Distillation Vessel (Jacketed Type): Material Stainless Steel, Capacity 3 Ltrs. insulated with Ceramic wool and Aluminium cladding. Flow measurement: Rotameter for cold water. Steam Generator: Made of Stainless Steel, provided with Pressure Gauge & Level Indicator, Safety valve & insulated with ceramic wool and Aluminium cladding. Separating Chamber: Borosilicate Glass. Capacity 2 Ltrs. Condenser: Shell & Tube type made of Stainless Steel. Distillate tank: Made of Stainless Steel, capacity 5 Ltrs. Heater: Nichrome wire heater. 3 kW. Temperature Sensors: RTD PT-100 type. The whole set-up is ingeniously designed and schematically arranged on a powder-coated rigid structure.



Order Code - 14228 SIMPLE BATCH DISTILLATION

Introduction: The equipment consists of a distillation still made of stainless steel. The feed in the still is heated externally by heater. The vapours from the top of the vessel is condensed in the type condenser by circulating cooling water. Temperature of the feed mixture is controlled by means of a digital temperature Controller. The condensate is collected in a receiver made of stainless steel.

Specifications: Flow measurement: Rotameter for cold water for condenser. Distillation still: Made of Stainless Steel, capacity 5ltrs. Insulated with ceramic wool. And cladding with Aluminum foil. Condenser: Concentric Tube type made of Stainless Steel. Distillate tank: Made of Stainless Steel, capacity 2 Ltrs. Heater: Nichrome wire heater. The whole set-up is ingeniously designed and schematically arranged on a powder-coated rigid structure.



MASS TRANSFER LAB

DRYING

Order Code - 14229 NATURAL DRAFT TRAY DRYER

Introduction: Natural Draft Tray Dryer is a dryer in which moisture removal takes place by heat under natural condition. The set-up consists of an insulated Stainless Steel chamber fitted with heater. Inside the chamber a tray is attached directly to an electronic weighing balance, which is fitted on the bottom, outside the chamber.

Specifications: Drying Chamber Material:Stainless Steel Size:(30 x 30 x 30) cm insulated by Ceramic wool and housed in a MS Chamber.Maximum Temperature:120°C.Heater:Nichrome wire heater.Weighing Balance:Digital, 0-1000gm. of ± 1 gm resolution.Temp.Sensor:RTD PT-100 type.



Order Code - 14230 FORCED DRAFT TRAY DRYER

Introduction: Forced Draft Tray Dryer is a dryer in which moisture removal takes place by means of forced draft action created by hot air. The set-up consists of an insulated double wall chamber. Inside the chamber a tray is attached directly to a electronic weighing balance, which is fitted on the bottom, outside the chamber.

Specifications: Drying Chamber:Insulated double wall chamber, Size (20 x 20 x 25)cm.Weighing Balance:Digital(0-1000gm)of ± 1 gm resolution.Hot Air Circulation:By forced draft fan, Arrangement is done to vary the air flow rate.Heating Chamber:Compatible capacity.Heater:Nichrome wire heater.



Order Code - 14231 ROTARY DRYER

Introduction: Rotary dryer is a unit in which drying is done by forced draft action created by hot air. The set-up consists of a long revolving cylindrical shell slightly inclined towards the outlet. The shell is fitted with two brackets for support. Air from a blower passes through a heating chamber serves the purpose of drying agent.

Specifications: Drying Shell:Material Stainless Steel,Length 1.5 m,Dia 110 mm.Feed Hopper:Material Stainless Steel,Compatible Capacity Product Receiver:Material Stainless Steel, Compatible Capacity.Rotating Action:Using motor coupled with a Reduction Gear Box.Hot Air Circulation:By forced draft fan, Arrangement is done to vary the air flow rate.Heating Chamber:Compatible capacity Heater:Nichrome wire heater Temperature Sensors:RTD PT-100 type.The whole set-up is ingeniously designed and schematically arranged on a powder-coated rigid structure.



Order Code - 14232 FLUIDIZED BED DRYER

Introduction: This is a dryer in which moisture removal takes place by fluidization of solids particles by hot air. The set-up fitted with a specially designed, vertical Glass Column. The lower portion of the column is filled with fluidizing material. The material is supported on the screen mesh held between two flanges.

Specifications: Column:Material Borosilicate Glass Dia. 80 mm. Total Length 500mm.Cyclone Separator: Material Stainless Steel, Compatible Capacity with collector.Air Circulation:By forced draft fan, Arrangement is done to vary the air flow rate.Heating Chamber:Compatible capacity Heater:Nichrome wire heater Temperature Sensors: RTD PT-100 type.The whole set-up is ingeniously designed and schematically arranged on a powder-coated rigid structure.



Order Code - 14233 VACUUM TRAY DRYER

Introduction: This is a dryer in which moisture removal takes place by fluidization of solids particles by hot air. The set-up fitted with a specially designed, vertical Glass Column. The lower portion of the column is filled with fluidizing material. The material is supported on the screen mesh held between two flanges.

Specifications: Column:Material Borosilicate Glass Dia. 80 mm. Total Length 500mm.Cyclone Separator: Material Stainless Steel, Compatible Capacity with collector.Air Circulation:By forced draft fan, Arrangement is done to vary the air flow rate.Heating Chamber:Compatible capacity Heater:Nichrome wire heater Temperature Sensors: RTD PT-100 type.The whole set-up is ingeniously designed and schematically arranged on a powder-coated rigid structure.



MASS TRANSFER LAB

⇒ CRYSTALLIZATION

Order Code - 14234 BATCH CRYSTALLIZER

Introduction: Crystallization is the formation of solid particles within a homogeneous phase of saturated liquid. Its wide use has a two-fold basis, a crystal formed from an impure solution is itself pure and crystallization affords a practical method of separating w. This operation involves both heat and mass transfer. Cooling type agitated batch crystallizer set up consists of an open jacketed stirred vessel provided with water heating & cooling arrangement. The feed is prepared in the crystallizer itself with hot water and stirrer.

Specifications: Crystallizer(Jacketed Type): Material Stainless Steel,Cap.2Ltrs.with conical bottom.Stirrer:FHP,Variable Speed.Heater:Nichrome wire heater.

Cooling Water Tank: Material Stainless Steel,Capacity 30litre fitted with Pump.Flow measurement:Rotameter for cooling water.Pump:FHP.Receiving Tank:Material Stainless Steel,Capacity 2litre with SS sieve.Temperature Sensors:RTD PT-100 type.The whole set-up is ingeniously designed and schematically arranged on a powder-coated rigid structure.



Order Code - 14235 SWENSON WALKER CRYSTALLIZER

Introduction: The set-up is designed to demonstrate and stimulate the phenomena of crystallization. Swenson Walker crystallizer is a continuous type crystallizer. This operation involves both heat and mass transfer. Crystallization is the formation of solid particles within a homogeneous phase. Its wide use has a two-fold basis; a crystal formed from an impure solution is itself pure.

Specifications: Crystallizer(Jacketed Type): Material Stainless Steel,Cap.2Ltrs.with conical bottom.Stirrer:FHP,Variable Speed.Heater:Nichrome wire heater.

Cooling Water Tank: Material Stainless Steel,Capacity 30litre fitted with Pump.Flow measurement:Rotameter for cooling water.Pump:FHP.Receiving Tank:Material Stainless Steel,Capacity 2litre with SS sieve.Temperature Sensors:RTD PT-100 type.The whole set-up is ingeniously designed and schematically arranged on a powder-coated rigid structure.



⇒ MISCELLANEOUS

Order Code - 14236 WETTED WALL COLUMN

Introduction: The set up to consists of a glass column. Water is to be fed at the top of the column along the walls to make the column a wetted wall column. Hot air from heating chamber with known humidity when passed through the column vertically upward and evaporation in the liquid film around the wall to take place.

Specifications: Column:Borosilicate Glass Water Circulation:FHP Pump.Air compressor Water Tank:Material Stainless Steel,Heating Chamber:Compatible capacity.Heater:Nichrome Wire Heater Rotameter:For water flow rate measurement.Dry & wet Bulb Temp.:With Digital Temperature Indicator.Temperature Sensors:RTD.Control panel comprises of:Digital Temp. Indicator, Standard make on/off switch, Mains Indicator etc.



Order Code - 14237 VAPOUR-LIQUID EQUILIBRIUM SET-UP

Introduction: The basic data of any distillation problem are the equilibrium between the liquid and vapours phases of the system subjected to distillation. Hence is of great importance to study the vapour liquid equilibrium. The set-up consists of distillation still with a heating element.

Specifications: Distillation still:Made of Stainless Steel Capacity 1Ltrs.Insulated by ceramic wool.Condenser:Concentric Tube type.Heater:Nichrome wire Cooling Water Tank: Material Stainless Steel,Capacity 15Ltrs.(Approx.).Cold Water circulation:Using FHP Pump.Temperature Sensors:RTD PT-100 type The whole set-up is ingeniously designed and schematically arranged on a powder-coated rigid structure.



Order Code - 14238 CONTINUOUS DISTILLATION PILOT PLANT

Introduction: The solution having to be distilled, stored in a glass tank, is sent to the distillation column by a metering pump after crossing a pre-heating exchanger. The column can be fed through 3 points at different height. The distillation column is completely made of glass and it consists of a reboiler, of a column with packing of steel mesh and of a condenser with reflux valve and head. The bottom product and the distillate are collected into two glass tanks after being cooled by two heat exchangers.

Specifications: Framework of stainless steel with castors 15 l feeding tank of borosilicate glass Distillation column of borosilicate glass, h = 1100 mm, packed with mesh of 316 stainless steel Reflux head of borosilicate glass equipped with solenoid valve for the control of reflux ratio Reboiler of borosilicate glass, with capacity of 5 l, equipped with quartz-sheathed electric heater of 2.5 Kw Over head condenser of borosilicate glass, with exchange surface of 0.4 m². 2 graduated vessels of borosilicate glass for collecting the bottom product (4 l) and the distillate (1 l) Tube-in-tube heat exchanger of stainless steel for the bottom product Feeding metering pump of 316 stainless steel, with max. flow rate of 12 l/h Flowmeter of 304 stainless steel for measuring the flow rate to the condenser, range of 0 to 250 l/h 2 programmable timers for the control of reflux ratio 12 thermoresistances Pt 100, with sheath of 316 stainless steel 2 electronic temperature indicators Electronic differential pressure transmitter (between column top and bottom) of 316 stainless steel, with range of 0 to 200 mm H₂O, 4-20 mA output signal Quartz-sheathed electric heater for preheating the feeding mixture, P = 0.3 kW Piping and valves of 304 and 316 stainless steel Control Panel Emergency button.



MASS TRANSFER LAB

Order Code - 14239 MASS TRANSFER WITH & WITHOUT CHEMICAL REACTION (Solid-Liquid)

Introduction: The setup consists of a Reactor, in which solid cylinder of Benzoic Acid is placed and is stirred by means of a variable speed mixer. Baffles are also provided. The Reactor is made of Stainless Steel. Peltizer is provided to make the solid cylinder of Benzoic Acid.

Specifications: Reactor:Material Stainless Steel,Capacity 2 Ltrs.(approx.)Water Bath:Material Stainless Steel,Double Wall,insulated with ceramic fibre wool.Heater:Nichrome Wire Heater Stirrer:Stainless Steel Impeller and shaft coupled with DC motor drive for variable speed.Temperature Sensors: RTD PT-100 type.Control panel comprises of:RPM Indicator:Digital, Non contact type.Digital Temp. Controller:PID Controller,0-199.9°C(for hot water tank).



Order Code - 14240 EXPERIMENTAL WATER COOLING TOWER

Introduction: Experimental water-cooling tower is a forced draft counter flow type cooling tower specially designed for the Engineering students to provide them insight about actual working of tower. In this system, air from a fan enters at the bottom of the tower and after passing through the mesh packing, discharges into the atmosphere via a duct.

Specifications: Tower:Material Stainless Steel Size-Cross-Section 250x 250mm,Height 1000mm.Packing:Expanded wire mesh.Air Circulation:By forced draft fan, arrangement is done to vary the air flow rate.Air Flow Measurement: Orifice meter with U-tube manometer.Flow Measurement:Rotameter.Dry & Wet Bulb Temperature:Measured by Temperature Sensors insulated with ceramic fibre wool.Hot Water Tank: Material Stainless Steel, Double wall,Hot water circulation:Magnetic Pump Heater:Nichrome wire heater.Temperature sensors:RTD PT-100 type 6 Nos.The whole set-up is ingeniously designed and schematically arranged on a powder-coated rigid structure.



Order Code - 14241 ADSORPTION IN PACKED BED

Introduction: The set up consist of three vertical column packed with activated Charcoal. Columns are operated individually. Liquid feed with dye is fed to the individual column from the bottom and samples are collected from the top at regular interval of time. Rota meter is provided to measure the flow rate. Pump with a feed tank is provided for fluid flow.

Specifications: Column(3 Nos.):Material Borosilicate glass of different dia.Feed tank: Material Stainless Steel, Capacity 20 litres.Receiving tank: Material Stainless Steel, Capacity 20 litres.Feed circulation: FHP, Magnetic Pump made of Polypropylene.Piping:Stainless Steel and PVC of size ¼.Flow measurement:Rotameter for feed.Stop Watch: Electronic.



Order Code - 14242 ION EXCHANGE

Introduction: The set up consists of two glass column packed with Anion and Cation exchanger resin upto suitable height. The layer of glass wool is placed on bottom and top of the resin bed. The feed is allowed to enter from the bottom of first column and comes out of the top, which is again passed through the second column in same fashion.

Specifications: Column (2 Nos.) : Material Borosilicate Glass / Stainless Steel,Dia 55mm, Length 500mm approx.(For Anion & Cation)Water Tank:Material Stainless Steel,Capacity 25 Ltrs.Feed Circulation:FHP Pump Tullu / Champion make Flow Measurement:Rotameter,Eureka make Piping:Stainless Steel and PVC size 1/4"Conductivity Measurement : Digital Conductivity Meter Control panel comprising of: With Standard make On/Off switch, Mains Indicator etc.



Order Code - 14243 HUMIDIFICATION & DEHUMIDIFICATION SETUP

Introduction: The setup consists of two glass columns with packing of rashing rings and silica gel. Water & Air flow rates can be set and measured by Rotameters and temperature by RTD type temperature sensors. Water at desired temperature is sprayed in first column.

Specifications: Column:Material Borosilicate Glass Dia 50 mm,Length 500 mm(2Nos.)Packing:Rasching Rings & Silica Gel.Air Flow Measurement:By Rotameter.

Water Flow Measurement:By Rotameter.Water Tank:Material Stainless Steel, compatible capacity Water circulation:By Pump Heater:Nichrome wire heater Condenser:Material SS, compatible capacity Temperature sensors:RTD PT-100 type- 10Nos.Control panel comprising of : Digital Temp. Controller:0-199.9 °C, For Air Digital Temp. Indicator : 0-199.9 °C, with multi-channel switch With Standard make On/Off switch, Mains Indicator etc.



PROCESS CONTROL & INSTRUMENTATION LAB

Order Code - 14244 GAS ADSORPTION FIXED BED UNIT

Introduction: The unit is fitted with a stainless-steel reactor column in which the adsorbent, activated carbon, is packed. There are six thermocouples (T1 - T6) sited along the length of the column, which enable the adsorption/desorption fronts to be followed (adsorption/desorption of CO₂ leads to changes in temperature). A hot water circulation system, also containing a thermocouple (T7), is connected to the jacket of the column to enable accurate temperature control via a PID temperature controller. This way the desired processing temperature is accurately maintained. The system is equipped with all the valves required for flow direction control, flow rate control and pressure relief for safety. Electronic flow meters monitor the flow rate of both the carrier gas, helium, and the absorbate, carbon dioxide. These combined with the column temperature sensors and the IR detector, for measuring CO₂ concentration, enable the processes to be followed closely and a wide range of operating variables to be examined.

Specifications: Glass cylinder volume: 1 litre. Glass cylinder: Ø100mm x 220mm high. Measured height displayed by the scale: 200mm. Compressor: 500W.



Order Code - 14245 LABORATORY PASTEURISER

Introduction: The process involves heating the process liquid (milk) to a minimum temperature of 72°C, holding this temperature for 15 seconds and cooling to a storage temperature as quickly as possible. The three-stage plate heat exchanger of this achieves these parameters by heating the process liquid with hot water prior to its entry into the holding tube and then by cooling with cold water to storage temperature.

Specifications: A benchtop miniature high temperature, short time (HTST) system for the demonstration of the industrial pasteurization process. Includes a transparent feed tank, a feed pump, a three-stage heat exchanger, a holding tube, a divert system and a hot water circulator. The feed pump is a peristaltic pump with a variable-speed control. The heat exchanger is fully representative of large-scale industrial units. It uses stainless steel heat transfer plates. It can be dismantled for examination and cleaning. It comprises three stages, a final heating stage, a regeneration stage and a cooling stage. Holding time is 15s at 10 l/hr. in a stainless-steel holding tube. Process temperature is measured and controlled. Hot water is circulated around the heating stage of the heat exchanger in a closed-loop system. A PID controller is used to adjust the electric water heater, keeping the product process temperature at the requested value.



Order Code - 14246 DISTILLATION COLUMN

Introduction: The system includes two distillation columns supplied as standard: A 50mm diameter plate distillation column containing eight sieve plates and downcomers. Every plate includes a temperature sensor positioned to measure accurately the temperature of the liquid on each plate. The sheaths of each plate temperature sensor are not more than 1.5mm diameter to ensure rapid dynamic response. A 50mm packed column supplied as a separate item but readily interchangeable with the plate column by the user, for comparative studies of the two types of distillation column.

Specifications: Electrically heated reboiler with sufficient capacity for up to two hours of batch operation. The reboiler heater is protected against overheating and by a low-level alarm. Overhead condenser with cooling water flow measurement and adjustment. Condensate collecting vessel equipped with double overflow weirs and exit pipes to enable separation of immiscible liquids. A solenoid operated reflux return valve to provide for 0%-100% reflux, adjustable by electrical signal. Sampling points throughout the system for composition analyses. Differential manometer connected to the top and bottom of the column to monitor column pressure drop. Materials of construction for surfaces in contact with the process fluids are; glass, stainless steel, PTFE or similar solvent-resistant materials. Maximum operating temperature inside the column operation is at least 130 °C. Temperatures are monitored via fourteen thermocouple sensors located at strategic positions in the system.



Order Code - 14247 GAS ABSORPTION COLUMN

Introduction: In the process of gas absorption, a mixture of gases is contacted with a liquid, for the purpose of dissolving one or more components of the gas and to provide a solution of them into the liquid. In this, a gas phase consisting of CO₂ and air is introduced into the bottom of the packed column. Adjustment of their flow ratio is obtained by manual valves. A sample of the gas mixture is sent to a CO₂ concentration sensor located inside the electric console, and readings of flows and percentage CO₂ concentration is visible on the display screen as well as in the software. For the liquid phase, water (or a solution of sodium hydroxide) is pumped to the top of the column where it falls through the packing material. The gas and liquid phase flows counter-currently.

Specifications: An apparatus for teaching the principles of the absorption of gas into liquid, using a packed column. Column working length is 1.4m x 80mm diameter, split into two sections. Two electronic pressure sensors measure the pressure drop across each half of the column. An electronically controlled submersible pump provides a liquid flow of 1-10 l/min u 60l feed tank. Water flow can be used in either recycle or one-pass operation. Column supplied with 10mm x 10mm Raschig rings as packing material, total volume 7l. Other sizes can be used. Centrifugal fan provides air flow up to 160 l/min. Two electronic temperature sensors measure the air and liquid temperatures. Electronic measurement of CO₂ concentration in the air streams, measurements can be taken at the column inlet and outlet. Sensor values displayed on an alphanumeric display on the control console.



PROCESS CONTROL & INSTRUMENTATION LAB

Order Code - 14248 CONTROL VALVE CHARACTERISTICS

Introduction: The setup is specially designed for various experimental and demonstrative capabilities. The product consists of Pneumatic control valves of Quick opening, Linear and Equal % type. The Stainless Steel water tanks with pump are provided for continuous water circulation.

Specifications: Water Supply:Control Valve Type:Pneumatic Size:1/2".Actuator:15 Sq.Inch.Stroke:14 mm.Input:3-15 PSIG. Water Tank Material:Stainless Steel, capacity 25 litres Water Circulation : FHP Pump Tullu/Champion make.Overhead Tank Material:Stainless Steel,Capacity 10 Ltrs.Flow Measurement:Rotameter.Pressure Drop measurement:Using Manometer.Pressure Regulator:0-2 kg/cm² Pressure Gauge:Bourdon type 0-2 kg/cm² Piping: Size 1/2".



Order Code - 14249 STUDY OF P-I & I-P CONVERTOR

Introduction: The present set-up is designed to study the working principle and calibration procedure of P/I converter and I/P converter. Air pressure is given to both by compressed air out put generated by the both converter is observed and measured.

Specifications: I/P Converter:Input:4-20mA DC Output : 3-15PSIG.Pressure Gauge:Bourdon type 0-2 kg/cm².P/I Converter:Input:0-1barOutput:4-20 mA DC Digital Current Source/Meter:Digital Indication of Current input and output.Range 0-20 mA DC.Pressure Regulator:0-2 kg/cm².Piping:Size 1/4".



Order Code - 14250 CHARACTERISTICS OF P.I.D CONTROLLER

Introduction: The present set-up is designed to study the characteristics of a PID controller. It consists of a stirred tank in which a heater is provided to heat the water. Water is supplied to the tank from laboratory overhead tank by the user. The flow rate can be adjusted by operating the need levels provided on Rota meter.

Specifications: Stirred Tank:Material Stainless Steel, Capacity 2Ltrs (approx.)Stirrer:Stainless Steel Impeller and shaft coupled with FHP Motor.Flow Measurement:Rota meter.Stop Watch:Electronic Heater:Nichrome wire heater.Control Panel comprises of:PID controller:0-200°C Temperature Sensor:RTDPT-100 type With standard make On/off switch, Mains Indicator etc.



Order Code - 14251 MEASUREMENT OF LEVEL BY AIR PURGE METHOD

Introduction: The apparatus is based on the principle that when compressed air is purged in to the pipe, the liquid with in the pipe is displaced by air pressure equal to the hydrostatic force of the liquid in the tank or vessel. The apparatus consists of a pipe lowered into the water tank to appoint about 1" above the bottom of the tank.

Specifications: Water Tank:Material Stainless Steel, Diameter 200 mm,Height500 mm.Air Purging Valve:1/4" BSP Manometer:Type U Tube Manometer,Height 300mm.Bubbler Pipe:Material Stainless Steel.



Order Code - 14252 MEASUREMENT OF LEVEL BY CAPACITANCE METHOD

Introduction: The present set-up is designed to study the working principle and calibration procedure of capacitance type level transmitter. The set-up consists of a probe which is mounted in a level tank with graduated scale. Water is poured in the level tank manually and response of the level transmitter is indicated on the Level Indicator.

Specifications: Capacitance type Level Transmitter:Input:0-300 mm of water.Output:4-20 mA DC Digital Current Meter:Digital Indication of Current output.Range 0-30 mA DC Level Tank:Acrylic/Glass, PVC.Piping:Size 1/4".



Order Code - 14253 CALIBRATION OF THERMOCOUPLE

Introduction: Settling or sedimentation is the separation of solid particles from fluids under the gravitational force. When a solid particle moves in a fluid, then a number of Forces are acting on it: (1) the gravitational force, acting downward, (2)the buoyant force, acting upward, (3)the drag force, acting upward. When a particle fall in a fluid under constant force, e.g. force of gravity, then particle accelerates for some time, but when the accelerating force equals the Retarding force (Buoyant force and Drag force) then the resultant force acting on the particle will be zero, and particle quickly reaches velocity, which is the Maximum attainable under the circumstances and which is called the terminal Velocity.

Specifications: Heat Source:Provide with ceramic insulation.Temp. Controller:Digital Temperature Controller.0-200°C.Thermocouple:Standard 3 types of thermocouple (a)CR / Al (b)Cu-Constantan (c)Fe-Constantan.



PROCESS CONTROL & INSTRUMENTATION LAB

Order Code - 14254 DEAD WEIGHT PRESSURE GAUGE TESTER

Introduction: The present set-up is designed to calibrate and check the given pressure gauge (Bourdon Type). This unit consists of a precision ground plunger, which develops the required pressure by loading of weights. This pressure is transmitted to the pressure gauge by oil.

Specifications: Precision ground plunger to develop the required pressure. Valves Arrangement to fill oil. Pressure Gauge (Bourdon Type) of 7kg/cm². Weight set for the pressure of 0.5 to 7kg/cm².



Order Code - 14255 PRESSURE CONTROL TRAINER (Computer Controlled System)



Introduction: The setup consists of a process tank in which compressed air enters through a Pneumatic control valve. The pressure transmitter is fitted on the process tank. The air pressure in process tank is sensed by the transmitter and communicated to the digital indicating controller.

Specifications: Pressure Transmitter: Range 0-5 bar, type strain gauge, output 4-20 mA. Process Tank: Material Stainless Steel, Capacity 1.5 Ltrs. Powder Coated. Control Valve: Compatible capacity with Pneumatic Actuator. I/P converter: Input 4-20mA, Output 3-15 PSIG. Pressure Regulator: 0-2 kg/cm². Pressure Gauge: Bourdon type, 0-2 kg/cm², 0-7 kg/cm². Piping: PU Piping. Interfacing unit: For input-output communication with auto/manual facility.

Order Code - 14256 LEVEL CONTROL TRAINER (Computer Controlled System)

Introduction: The setup consists of a process tank fitted with scale in which water enters through a Pneumatic control valve. Water is pumped to process tank from the sump tank by means of a centrifugal pump. The level transmitter is fitted in the process tank. The level of water in process tank is sensed by the transmitter and communicated to the digital indicating controller.

Specifications: Level Transmitter: Range 0-300 mm, Capacitance Type, Output 4-20 mA. Process tank: Material SS/Glass/Acrylic with Scale. Capacity 2 Ltrs approx. Water Tank: Material Stainless Steel, Capacity 10 Ltrs. Water Circulation: FHP Pump. Tullu/Champion make. Flow Measurement: Rotameter.

Control valve: Compatible capacity with pneumatic actuator. I/P converter: Input 4-20mA, Output 3-15 PSIG. Pressure Regulator: 0-2kg/cm². Pressure Gauge: Bourdon type, 0-2 kg/cm². Piping: Size 1/4". Interfacing unit: For input-output communication with auto/manual facility. Micro-processor Controller: PID Setting, auto tuning, fully programmable with serial communication. Software: For experimentation, PID control, Data logging, trend plot, offline analysis and printing.



Order Code - 14257 TEMPERATURE CONTROL TRAINER (Computer Controlled System)

Introduction: The process setup consists of heating tank fitted with thruster-controlled heater for on line heating of the water. Water is supplied from laboratory constant head tank and its flow can be manipulated and measured by provided Rotameter. The temperature of the heated water is sensed by RTD sensor. This measured variable through Temperature Transmitter is communicated to Digital Indicating Controller.

Specifications: Temperature Transmitter: Input RTD PT-100 (0-100°C), output 4-20 mA. Process tank: Material Stainless Steel, Capacity 0.5 lit, Heater: Nichrome Wire Heater, Capacity 1 Kw. Thyristor Controller: Input 4-20mA for heater. Flow Measurement: Rotameter. Piping: Size 1/4". Interfacing unit: For input-output communication with auto/manual facility. Micro-processor Controller: PID Setting, auto tuning, fully programmable with serial communication. Software: For experimentation, PID control, Data logging, trend plot, offline analysis and printing.



Order Code - 14258 FLOW CONTROL TRAINER (Computer Controlled System)

Introduction: The present set-up is designed to study a PID Controlled Flow Process in the industry. Water is pumped from the sump tank by means of a centrifugal pump to a Pneumatic Control Valve and after passing through the Rota meter it return back to the sump.

Specifications: DP Transmitter: Output 4-20 mA. Orificemeter: Material Stainless Steel. Water Circulation: FHP Pump Tullu/Champion make. Water Tank: Material Stainless Steel, Capacity 10 Ltrs. Flow Measurement: Rotameter. Control Valve: Compatible capacity with Pneumatic Actuator. I/P converter: Input 4-20mA, Output 3-15 PSIG. Pressure Regulator: 0-2 kg/cm². Pressure Gauge: Bourdon type 0-2 kg/cm². Piping: Size 1/4". Interfacing unit: For input-output communication with auto/manual facility. Micro-processor Controller: PID Setting, auto tuning, fully programmable with serial communication. Software: For experimentation, PID control, Data logging, trend plot, offline analysis and printing.

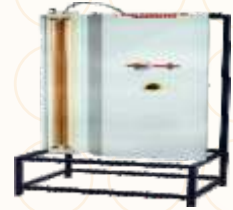


PROCESS CONTROL & INSTRUMENTATION LAB

Order Code - 14259 TIME CONSTANT OF MANOMETER

Introduction: The present set-up is designed to study the characteristics of a U Tube manometer. It consists of a U Tube manometer, which is pressurized by air. A suitable and proper arrangement has done for charging and discharging the manometer fluid in the manometer. These arrangements facilitate to observe the response of different types of manometer fluids of different heights.

Specifications: Manometer: Material Borosilicate Glass, U tube type, Height 1 m. Pressure regulator: 0-2 kg/cm². Stop Watch: Electronic.



Order Code - 14260 TIME CONSTANT OF THERMOCOUPLE & THERMOMETER



Introduction: The setup consists of a Heat source controlled with the help of digital temperature controller at any preset value. A thermometer/thermocouple pocket is provided to insert the thermometer/thermocouple in it. The time constant of different thermometer/thermocouple can be calculated with the set-up.

Specifications: Heat Source: Provided with Ceramic insulation. Heater: Nichrome Wire Heater. Temp. Controller: Digital Temperature controller, 0 to 200°C ICE Pot: Compatible capacity Thermometer: Glass Thermometer, Range 0-100°C. Thermocouple: Fe-Constantan type.

Order Code - 14261 SINGLE TANK SYSTEM

Introduction: The setup studies behavior of single tank system. It consists of supply tank, pump for water circulation, Rota meter for flow measurement, one process tanks with scale. The components are assembled on frame to form tabletop models.

Specifications: Process Tank: Material Stainless Steel, Circular, with level scale (1No.) Capacity 2.5 to 3.5 litres. Supply Tank: Material Stainless Steel, Capacity 20 litres. Overhead Tank: Material Stainless Steel, Capacity 5 litres. Water circulation: FHP Pump, Tullu/Standard make. Piping: SS/PVC, size ¼". Flow measurement: Rotameter.



Order Code - 14262 TWO TANK INTERACTING SYSTEM

Introduction: The setup studies behavior of multi capacity process when connected in interaction mode. It consists of supply tank, pump for water circulation, Rotameter for flow measurement, two independent process tanks with scales connected in interacting mode. The components are assembled on frame to form tabletop set-up.

Specifications: Process Tank: Material Stainless Steel, Circular, with graduated level scale (2Nos.) capacity 2.5 to 3.5 litres. Supply Tank: Material Stainless Steel, Capacity 20 litres. Overhead tank: Material Stainless Steel, Capacity 5 litres. Water Circulation: FHP Pump, Tullu/Standard make. Piping: SS/PVC, size ¼".



Order Code - 14263 TWO TANK NON INTERACTING SYSTEM

Introduction: The setup studies behavior of multi capacity process when connected in non interaction mode. It consists of supply tank, pump for water circulation, Rota meter for flow measurement, two independent process tanks with scales connected in non-interacting mode. The components are assembled on frame to form tabletop set-up.

Specifications: Process Tank: Material Stainless Steel, Circular, with level scale (2 Nos.) capacity 2.5 to 3.5 litres. Supply Tank: Material Stainless Steel, Capacity 20 litres. Overhead tank: Material Stainless Steel, Capacity 5 litres. Water Circulation: FHP Pump, Tullu/Standard make. Piping: SS 304, size ¼".



Order Code - 14264 INTERACTING & NON INTERACTING SYSTEM

Introduction: The setup is designed to study dynamic response of single and multi capacity processes when connected in interacting and non-interacting mode. It is combined unit to study 1) Single capacity process. 2) Non interacting process and 3) Interacting process.

Specifications: Process Tank: Material Stainless Steel, Circular, with level scale (3 Nos.) Capacity: 2.5 to 3.5 litres. Supply Tank: Material Stainless steel, Capacity 20 litres. Overhead tank: Material Stainless steel, Capacity 5 litres. Water Circulation: FHP Pump, Tullu/Standard make. Piping: SS/PVC, size ¼". Flow Measurement: Rotameter.



Order Code - 14265 STRAIN GAUGE TRAINER KIT

Introduction: The set – up has been designed for the characteristics of strain gauge using "Strain Gauge Transducer".

1. Cantilever fitted with a plate form for loading.
2. Strain Gauge Sensor.
3. Digital Strain Indicator.

Specifications: Power Requirement: 230 Volt, 10%, 50 Hz. Range: 0 – 500, Strain. Sensor: Strain Gauge fitted on Strain Bar. Weight Capacity: 1 Kg. (Maximum).



ENVIRONMENTAL & BIO-ENGINEERING LAB

Order Code - 14266 AERATION UNIT

Introduction: This equipment has been designed to study the phenomenon of oxygen transfer in air diffusion systems and the influence of chemical/physical parameters on oxygenation capacity. The Aeration Unit comprises an open tank equipped with a stirrer. Air is supplied via a compressed air line through a pressure regulator valve, and through a flow meter to a diffuser positioned within the tank.

Specifications: Framework of SS 304. Graduated tank of transparent borosilicate glass with capacity of 25 litres. Rota-meter to measure air flow. Portable oxygen probe with digital display. Variable speed stirrer.



Order Code - 14267 AEROBIC DIGESTER

Introduction: The present set-up consists of 2 Nos. upward flow packed bed reactors. The set-up is designed so that the reactors can be operated either parallel or in series. A buffer tank is provided in between the reactors to permit the discharge of excess flow from the first reactor when the second reactor is operated in series but at a low flow rate.

Specifications: Reactor Column (2 Nos.) Capacity: 5 Ltrs (approximately) Feed and product receiving tank Capacity: 30 Ltrs. Feed Pump (2 Nos.): Peristaltic Reactor Heater (2 Nos.): 200 each Control Panel comprises of: With standard make On/off switch, Mains Indicator etc.



Order Code - 14268 DEEP BED FILTER COLUMN

Introduction: The present set-up is designed to study the characteristics of a filter column. It consists of a column filled with packing to ensure the good water distribution. 20 Slotted pressure tapings are mounted on the column for measuring the pressure drop across the bed per unit length. These tapings are connected to a differential manometer. These tapings can also be used for drawing the samples from the column and change in concentration of the suspension can be determined. The unit is complete with 2 Nos. of feed tanks. A centrifugal pump is provided to circulate the water through the column. Water supplied to the column is regulated and controlled by rotameter.

Specifications: Column Material: Stainless Steel/Perspex ID: 100 mm (approx) Length: 1350 mm (approximately) Feed Tank Capacity: 200 Ltrs. (approx) Water Circulation: FHP Pump. Flow Measurement. Rotameter for Water, 0.5 to 5 L/min. Pressure Tapings: 20 Nos. Sampling Ports: 20 Nos. Control panel comprising of Standard make On/off switch, Mains Indicator etc.



Order Code - 14269 SEDIMENTATION STUDIES APPARATUS

Introduction: Settling or sedimentation is the separation of solid particles from fluids under the gravitational force. When a solid particle moves in a fluid, then a number of Forces are acting on it: (1) the gravitational force, acting downward, (2) the buoyant force, acting upward, (3) the drag force, acting upward. excess flow from the first reactor when the second reactor is operated in series but at a low flow rate.

Specifications: Cylinders: Five Graduated cylinders (Mounted vertically) Material: Borosilicate Glass. ID: 50 to 51 mm. Length: 1 m. Stop Watch: Electronic. Collecting Tanks: Capacity 2 Ltrs. (3 Nos.)



Order Code - 14270 DRAINAGE & SEEPAGE TANK

Introduction: The bed of the tank is made from painted mild steel. The sides of the tank are supported and sealed by a well proven method which allows free access to the interior and results in minimum sight obstruction. One side is of toughened glass to give good scratch-free visibility over a long period of use while the other is made of aluminium which permits the insertion of pressure tapping points as required. The ends of the tank are made of steel plate. Adjustable overflows are provided close to each end of the tank so that constant water levels may be maintained in each half of the tank.

Specifications: A self-contained facility for study of flow through permeable media. The tank has a toughened glass at front and aluminium at back to permit the insertion of pressure tapings as required. Six tapping points are provided. The design of the side supports allows free access to the interior with minimum sight obstruction. Supply includes sump tank, pump, starter and control valve. Also a dye injection system and a selection of models. An instruction manual along with the apparatus. Working section of suitable capacity. BASIC ACCESSORIES: Foundation pressure plate Straight permeable membrane.



Order Code - 14271 MODEL SEDIMENTATION TANK

Introduction: Settling or sedimentation is the separation of solid particles from fluids under the gravitational force. When a solid particle moves in a fluid, then a number of Forces are acting on it: (1) the gravitational force, acting downward, (2) the buoyant force, acting upward, (3) the drag force, acting upward. excess flow from the first reactor when the second reactor is operated in series but at a low flow rate.

Specifications: Cylinders: Five Graduated cylinders (Mounted vertically) Material: Borosilicate Glass. ID: 50 to 51 mm. Length: 1 m. Stop Watch: Electronic. Collecting Tanks: Capacity 2 Ltrs. (3 Nos.)



ENVIRONMENTAL & BIO-ENGINEERING LAB

Order Code - 14272 AEROBIC DIGESTOR

Introduction: The fuel cell module incorporates a unique plate stack assembly with a highly intricate optimized internal fuel path geometry and specialized membrane and is mounted in a reinforced plastic panel with a transparent window that clearly shows the main components. The educational unit is designed to allow the estimation of the exothermic heat generated in the stack as power is generated and water formed, and in addition to this, the instrumentation allows the key energy performance indicators e.g. power output, fuel consumption, efficiency, oxidant excess (air) etc. to be determined for the unit.

Specifications: Main metallic elements made of stainless steel. Diagram in the front panel with distribution of the elements similar to the real one. 20 L reactor vessel with a tubular membrane inside. Lid for the reactor with a manual valve and the respective holes. Heating or cooling coil. Thermostatic bath (up to 60 °C), 6 l capacity, 600 W. Pump for hot water circulation of the thermostatic bath. Air compressor, range: 0 – 5 l/min. Diffusion plate for the air inlet. Air flow meter, range: 0.4 – 5 l/min. Peristaltic pump, range: 0 – 0.05 l/min. Water flow meter, range: 0.004 – 0.05 l/min. Membrane, muds separation. Overflow for the outlet of filtered water. Valve on the bottom for mud extraction. Temperature, pH and dissolved oxygen meter to monitor the digestion. Control panel, including: Switch for pump for the hot water circulation. Switch for peristaltic pump. Switch for air compressor. Main switch.



Order Code - 14273 BIOGAS PILOT PLANT

Introduction: This unit serves to demonstrate the generation of biogas in a practical manner. The substrate is a suspension of shredded organic solids. It is hydrolysed and acidified in the first stirred tank reactor. Here, anaerobic microorganisms convert the long-chain organic substances into short-chain organic substances. The biogas forms in the second stirred tank reactor in the last step of the anaerobic degradation. It contains mainly methane and carbon dioxide. This two-stage method enables the ambient conditions to be adjusted and optimised in both reactors separately. The digestate is collected in a separate tank.

Specifications: Main metallic elements made of stainless steel. Diagram in the front panel with distribution of the elements similar to the real one. 20 L reactor vessel with a tubular membrane inside. Lid for the reactor with a manual valve and the respective holes. Heating or cooling coil. Thermostatic bath (up to 60 °C), 6 l capacity, 600 W. Pump for hot water circulation of the thermostatic bath. Air compressor, range: 0 – 5 l/min. Diffusion plate for the air inlet. Air flow meter, range: 0.4 – 5 l/min. Peristaltic pump, range: 0 – 0.05 l/min. Water flow meter, range: 0.004 – 0.05 l/min. Membrane, muds separation. Overflow for the outlet of filtered water. Valve on the bottom for mud extraction. Temperature, pH and dissolved oxygen meter to monitor the digestion. Control panel, including: Switch for pump for the hot water circulation. Switch for peristaltic pump. Switch for air compressor. Main switch.



Order Code - 14274 ANAEROBIC TANK REACTOR

Introduction: The reactor is a cylindrical glass vessel with a water jacket for heating. The vessel is supplied with baffles and a variable-speed stirrer for use as a continuous stirred tank reactor (CSTR). Multi configurable and extremely versatile for both educational and research purposes. It has a self-contained, floor-standing anaerobic tank reactor of 20 litre volume. The stirrer, motor and baffles are removable for non-stirred configurations.

Specifications: Anaerobic Tank Reactor. A self-contained, floor-standing anaerobic tank reactor, volume 20l. Configurable as: – Continuous stirred tank reactor (CSTR) – Packed bed reactor (PBR) – Up flow anaerobic sludge blanket reactor (UASB). Stirrer, motor and baffles are removable for non-stirred configurations. Variable-depth liquid sampling point u Common points to both reactors. Measures reactor temperature, jacket temperature and vessel Ph. Jacket heating system with pump and hot water vessel. Temperature is PID controlled room temperature to 55°C. Automated volumetric gas collection system measures, which adds less than 10 mbar back pressure to the reactor. User calibration of pH and gas collection system. Feed flow rates 0.06-4.8 l/hr (using interchangeable peristaltic hoses). Gas sample point.



Order Code - 14275 ACTIVATED SLUDGE WASTE WATER TREATMENT PILOTT PLANT

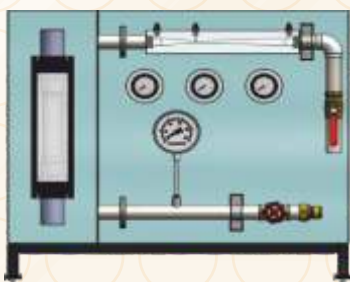
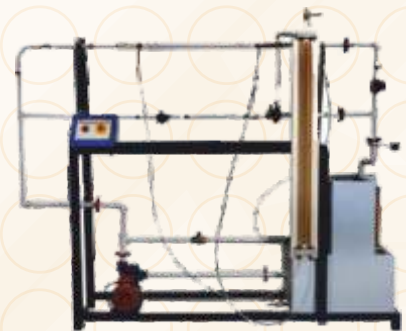
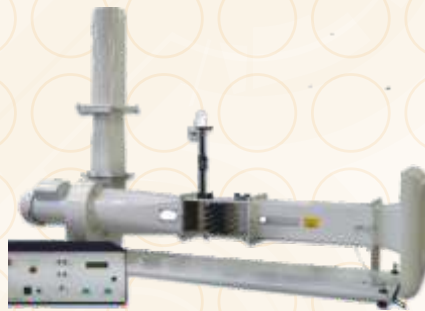
Introduction: A pump delivers raw water contaminated with dissolved organic substances (organic matter) into the aeration tank. Aerobic microorganisms (activated sludge) in the aeration tank use the organic matter as a source of nutrition, biodegrading it in the process. Since aerobic microorganisms need oxygen, the raw water is aerated in the aeration tank. The activated sludge is mixed with the raw water by stirring machines.

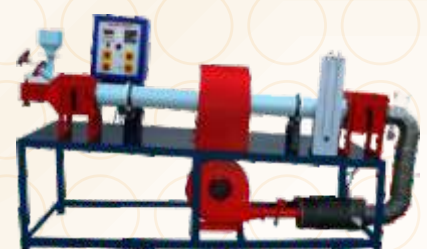
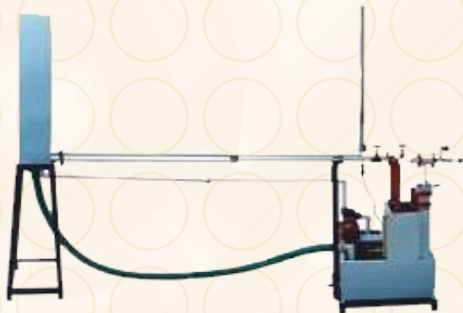
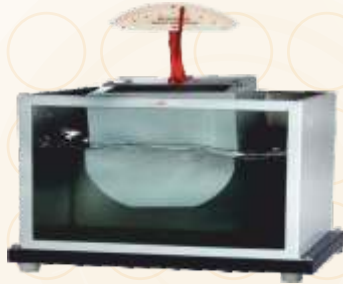
Specifications: Tanks aeration tank (nitrification zone): approx. 34L aeration tank (denitrification zone): approx. 17L secondary clarifier: 30L raw water tank: 200L treated water tank: 80L Flow rates raw water pump: max. 34L/h return sludge pump: max. 34L/h circulation pump: max. 34L/h Speeds (stirring machines) raw water tank: each max. 600min⁻¹ aeration tank: each max. 330min⁻¹ secondary clarifier: max. 45min⁻¹.

Measuring ranges

flow rate: 0.6...30L/h (raw water and return sludge) 3...60L/h (internal recirculation) 50...550L/h (compressed air) temperature: 0...50°C pH value: 0...14 oxygen concentration: 0...20mg/L.







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SCAN ME