



P3200 AIR FLOW BENCH

INTRODUCTION

Cussons Air Flow Bench, together with the various ancillary items and special experimental equipments, form a comprehensive laboratory facility, which enables detailed experiments in various aspects of air flow studies, convective heat transfer and subsonic aerodynamics to be performed.

All Cussons equipment is supplied with comprehensive operating manuals which provide full instructions for each experiment, relevant theory, sample results, graphs where applicable and full maintenance details.

FEATURES

- ◆ Standard Fan test to BS 848 without the use of additional equipment.
- ◆ Integral inlet flow measurement device.
- ◆ Large range of add-on experiments in air flow, aerodynamics and heat transfer.
- ◆ Additional equipment easily and quickly fitted.
- ◆ Mobile self-contained unit with storage shelf.
- ◆ Well instrumented, including dual sloping manometer, barometer and pitot static tube.
- ◆ Optional multi-tube manometer.
- ◆ Optional 0-10V data logging modules.

EXPERIMENTAL TOPICS

- ◆ Fan characteristics (BS 848)
- ◆ Air flow in ducts
- ◆ Air flow measurement
- ◆ Bernoulli's experiment
- ◆ Flow around a bend
- ◆ Free jet studies
- ◆ Tube wall to air convective heat transfer
- ◆ Heat transfer in a shell and tube heat exchanger
- ◆ Flow around a cylinder
- ◆ Lift and drag of an aerofoil
- ◆ Flow visualisation
- ◆ Boundary layer growth

P3200

AIR FLOW BENCH AND EXPERIMENTS

DESCRIPTION

The P3200 Air Flow Bench consists of a welded steel frame, mounted on castors, and provides two work surfaces for experiments and integral storage space. A tangential fan (i.e. fitted with a narrow chord centrifugal impeller), directly driven from a single phase induction motor, provides the necessary air flow for experiments. The fan is capable of providing a flow of 500 litres/second at a static pressure rise of 800 Pascals.

The ductwork supplied with the Air Flow Bench is manufactured in aluminium sections assembled by deep spigoted sockets, sealed by 'O' rings and clamped by quick-release over-centre toggle latches. The design of the ductwork allows various configurations to be assembled including the easy installation of the optional additional equipment available from Cussons. The duct work includes flow straighteners and an adjustable discharge valve.

An electrical enclosure is mounted on the upper work surface and contains the fan contactor, fan start and stop pushbuttons, and provides electrical power for optional additional equipment.

The instrumentation supplied with the Air Flow Bench comprises a dual multi-slope manometer with dial type barometer, a conical inlet flow measuring device, and a pitot static tube for traversing the duct. An optional data logging system with various modules is available to provide 0-10V dc analogue outputs of all measurements for interfacing to a computer system.

TENDER SPECIFICATION

P3200 - Air Flow Bench

Steel-framed bench on castors with two work surfaces and ample storage; narrow chord centrifugal fan with single phase induction motor; electrical enclosure containing fan contactor, fan start and stop pushbuttons; 60° by 95 mm dia. conical inlet flow measurement pipe with four pressure tappings, 9°-95 to 146 mm dia. conical transition piece, 380 mm long by 146 mm dia. duct fitted with honeycomb flow straightener and incorporating four pressure tappings, 285 mm long by 146 mm dia. section incorporating a 70 mm right-angled branch section fitted with blanking cap, 306 mm long by 146 mm dia. section fitted with anti-swirl vanes, 350 mm long by 146 mm dia. section fitted with outlet flow control device and incorporating four pressure tappings; instrumentation comprising traversible pitot static tube with 40-0-40 mm scale, dual multi-slope manometers scaled 0-5 and 0-2.5 kPa and dial type barometer.

SERVICES REQUIRED

Single phase 220/240V, 50Hz supply. Other voltages by request.

PHYSICAL DETAILS

| | Nett Weight | | Length | | Width | | Height | |
|-------|-------------|-----|--------|----|-------|----|--------|----|
| | kg | lb | m | in | m | in | m | in |
| P3200 | 120 | 264 | 1.7 | 67 | 0.74 | 29 | 1.55 | 61 |

ADDITIONAL EXPERIMENTS

The modular design of the basic system enables numerous add-on units to be used with this service bench, ensuring that the scope of the work which can be dealt with can be enlarged as required. The full range of experiments is shown here in brief detail for all three disciplines, whereas information on Heat Transfer and Aerodynamics is provided on a separate leaflet.

AIR FLOW

P3202 - Multitube Manometer

For convenient and simultaneous measurement of up to fourteen pressure tapping points.

P3203 - Flow Measurement Apparatus

A series of flow measuring devices including venturi tube, orifice plate and nozzle.

P3204 - Anemometer

A telescopic thermistor anemometer for the direct measurement of low air velocities in the range 0-30m/s.

P3208 - Bernoulli's Experiment

A three-dimensional method of demonstrating Bernoulli's Theorem by measurement of static and total heads.

P3222 - Flow Around A Bend

Demonstration model basically in clear acrylic material to illustrate the pressure profile of an air stream flowing round a bend. Requires the use of P3202 Multitube Manometer.

P3224 - Flow In Pipes Apparatus

Unit designed for study of pressure losses and velocity profiles through pipes and fittings including losses at entry, in straight pipes, and in an enlargement section. Requires the use of P3202 Multitube Manometer.

P3234 - Turbulent Jet

Experiment to determine the pressure profile of an air jet by the use of a traversible pitot tube.

AERODYNAMICS

P3230 - Two Dimensional Wind Tunnel

Two models are provided with the tunnel - a cylinder with a single radial tapping and an aerofoil section with multiple pressure tappings. Comparisons of the drag co-efficients between the two models gives an appreciation of the streamlining qualities of the aerofoil. Requires the use of P3202 Multitube Manometer.

P3231 - Two Component Balance

Lift and drag can be measured directly and the results compared with those evaluated from the pressure profile.

P3232 - Boundary Layer Apparatus

For the study of build-up of boundary layers on a flat plate having both sharp and rounded leading edges. The velocity profile adjacent to the model surface is investigated by means of a vernier mounted pitot tube.

P3233 - Smoke Generator

Equipment includes a smoke generator to demonstrate visually the flow of air around models.

SIGNAL CONDITIONING & DATA

LOGGING ACCESSORIES

P3205 - Signal Conditioning System for Air Flow Bench

Module for P3200 providing 0-10V analogue signals for barometric pressure, one 0-50 mbar and one 0-25 mbar air pressures, and fan motor current.

P3206 - Signal Conditioning System for Multiple Pressures

Module for use with P3205 providing 0-10V analogue signals for fourteen air pressures scaled from -25 mbar to +25 mbar.

P3207 - Signal Conditioning System for Two Component Balance

Module for use with P3205 and P3231 providing two 0-10V analogue signals representing lift and drag measured by the Two Component Balance, includes lift and drag load cells.

P3209 - Data logging System complete with PC

FURTHER ADDITIONAL EXPERIMENTS

HEAT TRANSFER

P3219 - Cross Flow Heat Transfer Apparatus

The use of electrically heated tubes positioned transversely to the direction of air flow, enables a series of forced convection heat transfer co-efficients to be derived for varying flow rates and model configurations. Experimental equipment is supplied complete with an electrical control and instrumentation box that is also used for the additional heat transfer experiments (P3212/3).

P3212 - Parallel Flow Heat Transfer Apparatus

Determination of Nusselt/Reynolds Number relationship for heat transfer from wall to air both inside and outside of heated tubes in parallel flow orientation. This is an additional experiment to P3219 Cross Flow Heat Transfer Unit.

P3213 - Mixed Flow Heat Transfer Apparatus (Simulated Shell And Tube)

This unit is provided as an additional experiment to P3219 demonstrating the heat transfer process from tube wall to air within a tube bundle.

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