

AIR FLOW & WIND TUNNEL LABORATORY CUSSONS TECHNOLOGY LABORATORY RECOMMENDATION

Air flow work is conducted using the Cussons Airflow Bench which is designed to be extremely versatile in the study of aerodynamics and air flow studies. All equipment is made to be robust and as portable as possible.

Please see www.cussons.co.uk for additional information on any product, or contact us at sales@cussons.co.uk

Air Flow Bench & Data Logging Packages

P3200 Air flow Bench

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 impellor), 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.

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.



P3205 Data Acquisition Unit for P3210

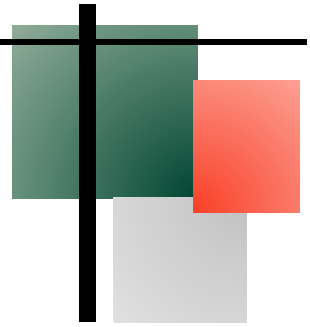
The unit is housed in a 3U Standard 19" rack module. It incorporates a power supply and the necessary signal conditioning board for the transducers supplied. Three pressure transducers are fitted as standard :

1. 0 - 1040 mbar Absolute (barometric)
2. 0 - 70 mbar Differential or Gauge
3. 0 - 70 mbar Differential or Gauge

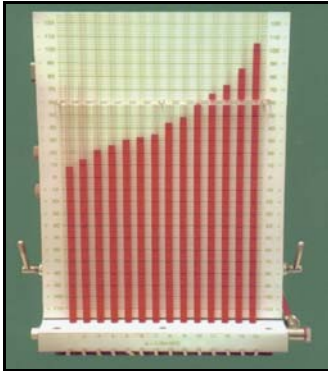
There is also provision for RMS motor current (for P3200 fitted with current transducer) and Dynamometer Torque and Speed (for use with P3240 DC dynamometer).

OPTIONS:

- P3206** 14 Channel pressure transducer module for use with P3202 Multi Tube Manometer. (only available Factory Fitted into P3205 rack)
- P3207** Two channel strain gauge module for use with P3231 Two Dimensional Balance. (only available Factory Fitted into P3205 rack).
- P3209** Computer Software and Data Logging Interface
- P3211** PC system for P3205
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Air Flow Bench Experiment



P3202 Multitube Manometer

The manometer, which uses blended paraffins of Specific Gravity 0.784 as the working fluid, consists of fourteen vertical tubes connected to a common manifold and from there to a large reservoir which can be raised or lowered for adjustment of the zero reading. A tapping point on the reservoir allows datum pressures other than atmospheric to be employed. The instrument is directly scaled with a range extending from -230 mm to +110 mm H₂O.

P3203 Flow Measurement Apparatus

The fan inlet and outlet ports are designed to accept standard sections of ductwork 146 mm dia. manufactured in aluminium and connected by deep spigoted sockets sealed by 'O' rings and clamped with quick-release over centre toggle catches. All sections conform with either British Standard BS 848 or BS 1042

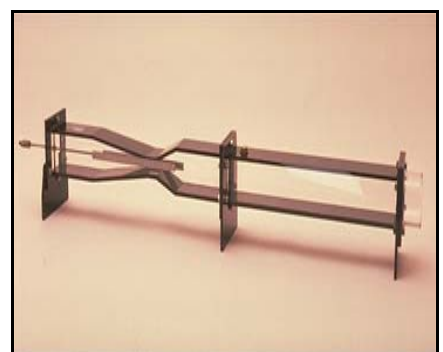


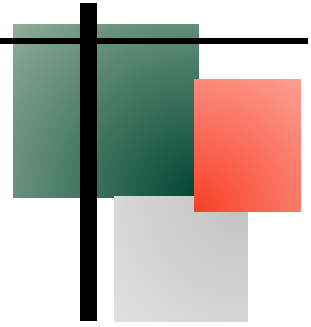
P3204 Anemometer

The Anemometer comprises a probe containing a heated miniature thermistor bead which is used in a current controlled circuit designed to eliminate the effects of changes in air temperature. The telescopic probe is arranged for any depth of insertion into a duct through a 1/2" BSP tapped boss. The analogue readout has a range of zero to 30 m/s and a temperature readout of zero to 80°C.

P3208 Bernoulli's Apparatus

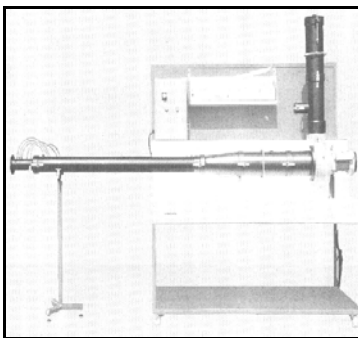
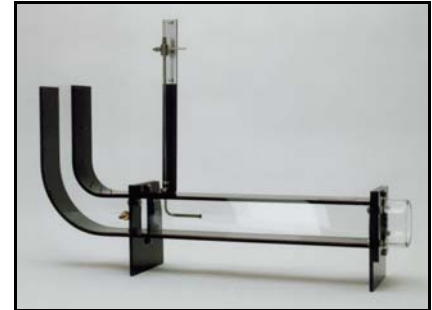
The apparatus comprises an acrylic duct with the upper and lower surfaces in opaque material and the sides clear. The whole unit forms a 60 x 50 mm rectangular cross section converging to a 20 x 50 mm throat area then diverging back to 60 x 50 mm section at the exit plane. A pitot static tube is fitted at the outlet end of the venturi duct and this can be traversed longitudinally along the centre line to enable its measuring tip to be positioned at various points. Measured positions are obtained against two scales positioned on opposite sides of the duct to avoid parallax errors. The scales are marked in millimetres but are reversible to show imperial measurements.





P3222 Flow Around a Bend

The unit is in two parts, a straight section followed by a regular 90° bend, in which the upper and lower sections are constructed from black acrylic material while the sides are of clear material. A cross section through the duct gives a height of 60 mm and a depth of 50 mm. Various tapping points are provided in both the upper and lower surfaces of the bend for connection to the P3202 Multitube Manometer which is a necessary accessory for this experiment.



P3224 Flow In Pipes Apparatus

This is an additional experiment to the basic P3200 Air Flow Bench which enables the student to gain a practical appreciation of various topics related to air flow in pipes.

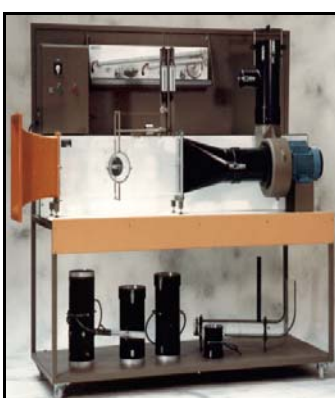
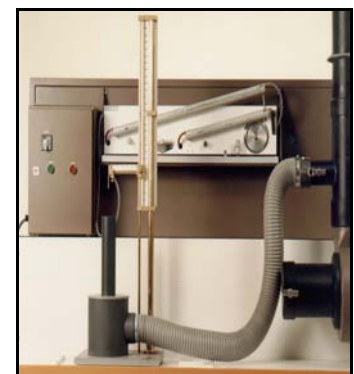
EXPERIMENTAL TOPICS

- ◆ Duct entry pressure profile with 65 mm diameter sharp, bluff and bellmouth entries.
- ◆ Study of sudden enlargement losses from 65 to 95 mm diameter.
- ◆ Friction losses in a 95 mm diameter pipe.
- ◆ Velocity profile development in a 95 mm diameter pipe.

P3234 Turbulent Jet Apparatus

The equipment consists of a plenum chamber with outlet tube and a calibrated stand to mount the pitot tube which can then be traversed along the axis of the air flow at various heights. The apparatus is shown mounted on the working surface of the basic P3200 Air Flow Bench and connected to the 'blown' experiment duct of the fan by re-inforced plastic hose. The pitot tube is connected to the larger of the two sloping manometers which is levelled and zeroed before starting the experiments.

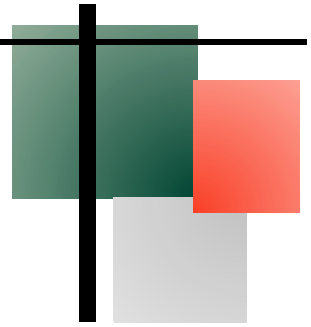
Although used with the basic Air Flow Bench the apparatus can be operated as a stand alone unit if supplied with an air flow of approximately 500 litres/second at a pressure of 600 Pascals.



P3230 Two Dimensional Wind System

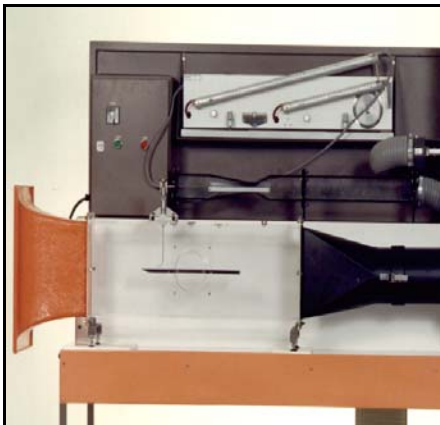
Cussons P3230 Two Dimensional Wind Tunnel is designed for use with either Cussons P3200 Air Flow Bench or Cussons P3240 Fan Test Stand. The wind tunnel has a high aspect ratio clear acrylic test section 250 mm high and 65 mm deep. The test section can be fitted with two interchangeable variable incidence model carriers, one with a cylindrical section and the other with a low velocity sub-sonic aerofoil. The cylinder has a single static tapping which can be used to plot the pressure profile around the cylinder. The aerofoil has 14 static pressure tappings allowing the pressure profile around the nose and along both the upper and lower cambered surfaces to be measured.

Pressures can be measured using Cussons P3202 Multitube Manometer or the P3206 Multiple Pressure transducer Module which provides 0-10 Volt analogue outputs for connection to a computer or data logging system.



P3231 Two Component balance

Cussons two component balance features a simple unique lever system employing vertical and horizontal balance beams to provide independent measurement of lift and drag forces using precision spring balances. Adjustable balance weights allow easy initial set-up and zeroing of the system.



P3232 Boundary Layer Experiment

FEATURES

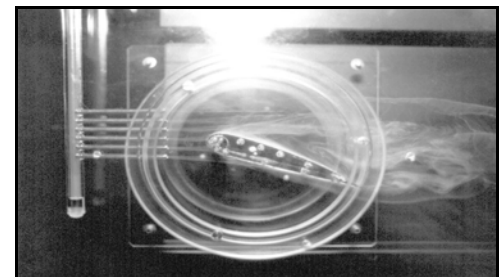
- ◆ Reversible flat plate with blunt and sharp leading edges and smooth and roughened surface
- ◆ Miniature pitot tube on vernier mounting

PRINCIPLE EXPERIMENTS

- ◆ To determine the velocity profile of the boundary layer at specified distances from the 'blunt' leading edge of a 'smooth' test plate (turbulent flow conditions)
- ◆ To determine the velocity profile of the boundary layer at different distances from the 'sharp' leading edge of a 'smooth' test plate (laminar flow conditions).

P3233 Smoke generator

- ◆ Oil reservoir capacity (nominal): 200 ml
- ◆ Oil Consumption (average): 70 ml/h
- ◆ Fine control over smoke generation
- ◆ Damping of smoke circuit oscillations

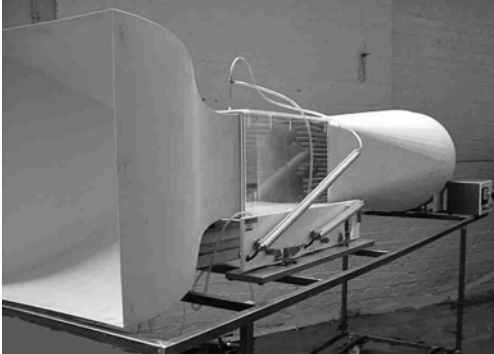


P3240 Fan test stand

- ◆ Air flow rate measurement as a function of fan speed
- ◆ Static pressure measurement and its variation with air flow rate
- ◆ Dynamic and total pressure measurement
- ◆ Measurement of electrical power required by fan
- ◆ Fan motor torque
- ◆ Fan efficiency at different speeds
- ◆ Flow measurement by pitot static tube traverse and by flow nozzle
- ◆ Measurement of temperature rise across fan



Wind Tunnel and Accessories



P3260 Wind Tunnel

The P3260 Air Flow Bench consists of a welded steel frame, mounted on castors, and provides a work surface for experiments and integral storage space. An axial impeller directly driven from a variable speed motor, provides the necessary air flow for experiments. The impeller is capable of providing a flow of 9000m³/hr at a static pressure rise of 500 Pascals.

P3262e Electronic 2 component balance including PC System.

Models & Accessories for use with P3260 / P3262

P3274 75 mm diameter sphere,

P3275 75 mm hemisphere,

P3276 75 mm disc,

P3277 75 mm ring,

P3278 75 mm square plate,

P3279 75 mm Vane,

P3273 75 mm diameter cylinder,

P3272 Streamlined shape

P3270 Aerofoil Section

P3267 Flutter Wing Model

Experiment to demonstrate wing flutter, including an aerofoil section supported on eight un-damped springs.

P3271 Aerofoil with Flap & Slot

P3268&69 - Pressure Models

Models provided with pressure tapping points to allow the pressure distribution over the model to be determined.

1. P3268 75 mm diameter cylinder,
2. P3269 aerofoil section.

N.B. Requires P3202 multi-tube manometer or P3206 data logging.

P3280 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.

P3281 Bernouilli Apparatus

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

Pitot Tube

Prantdl Probe

Static Presure Probe

P3202 Multitube Manometer (see previous page)

P3233 Smoke Generator (see previous pas)

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