



# P·A·Hilton Ltd

## COMPRESSIBLE FLOW AND AERODYNAMICS

Though the subject of aerodynamics normally brings to mind images as above, it also includes the more mundane, but equally important flow of air in ducts and pipes. For example the efficient transfer of air within a building air conditioning system can make major reductions in energy consumption throughout the life of the building. Gas flow can be made to generate power by expansion through a turbine. This can be as complex as an aero engine or as simple but equally important as an air tool that may be used to assemble the aero engine. Compressible flow through nozzles leads on to sonic and supersonic flows and ultimately to rocketry and space science. The Hilton Compressible Flow and Aerodynamics range includes a wide range of interrelated units that are continuously being expanded and are both modular and very flexible.

**AERODYNAMICS**

**NOZZLE TESTING AND  
SUPERSONIC FLOW**

**FLOW AND PRESSURE  
MEASUREMENT**

**SINGLE AND TWO  
STAGE COMPRESSORS**

**BERNOULLI'S  
EQUATION**

**TURBINES**

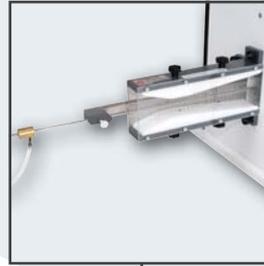
## F100 Series

The Hilton Airflow System F100 is available with an extensive range of optional accessories that makes the unit a very versatile and economic investment. The modules can be simply changed over using the robust connectors provided with no extra tools required. Nor is any complex set-up or installation required as the unit simply needs connecting to a power supply for operation. The unique design of the F100 Airflow System allows both the intake and discharge side of the fan to be utilised for experimental purposes.

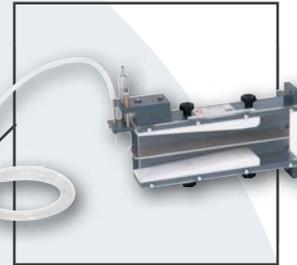
**F100A - Multi-tube  
Manometer**



**F100B - Bernoulli's  
Equation**



**F100M - Principles of  
Airflow, Fan Test and Flow  
Measurement**



**F100C - Boundary Layer  
Investigation**



*\*F100 shown with optional  
F100B Bernoulli's Equation Fitted*

### F100 Airflow System Base Unit

The Hilton Airflow F100 and its range of optional accessories enable students to safely investigate the fundamentals of airflow and simple aerodynamic experimental procedures. The unit consists of a small footprint, high volume, high pressure centrifugal fan with adjustable speed control, inlet and outlet couplings. Attached to this is the plenum chamber to which the individual experimental modules are fixed in a linear orientation. This compact design will fit onto a standard laboratory bench for easy storage and use.



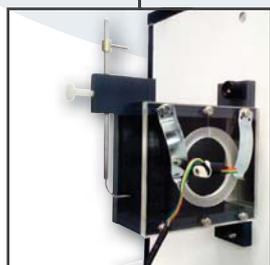
**F100K - Principles of Airflow,  
Friction Losses in Bends, and  
Pipe Elements**



**F100D - Round Turbulent Jet  
Investigation**



**F100H - Flow Visualisation  
Investigation**



**F100G - Drag Force  
Investigation**



**F100F - Jet Attachment  
Investigation**

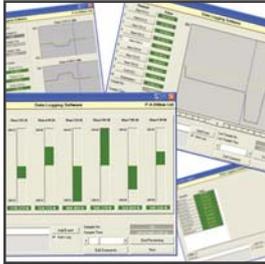


**F100E - Flow Around a Bend  
Investigation**



## F300 Series

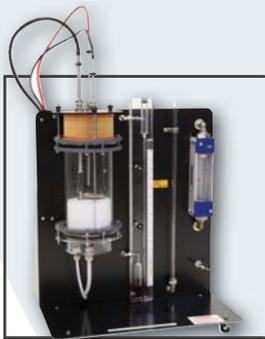
The F300 Compressible Flow range expands and updates a range of fundamental experiments that have been market leaders for many years and are still being utilised in colleges throughout the world over 30 years after initial development. The use of a very small volume of compressed air to generate sonic and supersonic flow through nozzles and the ability to monitor the position of an expansion shock wave in a nozzle of 2mm throat diameter still has the ability to enthral students. The modular design and the addition of air turbines, vortex driven heat pumping and fluidised beds further expands the range of interest.



Data Acquisition Upgrade



F300F - Vortex Tube Refrigerator Module



F300E - Fluidisation and Fluid Bed Heat Transfer Module



### F300 Compressible Flow Base Unit

The phenomenon of compressible flow, sonic velocity and supersonic flow is possibly one of the most demanding areas of study for many students.

The Hilton Compressible Flow range F300 and its optional accessories enable students to safely and clearly investigate the fundamentals of compressible flow, air turbines and a variety of heat transfer experiments.



F300A - Nozzle Performance Test Module



F300B - Nozzle Pressure Distribution Module



F300D - Experimental Reaction Turbine Module



F300C - Experimental Impulse Turbine Module

## F110 Pressure Measurement Bench

Allows students to investigate measurement of one of the fundamental parameters that will be present in almost every branch of engineering and physics.

The unit is bench mounted and self-contained having its own means of pressure generation.

The F110 is a bench top, panel mounted U tube and inclined tube manometer together with a positive pressure Bourdon tube pressure gauge and compound (positive and negative) pressure gauge.

The manometers allow investigation of the use of U and inclined tubes for pressure measurement and demonstrate the use of fluids of different density. All of the manometers and the panel mounted pressure gauges may be interconnected and linked to the common pressure source supplied.



## F110A Deadweight Tester

A self-contained deadweight tester with weights and a bourdon tube pressure gauge with a clear front allowing the mechanism to be viewed. Unique design allows standard Newton weights to be used; hence reinforcing the student understanding of pressure being Force / Unit Area. The unit has an optional pressure transducer (F110B) available allowing the concept of electronic representation of pressure to be investigated.



## F860 Single Stage Compressor Unit

Compressed air is utilised in a wide range of applications and the factors that determine the amount of power required to obtain it must be understood by engineers in many disciplines. The F860 Single Stage Compressor gives students a thorough experience of how a compressor operates. A motor mounted on bearings allows the torque and power to drive the compressor to be directly measured. The air delivery pressure and flow rate are measured as is the motor current and voltage. The intake pressure may also be measured and throttled to simulate operation at high altitude.

## F865 Two Stage Compressor Test Unit

The F865 reciprocating air compressor provides a useful introduction to both heat engine theory and fundamental thermodynamic analysis.

The measured parameters also give students experience of a wide range of instruments and measurement techniques.

The F865 is a free standing, belt driven, two stage reciprocating air compressor that may be operated as a single stage, two stage or two stage with and without intercooling system. An intake vessel reduces intake air pulsations and a high pressure air receiver is connected to the compressor discharge.

Intake and discharge air pressures are measured together with the air flow rate and motor drive power.



## OTHER EXPERIMENTS AVAILABLE (Refer to our Website for details)

**B500** Ventilation Trainer

**F300G** Compressible Flow, Pipe Friction Module

**F100J**

Principles of Airflow, Pressure and Velocity Distribution (Pitot-Traverse)



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