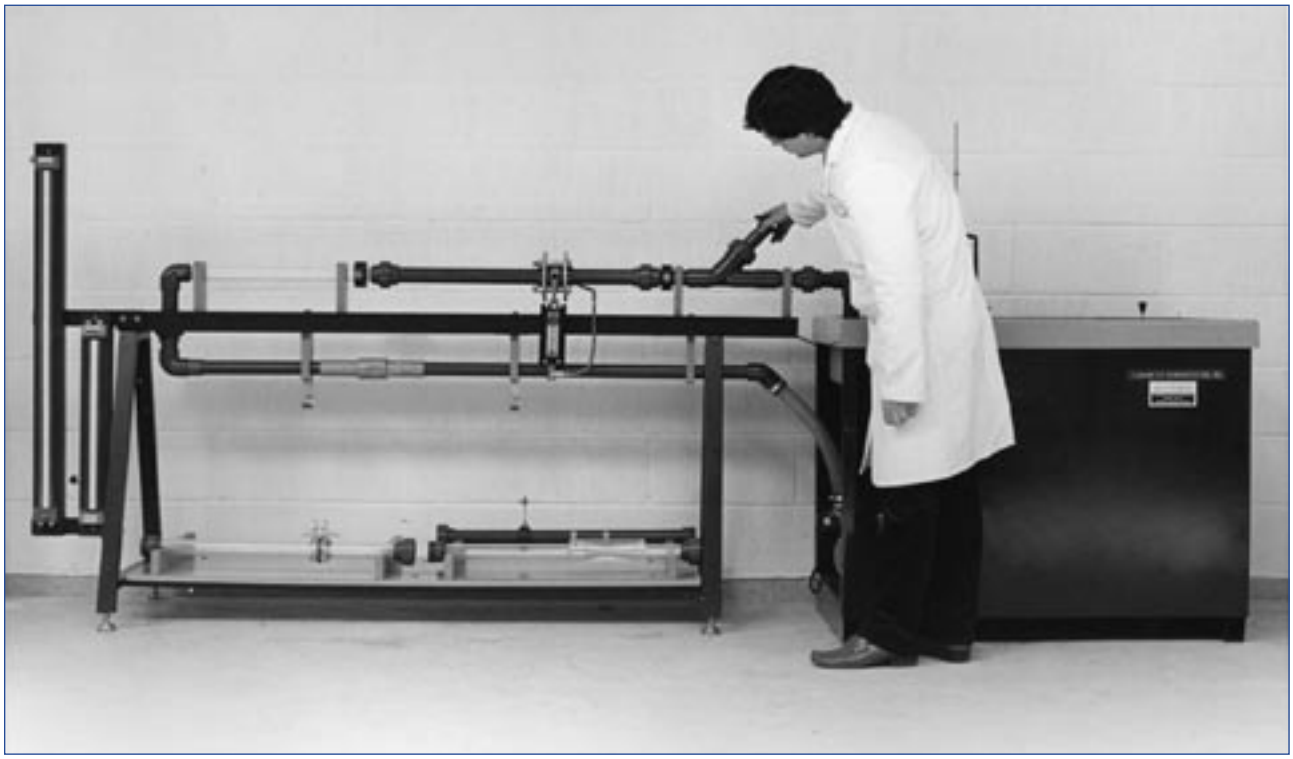
armfield

FLOW METER DEMONSTRATION UNIT

C9
issue 10



The Armfield Flow Meter Demonstration Unit is a self-contained facility designed to demonstrate the important characteristics of fourteen types of flow meter used in the measurement of water flow through pipes or open channels. Equipment purchase can be configured to suit the course being followed (see Meter Selection Chart).

DEMONSTRATION CAPABILITIES

- *comparing the use, application and limitations of various types of flow meter*
- *considering the implications on flow meter selection of performance, accuracy, convenience, cost and head loss*
- *understanding the principles on which different types of flow meter are based*
- *relating pressure drop across a flow meter to flow rate*
- *using manometers to measure pressure drop*
- *investigating the effect of air in the hydraulic stream on flow meter performance*
- *understanding the application of Bernoulli's Theorem*

DESCRIPTION

The Armfield Flow Meter Demonstration Unit is self-contained, the main elements are a service module and flow meter support stand.

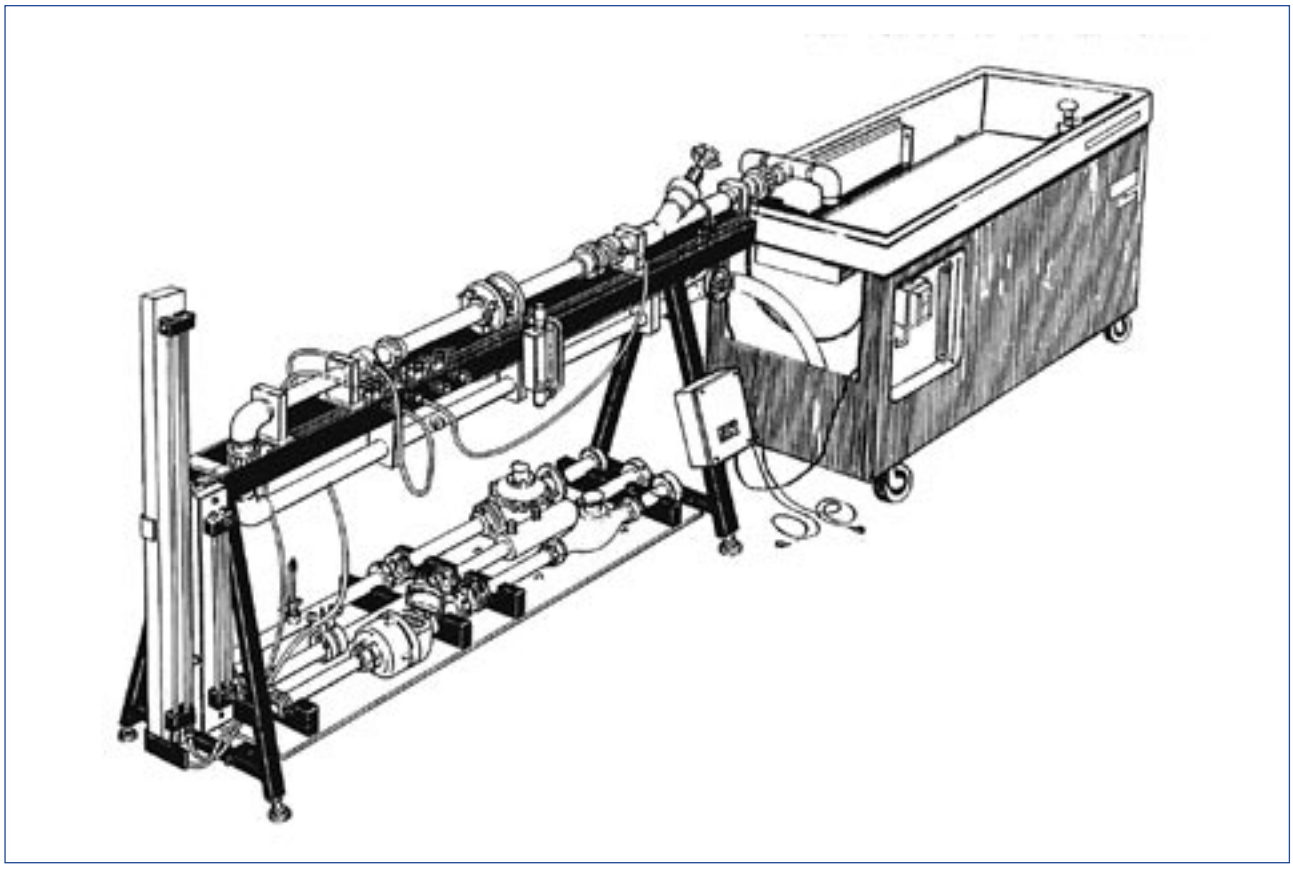
A self priming centrifugal pump draws water from the sump tank in the service module and delivers it to a flow meter test pipe. Industrial type flow meters mounted in test sections can be fitted into the test pipe quickly and easily. These meters have been chosen to give a variety of different metering principles and degrees of sophistication and accuracy. Some of the meters are calibrated directly in units of flow, whilst others involve the use of calibration charts.

The pressure drop across each of the flow meters can be measured by using either the 0.5 metre pressurised water manometer or the 1 metre mercury manometer supplied. Ported manometer connection valves ensure rapid bleeding of all manometer pipework. The facility exists to admit air into the hydraulic stream to demonstrate the effect on the meter's accuracy. The discharge from the test section is controllable and is fed through a diffuser into the channel of the service module, into which a 'Vee' Notch and Rectangular Notch Weir can be fitted.

An auxiliary channel (C9-15) accommodates the Broad Crested and Crump Weirs also the 'H' Flume and Washington Flume. Levels in the channel can be determined by using the hook and point gauge.

Water discharging from the flow meter on test is collected in a volumetric tank where the flow may be determined absolutely. This tank is stepped to accommodate high or low flow rates and incorporates a stilling baffle to reduce turbulence. A remote sight tube and scale connected to a tapping in the base of the volumetric tank allow an instantaneous indication of water level. Water is returned to the sump tank by a dump valve. The basic system incorporates a reference flow meter which has been chosen for reliability and accuracy. This meter remains installed whereas other meters are selected from their storage position on the apparatus and tested as desired.

In addition to being a valuable teaching aid, the apparatus brings to the laboratory a selection of instruments that can be used to support student project work. A full set of instructions is provided, including details for testing and comparison of flow meters.



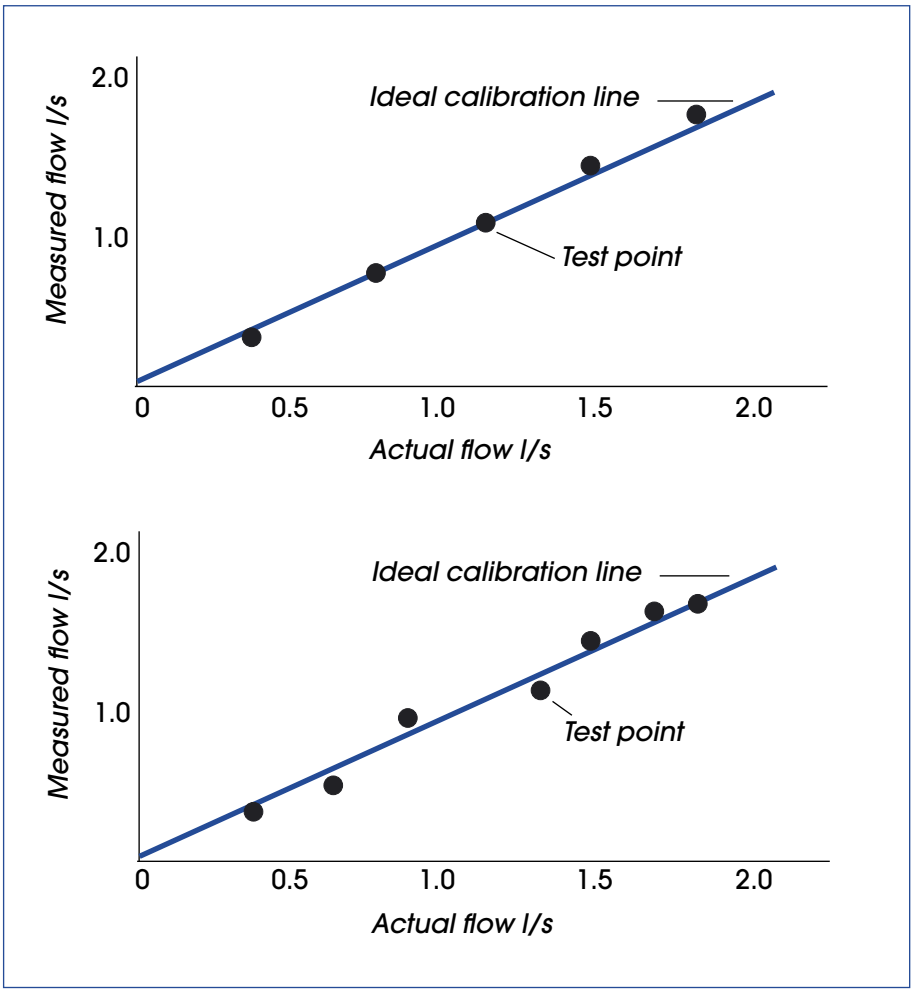
C9 Flowmeter Demonstration Unit

METER SELECTION CHART

Ordering Code	Course bias / Meter type	C9/20 Basic rig	C9/21 Mechanical/ Chemical	C9/22 Civil	C9/23 Agricultural	C9/00 Comprehensive
C9/1	Venturi	•	•			•
C9/2	Orifice	•	•			•
C9/3	Pitot	•	•			•
C9/4	Shunt gapmeter	•	•			•
C9/5	Swinging flap		•			•
C9/6	Volumetric rotary piston		•			•
C9/7	Electro-magnetic		•	•		•
C9/8	Helical rotary			•	•	•
C9/9	Inferential multistream			•	•	•
C9/10	Current meter			•	•	•
C9/11	Broad crested weir			•		•
C9/12	Crump weir			•	•	•
C9/13	'H' flume				•	•
C9/14	Washington flume				•	•
C9/15	Channel for C9/10-14			•	•	•
C9/16	D.P. meter for C9/1-3		•			•

TECHNICAL DETAILS

Maximum flow rate:	2.3 litres/s
Reservoir capacity:	140 litres
Volumetric tank capacity:	40 litres
Nominal bore of pipework:	38mm
Length of removable test pipe:	750mm
Pump motor rating:	0.55kW



Calibration of a venturi meter (top) and a shunt gapmeter (bottom)

ORDERING SPECIFICATION

- *A self-contained apparatus to demonstrate the characteristics of flow meters used in measurement of water flow through pipes or open channels.*
- *Service module with reservoir, volumetric measuring tank and pump.*
- *Reference turbine flowmeter permanently fitted.*
- *Metering devices available in various combinations to suit coursework.*

Selection from fourteen devices:

- *Venturi*
- *Orifice*
- *Pitot*
- *Shunt gapmeter*
- *Swinging flap*
- *Volumetric rotary piston*
- *Electromagnetic*
- *Helical rotary*
- *Inferential multistream*
- *Current meter*
- *Broad crested weir*
- *Crump weir*
- *'H' Flume*
- *Washington flume*

- *Quick and easy removal of test meters for evaluation and inspection.*
- *Air entrainment facility.*
- *Meters can be used independantly to support research or student project work.*
- *User instruction manual provides installation, commissioning and maintenance data, together with project excercises.*

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RECOMMENDED INSTRUMENTS

Stopwatch

SERVICES REQUIRED

Electrical supply:
C9-(00/20/21/22/23)-A: 220-240V/1ph/50Hz@10A
C9-(00/20/21/22/23)-B: 120V/1ph/60Hz@20A

Water supply:
Initial fill with clean water

OVERALL DIMENSIONS

Height:	*1.50m*
Width:	*3.50m*
Depth:	*1.00m*

SHIPPING SPECIFICATION

Volume:	*3m³*
Gross weight:	*400kg*

COMPLEMENTARY PRODUCTS

C1: *Compressible Flow Bench*
C2: *Subsonic Wind Tunnel*
C3: *Multi-pump Test Rig*
C4: *Multi-purpose Teaching Flume*
C6MkII: *Fluid Friction Measurements*
C7: *Pipe Surge & Water Hammer*
C10: *Laminar Flow Analysis Table*
C11: *Flow in Pipe Networks*
F1-10: *Hydraulics Bench & Accessories with F1-301 Computer Aided Learning Software (Windows)*

OPTIONAL ACCESSORIES

For installations where the use of Mercury is undesirable or prohibited a digital pressure meter is available, ask for data sheet:
H12: Manometers and pressure meters.

TOXIC MATERIALS:
Due to international restrictions limiting the transport of toxic materials, we do not include mercury in our supply.