

**Flow Meter Demonstration Unit - C9**

The Armfield Flowmeter Demonstration Unit has been designed to demonstrate the characteristics of the different types of flowmeter used for the measurement of water flow through pipes and open channels. Pressure drop/flowrate characteristics of meters can be readily determined with the volumetric tank and differential manometers fitted.

**CONFIGURABLE WITH 14 ACCESSORIES**

**DEMONSTRATE THE IMPORTANT CHARACTERISTICS OF FLOW METERS**



Venturi, one of 14 devices optionally supplied

**Experimental content**

- ▶ To demonstrate the application of an Orifice Plate, Venturi and Pitot tube in the measurement of flow rate in a closed conduit
- ▶ To demonstrate the use of one or more flowmeters for the measurement of flow rate in a closed conduit, and to determine the flowmeter characteristics. Including Shunt Gage, Swinging Flap, Volumetric Rotary Piston, Electromagnetic, Helical Rotary and Inferential Multistream
- ▶ To demonstrate the use of a Broad Crested Weir, Crump Weir, H Flume and Washington Flume to measure flow rate in an open channel
- ▶ To demonstrate the characteristics of a Rectangular notch weir and Vee Notch weir in an open channel
- ▶ Comparing the use, application and limitations of various types of flow meter
- ▶ Considering the implications of flow meter selection on 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 a self-contained facility to demonstrate the important characteristics of flow meters. The main elements are a service module and flow meter support stand.

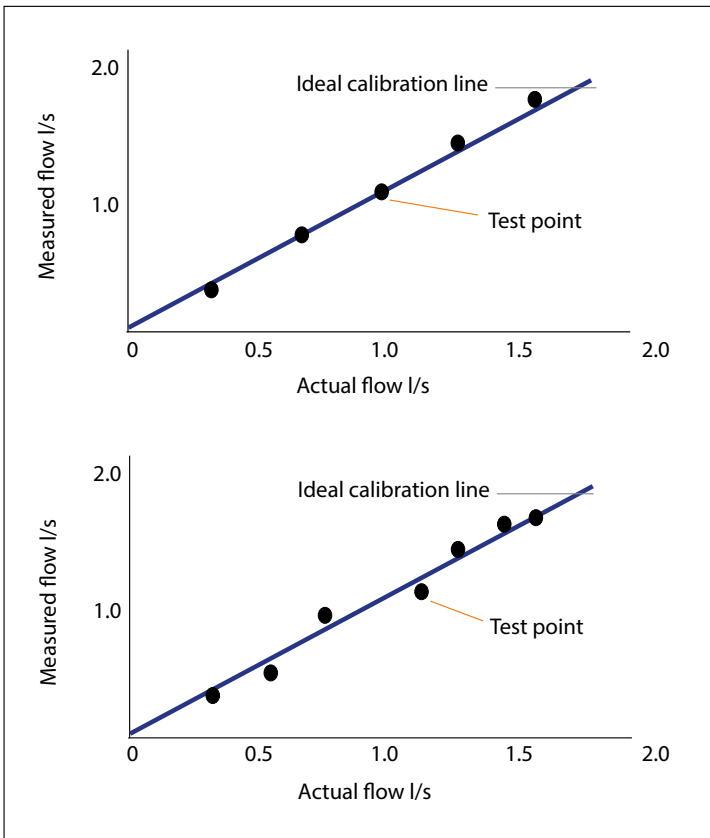
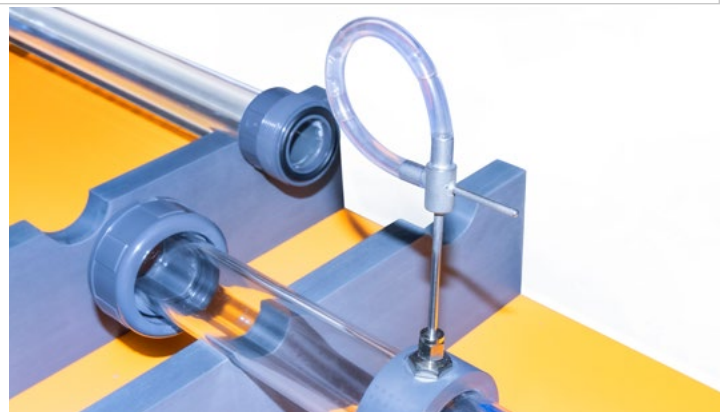
A self-priming centrifugal pump draws water from the sump tank in the service module and delivers it to a flow meter test pipe. Industrial-type flow meters mounted in test sections can be fitted into the test pipe quickly and easily. These meters have been chosen to give a variety of different metering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

The pressure drop across each of the flow meters can be measured by using either the one-metre pressurised water manometer or the 0.5-metre mercury manometer supplied. Ported manometer connection valves ensure rapid bleeding of all manometer pipework. A 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. A V-notch and rectangular notch weir can be fitted into the service module.

An auxiliary channel (C9-15) accommodates the broad-crested and crump weirs, as well as the 'H' flume and Washington flume. Levels in the channel can be determined by using the Hook and Point Gauge (H1).

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 enable 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.



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



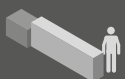
Ordering Codes	Ordering Codes	C9/20	C9/21	C9/22	C9/23	C9/00
	Course bias	Basic Rig	Mechanical/ Chemical	Civil	Agricultural	Comprehensive
	Meter Type					
C9/1	Venturi	•	•			•
C9/2	Orifice	•	•			•
C9/3	Pitot	•	•			•
C9/4	Shunt gapmeter	•	•			•
C9/5	Swinging flap		•			•
C9/6	Volumetric rotary piston		•			•
C9/7	Electromagnetic		•	•		•
C9/8	Helical rotary			•	•	•
C9/9	Inferential multi-stream			•	•	•
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 specifications

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

## Requirements

## Scale



### Electrical supply:

C9-(00/20/21/22/23)-A: 220-240V / 1ph / 50Hz / 10 amp

C9-(00/20/21/22/23)-B: 120V / 1ph / 60Hz / 20 amp

C9-(00/20/21/22/23)-G: 220-240V / 1ph / 60Hz / 10 amp

### Water supply:

Initial fill with clean water

### Stopwatch

## Overall dimensions

Length	3.50m
Width	1.00m
Height	1.50m

## Packed and crated shipping specifications

Volume	3m <sup>3</sup>
Gross weight	400Kg

### TOXIC MATERIALS:

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

## 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 paddle wheel meter with a digital indicator is permanently fitted
- ▶ Metering devices available in various combinations to suit coursework
- ▶ Selection from 14 devices:
  - Venturi
  - Orifice
  - Pitot
  - Shunt gapmeter
  - Swinging flap
  - Volumetric rotary piston
  - Electromagnetic
  - Helical rotary
  - Inferential multi-stream
  - 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 independently to support research or student project work
- ▶ User instruction manual provides installation, commissioning and maintenance data, together with project exercises

## Related products

- ▶ C1MkII: Compressible Flow Unit
- ▶ C15: Computer Controlled Wind Tunnel
- ▶ C3MkII: Multi-pump Test Rig
- ▶ C4MkII: Multi-purpose Teaching Flume
- ▶ C6MkII: Fluid Friction Measurements
- ▶ C7: Pressure Surge in a Pipe & Water Hammer Apparatus
- ▶ C10: Laminar Flow Analysis Table
- ▶ C11: Flow in Pipe Networks
- ▶ F1-10: Hydraulics Bench & Accessories with F1-ABASIC Computer Aided Learning Software (Windows)

## Optional accessories

For installations where the use of mercury is undesirable or prohibited a digital pressure meter is available (H12-8), ask for data sheet:

**H Series:** Hydraulic Measurement Instruments.

## Ordering codes

C9-(00/20/21/22/23)-A: 220-240V / 1ph / 50Hz / 10 amp

C9-(00/20/21/22/23)-B: 120V / 1ph / 60Hz / 20 amp

C9-(00/20/21/22/23)-G: 220-240V / 1ph / 60Hz / 10 amp

## Armfield standard warranty applies with this product

## Knowledge base

- > 28 years expertise in research & development technology
- > 50 years providing engaging engineering teaching equipment

Benefit from our experience, just call or email to discuss your laboratory needs, latest project or application.

An ISO 9001:2015 Company



**armfield.co.uk**

## Aftercare

Installation  
Commissioning  
Training  
Service and maintenance  
Support: [armfieldassist.com](mailto:armfieldassist.com)