

Fluid Properties & Hydrostatics Bench – F9092

The Armfield Fluid Properties and Hydrostatics Bench is designed to demonstrate the properties of fluids and their behaviour under hydrostatic conditions (fluid at rest).

This enables students to develop an understanding and knowledge of a wide range of fundamental principles and techniques, before studying fluids in motion.

HANDS ON LEARNING



Fluid Properties & Hydrostatics Bench – F9092 (shown with options)

Description

The equipment is mounted on a steel-framed bench fitted with castors. A variety of measuring devices is incorporated either fastened to the back of the bench or free-standing.

Water is stored in a polythene tank situated on the lower shelf of the bench.

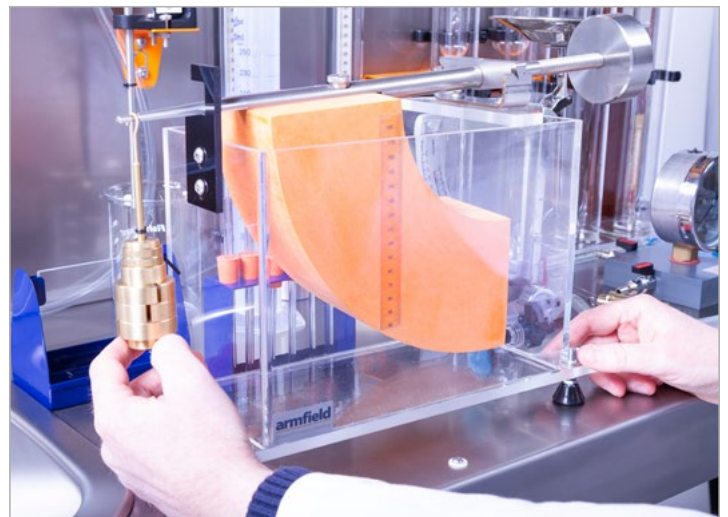
The water can be transferred by two positive displacement hand pumps, either to an elevated open storage tank connected to a number of glass tubes for free surface studies, or to a plastic sink recessed into the working surface so that benchtop experiments may be conducted without spillage. All excess water is returned to the storage tank via the sink drain.

The following experimental apparatus is included:

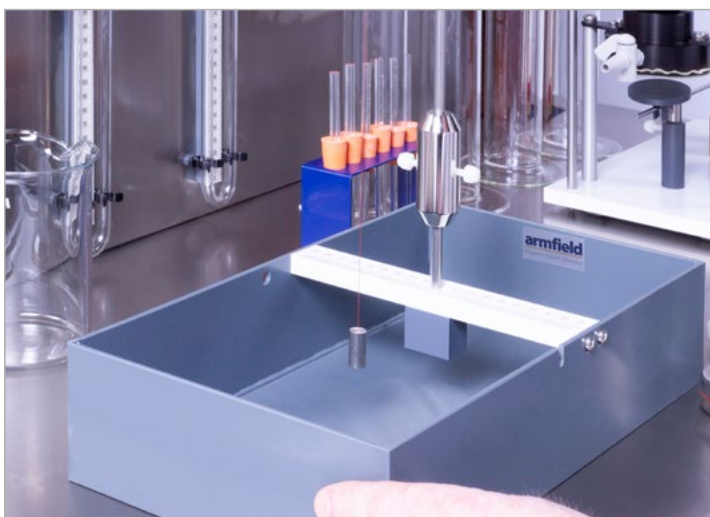
- ▶ Universal hydrometer and hydrometer jars
- ▶ Falling sphere viscometers
- ▶ Free surface tubes
- ▶ Hook and point gauge
- ▶ Mercury barometer (mercury not supplied)
- ▶ Bourdon gauge
- ▶ U-tube manometers
- ▶ Deadweight pressure gauge calibrator and weights
- ▶ Hydrostatic pressure apparatus
- ▶ Pascal's apparatus
- ▶ Parallel plate capillary apparatus
- ▶ Capillary tube apparatus
- ▶ Lever balance with displacement vessel, bucket and cylinder
- ▶ Metacentric height apparatus
- ▶ Measuring cylinder
- ▶ Thermometer
- ▶ Air pump
- ▶ 600ml beaker
- ▶ Stop clock



Dead Weight Pressure Gauge Calibrator - F1-11



Hydrostatic Pressure - F1-12



Metacentric Height - F1-14



Pascal's apparatus - F1-31

Demonstration Capabilities

► **Understanding the properties of fluids:**

- Principles and use of a hydrometer
- Measurement of densities and specific gravities
- Measurement of Viscosity

► **Understanding the effects of static pressure:**

- Observation of effect of capillarity
- Measurement of Capillary elevation
- Demonstrating that the free surface of a static liquid is horizontal
- Studying the effect of flow on a free surface
- Measurement of Liquid Levels using the Hook and point Gauge
- To show that pressure in a liquid varies with the depth and does depend on the shape or area of the vessel
- To determine the hydrostatic thrust acting on a plane surface immersed in water when the surface is partially submerged or fully submerged
- To determine the position of the line of action of the thrust and to compare the position determined by experiment with the theoretical position

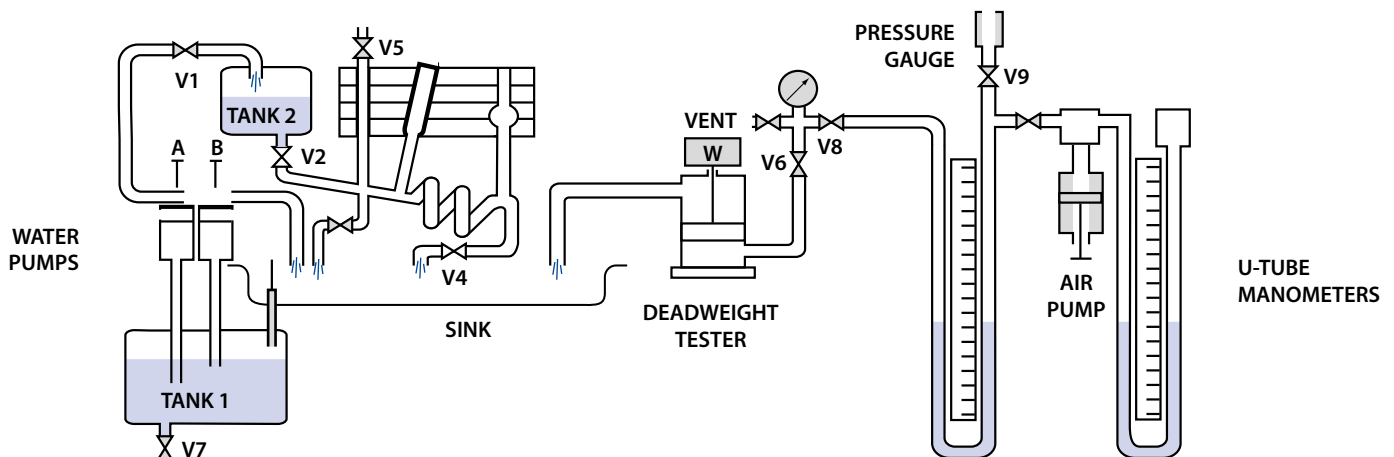
► **Studying the operation and application of pressure gauges and manometers:**

- Using a direct reading mercury barometer to read the barometric or atmospheric pressure (mercury not supplied)

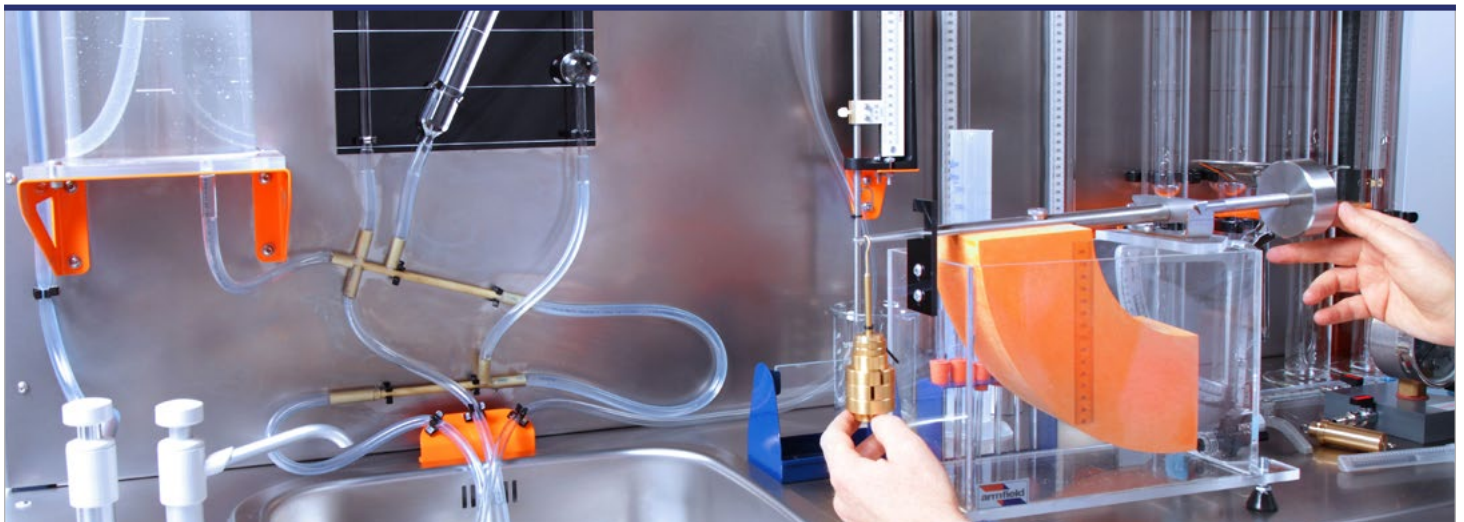
- To calibrate a Bourdon-type pressure gauge using the dead-weight pressure gauge calibrator
- To determine the measurement errors in the reference pressure source used for calibration
- To use a water over mercury 'U' tube manometer to determine the pressure at a point
- To compare the reading of a manometer with a Bourdon gauge
- To use an air over mercury 'U' tube manometer to determine the pressure at a point
- To use a water over manometer to determine and compare differences in pressures in a water and air system

► **Investigating the buoyancy force and stability of floating bodies:**

- Show that pressure in a liquid varies with the depth and does depend on the shape or area of the vessel - Verifying Archimedes' principle
- Stability of a floating body and determination of metacentric height
- Determining the centre of gravity of the pontoon
- Determining the metacentric height and from this the position of the metacentre for the pontoon
- Varying the metacentric height with angle of heel



Pressure and liquid level experiments are conducted using a built-in pipe system shown in outline in this diagram



Pressurising a manometer

Technical Details	
Universal hydrometer	Range 0.70-2.00 subdivided in 0.01 intervals
Falling sphere viscometer	40mm tube diameter
Hydrostatic pressure apparatus	Comprises counterbalanced precision quadrant pivoted on knife edges at its centre of arc
Direct reading barometer	With compensated silvered metal scale Range 585-790mm subdivided in 1mm intervals Includes thermometer
100mm dial pressure gauge	Range 0-200 kN/m ² (kPa) and equivalent head of water in metres
Deadweight pressure gauge calibrator	With 2 x 0.5kg, 1kg and 2.5kg weights
Lever balance	178mm diameter pan, hook for use in buoyancy experiments, antiparallax cursor, double scale 0-0.25kg and 0-1.00kg
Thermometer	Range -10°C to +50°C



Demonstration of the free surface of a static liquid

Optional products

H12-8: Basic Portable Pressure Meter

Consequent to its hazardous nature many technicians prefer not to use mercury or its use may be prohibited in the laboratory.

In any case Armfield is unable to include it in the supply with the purchase of mercury manometers due to shipping restrictions.

With this in mind Armfield offers a handheld, portable, battery-operated pressure meter (H12-8), which is capable of measuring pressures of air or water from 0-2.8 Bar (0-2100mm Hg).



Overall dimensions

Length	1.45m
Width	1.83m
Height	0.61m
Packed and crated shipping specifications	
Volume	2.7m ³
Gross weight	270kg

Requirements



Water:

Fill with clean water.

No permanent connection required.

Scale



Ordering specifications

- ▶ A self-contained and mobile unit for demonstration of the properties of fluids and hydrostatics
- ▶ The equipment is mounted on a steel-framed bench fitted with castors
- ▶ The benchtop incorporates a recessed plastic sink
- ▶ A variety of measuring devices is incorporated in the unit including a universal hydrometer, range 0.70-2.00; falling sphere viscometer; hook and point gauge; hydrostatic pressure apparatus; Pascal's apparatus; double-scale lever balance with displacement vessel, bucket and cylinder; metacentric height apparatus; direct reading barometer range 585-790mm; dial pressure gauge range 0-200 kN/m² (kPa); deadweight pressure gauge calibrator with weights; thermometer range -10°C to +50°C
- ▶ These devices enable a full range of 16 experiments to be carried out, demonstrating the properties of fluids, the effects of static pressure, the operation and application of pressure gauges and manometers and the investigation of the stability of floating bodies
- ▶ A comprehensive manual is included describing how the experiments are performed as well as how to commission the equipment

Complementary Products

F1:	Hydraulics Bench and Accessories
F1-ABASIC:	Programs for F1 product range
F5:	Osborne Reynolds' Apparatus
F6:	Air Flow Studies
F1-28:	Cavitation Demonstration
F12:	Particle Drag Coefficients
F14 MkII:	Hydrogen Bubble Flow Visualisation System

Ordering codes

- ▶ F9092

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



Products CE certified

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Aftercare

Installation
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Training
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Support: armfieldassist.com