FS SERIES

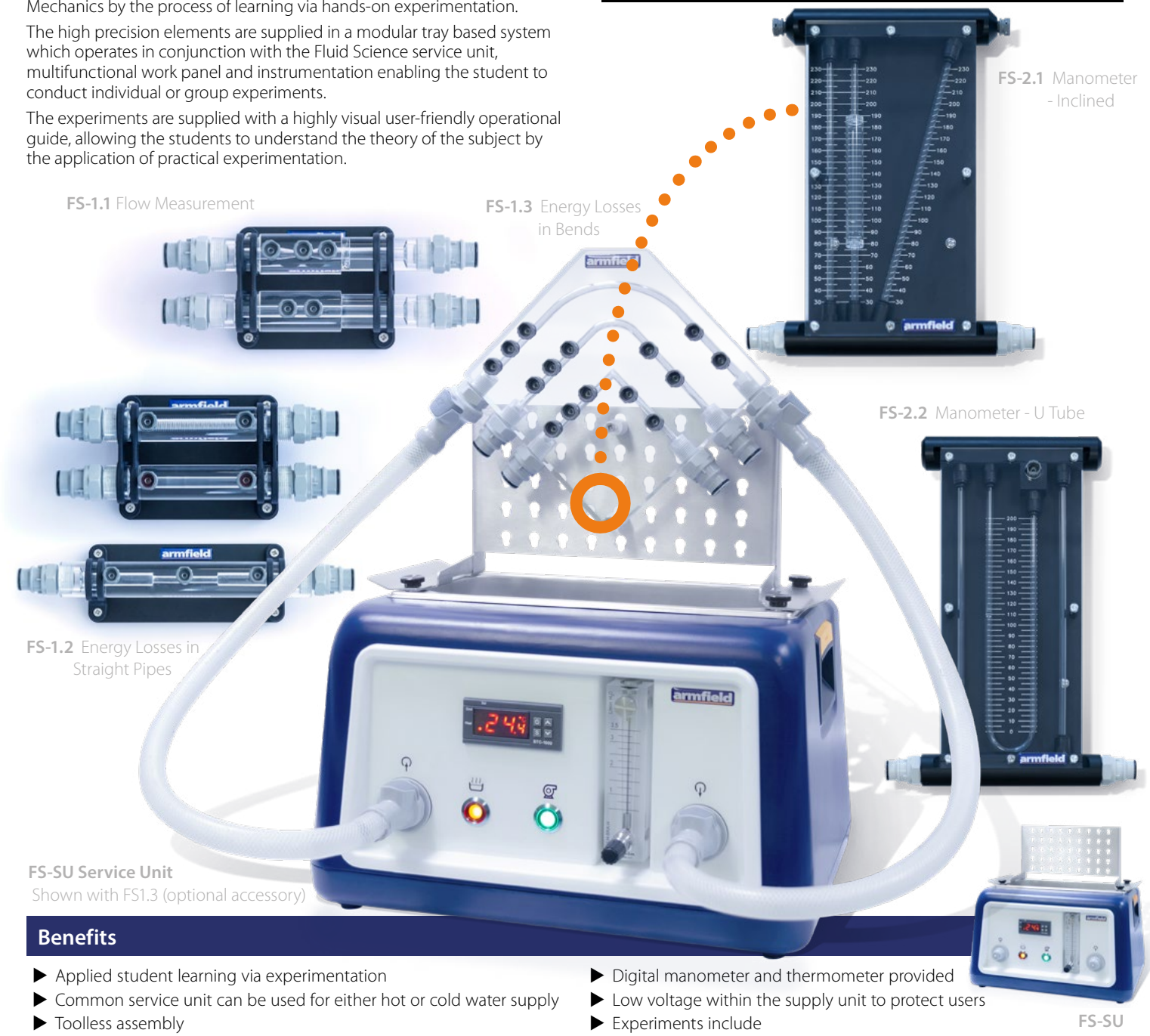
Fluid Mechanics FS-FM

The Fluid Science range is an innovative suite of products designed to enable students to gain an understanding of the fundamentals of Fluid Mechanics by the process of learning via hands-on experimentation.

The high precision elements are supplied in a modular tray based system which operates in conjunction with the Fluid Science service unit, multifunctional work panel and instrumentation enabling the student to conduct individual or group experiments.

The experiments are supplied with a highly visual user-friendly operational guide, allowing the students to understand the theory of the subject by the application of practical experimentation.

COST EFFECTIVE MOBILE TEACHING SYSTEM DESIGNED TO INTRODUCE THE BASICS OF FLUID MECHANICS



Benefits

- Applied student learning via experimentation
- Common service unit can be used for either hot or cold water supply
- Toolless assembly
- Designed to be highly visual and simple to use
- Quick setup
- Suitable for both classroom, laboratory and mobile environments

Features

- Fully mobile solution
- Each service unit can be used as either a hot or cold water supply
- Quick connect couplings for easy connection to experiment modules, self-sealing on supply unit to minimise water loss
- Digital manometer and thermometer provided
- Low voltage within the supply unit to protect users
- Experiments include
  - Venturi Meter
  - Orifice Plate
  - Energy losses in pipes
  - Energy losses in bends
  - Free surface demonstration (surface at atmospheric pressure)
  - U-tube manometer
  - Inclined manometer

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Issue: 1
URL: http://www.armfield.co.uk/ef
Applications
ME ChE CE IP

Description

The Fluid Science series provides a selection of tray based hands-on experimentation designed to demonstrate a variety of fluid mechanics principles including manometry, flow measurements and energy losses in pipes and bends.

Utilising the FS-SU service unit the experiments rapidly mount onto the multifunctional work panel and connect to the built-in water supply via quick connect couplings.

Differential pressure reading is taken using a digital manometer against varying flow rates.

Technical specifications

Water operational temperature range	Ambient to 55°C (131°F)
Water flow rate	0–3.5 litres/minute
Water volume	5 litres
Digital thermometer	
Measuring range	-50°C to 1350°C (-58°F to 2462°F)
Accuracy	0.015%
Digital manometer	
Measuring range	13.78kPa
Accuracy	0.3%
Hardwired thermal cut out switch to prevent over temperature of water	
Operating voltage	24vDC power supply
PSU voltage	100VAC to 240 VAC, 50-60Hz
IP65 rated	
CE certified for worldwide use	

Experiment trays are sold separately, see **Related Products**

Essential accessories / equipment

One of the range of Fluid Science service trays

Overall dimensions

Service unit dimensions stowed (excluding power supply)	
Length	0.385m
Width	0.314m
Height	0.249m
Tray dimensions stowed	
Length	0.43m
Width	0.312m
Height	0.080m
Packed and crated shipping specifications	
Net weight	7.7Kg (inc. power supply) (Subject to change)
Gross weight	8.5Kg (Subject to change)

Demonstration / instructional capabilities

FS-1.1 Flow Measurement

- Types of flow measurement and its application
- Explain the principles of a venturi meter and an orifice meter and why one is selected over the other in certain applications
- Pressure and velocity changes through a venturi meter i.e. increased velocity results in reduced pressure
- Energy transition in a venturi and orifice plate meter •Mechanical energy balance on a venturi meter
- Compare pressure drop across the entrance and exit of the meter (i.e. ΔP across entrance /throat and ΔP across throat/ exit) and explain results
- Explain the importance of discharge coefficient and calculate ideal flow rate across both meters
- Explain the term "vena contracta", why it occurs in an orifice meter and its result i.e. its permanent pressure loss – making it less suitable for certain applications

FS-1.2 / FS-1.3 Energy Losses - Straight Pipes / Bends

- Explanation of basic principles such as conservation of mass
- Conservation of energy
- Explain energy loss and frictional loss
- Types of flow - steady and unsteady flow, uniform and non-uniform flow etc
- Types of fluid flow regime i.e. laminar, turbulent and transitional flow
- Compare measured pressure drop from 3 different pipe forms, explaining the effect of geometry on pressure drop
- Using Bernoulli's equation, calculate the pressures and compare results with experimental values
- Calculate the frictional head loss and pressure drop using Darcy's equation

FS-2.1 / FS-2.2 Manometer - Inclined / U Tube

- Free surface demonstration (surface at atmospheric pressure)
- U tube manometer: comparison of pressure created with varying flow rates against atmospheric pressure for both ends of a straight pipe
- Differential pressure changes as flow rate changes across a straight pipe
- Inclined manometer: variation of pressure demonstration with varying flow rates against atmospheric pressure

Ordering codes

FS-SU Service Unit
FS-1.1 Flow Measurement
FS-1.2 Energy Losses – Straight Pipes
FS-1.3 Energy Losses - Bends
FS-2.1 Manometer - Inclined
FS-2.2 Manometer - U tube