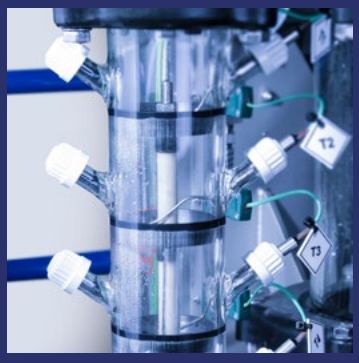


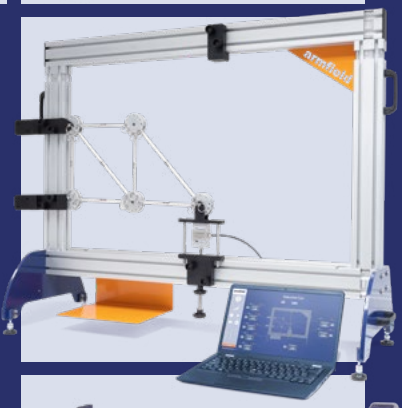




armfield ENGINEERING

teaching & research

CATALOGUE **2021**










CHEMICAL/CIVIL/MECHANICAL/GEOSCIENCE/ENVIRONMENTAL/AGRICULTURAL/FOOD SCIENCE

Innovative engineering teaching, research and development equipment

armfield
Part of Judges Scientific PLC

Preface

Since our inception in 1963 Armfield has been a proud and responsible provider of technical equipment.

Today, Armfield is the world leader in the supply of innovative Education teaching and research equipment and Industrial Research & Development equipment for Food and Pharmaceutical laboratories.

People are at the core of our company, we see our strength in trust, diversity and progress. Every Armfield employee's contribution, no matter how big or small, forges the success of our organisation with the customer placed at the very heart of our business.

As a business we take a market-based view in developing innovative and relevant products for our clients. This results in Armfield's mix of products and services being at the forefront of our sector. We embrace collaboration with our peers and end users by actively involving them in the design of our products.

Our equipment allows users to educate, test and research in ways that fit their individual needs, while at the same time providing cost-effective, reliable and user-friendly products.

Armfield has built its reputation on a commitment to providing quality products and services while rapidly responding to international needs for innovative and accurate educational and industrial equipment complete with superior customer satisfaction.

With our focus on delivering credible, original equipment and content, we serve multiple markets throughout the world in the areas of High Schools, Universities, and Industrial Processing. We are leaders in Fluid Dynamics, Chemical, Civil, Mechanical Engineering, Food and Pharmaceutical Processing, while servicing the biggest names in food and beverage industries.

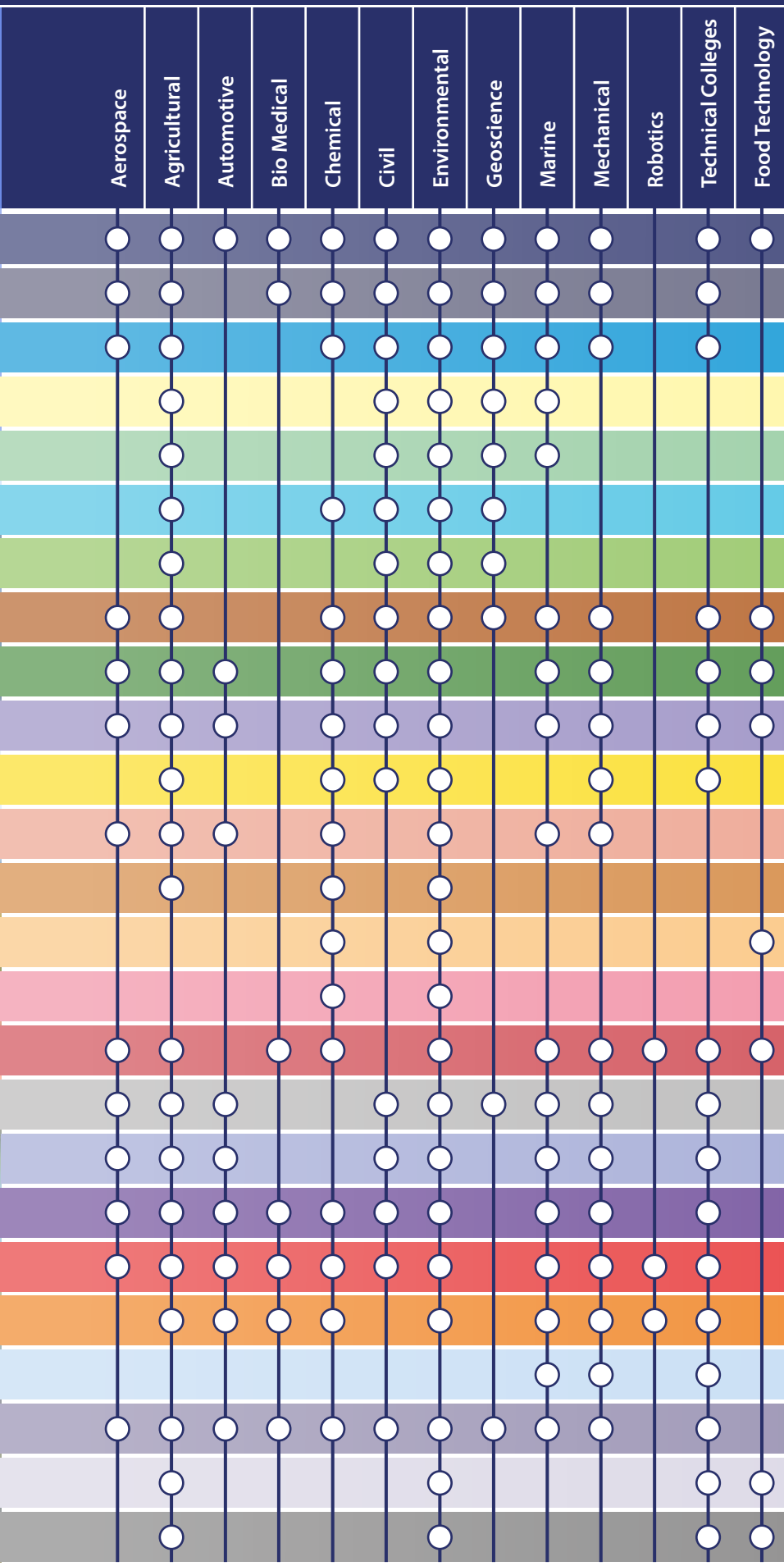
If you require more detailed data on any of the products contained within this catalogue, we are represented by a global network of agents, distributors and an international sales team who will be more than happy to support your requests.

You will find our comprehensive list of agents and distributors on our website.

Dr Sean Gregory

Managing Director Armfield Limited

ENGINEERING teaching and research



Contents

Link to F Series

F SERIES

Fluid Mechanics

The Armfield Fluid Mechanics range plays a fundamental role in engineering teaching across multiple disciplines. The comprehensive range covers the complete curriculum requirement in Mechanical, Civil, Chemical Engineering and Food Technology encompassing subjects such as Hydrostatics and Properties of Fluids, Fluid Dynamics, Open Channel Flow (Free Surface Flow), Flow Around Bodies, Compressible Flow, Rotodynamic Machines.

Hydrostatics and Properties of Fluids

The Armfield Hydrostatics portfolio offers a complete range of teaching equipment for the study of fluids at rest. Topics covered include Hydrostatics, Properties of Fluids, Static Pressure, Pressure Gauges and Manometers, buoyancy force and stability of floating bodies.

Fluid Properties and Hydrostatic Bench - F9092

Requirements

A practical instruction unit designed to demonstrate the properties of fluids and their behaviour under hydrostatic conditions.

With this apparatus students can develop their knowledge of a wide range of principles and techniques that will be of lasting value in their studies of fluid mechanics.

The equipment enables over 16 distinct experiments, is entirely self-contained, mobile, and independent of all laboratory services.

It includes a full range of ancillary equipment required for the experiments.

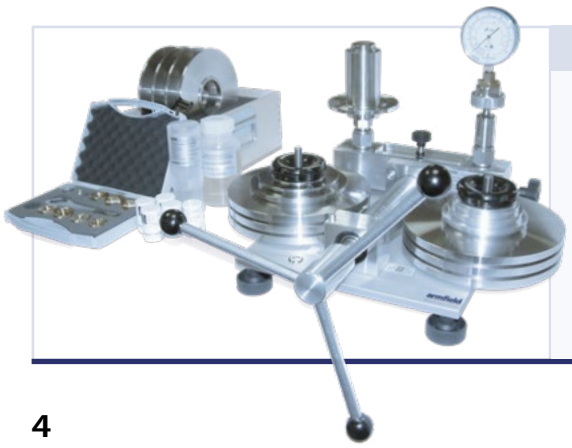
Dead Weight Pressure Gauge Calibrator - F1-11

Requirements

The Dead Weight Pressure Gauge Calibrator consists of a precision-machined piston and cylinder assembly mounted on levelling screws.

The unit is supplied with a Bourdon gauge for calibration.

The weights supplied are added to the upper end of the piston rod, which is rotated to minimise friction effects. The gauge is thus subject to known pressures, which may be compared with the gauge readings and an error curve drawn.



Precision Pressure Gauge Calibrator - F4

Requirements

The equipment is self-contained and portable, so it may be used in lecture theatre demonstrations or as a master calibrator for the laboratory.

The pressure in the system is produced by means of a capstan-operated hydraulic ram, balanced by a deadweight acting upon a piston of known area. Oil is used as the hydraulic fluid.

Meeting commercial standards, this laboratory dead weight calibrator is for gauges in the range 0.1-300bar. Accuracy is 0.03% of reading, traceable to International Pressure Standards.

Requirements

COLD

Hydrostatic Pressure - F1-12

The Hydrostatic Pressure accessory has been designed to determine the hydrostatic thrust acting on a plane surface immersed in water when the surface is partially submerged or fully submerged.

It also enables comparison of the measured magnitude and position of this force with the theoretical position.

Requirements

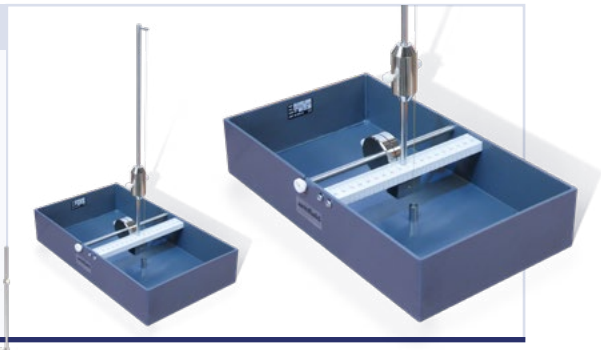
COLD

Metacentric Height - F1-14

This unit allows the position of the metacentric height to be varied to produce stable and unstable equilibrium.

The equipment consists of a plastic rectangular floating pontoon, whose centre of gravity can be varied by way of an adjustable weight, which slides and can be clamped in any position on a vertical mast.

A single plumb-bob is suspended from the mast, which indicates the angle of heel on a calibrated scale.



Requirements

COLD

Fluid Statics and Manometry - F1-29

The right-hand manometer tube is separate from the other tubes and incorporates a pivot and indexing mechanism at the base that enables this tube to be inclined at fixed angles of 5°, 30°, 60° and 90° (vertical).

The reservoir incorporates a hook and point gauge with Vernier scale, mounted through the lid, that enables large changes in level to be measured with precision.

A vertical transparent piezometer tube through the lid of the reservoir enables the static head above the water in the reservoir to be observed, when the air space above the water is not open to atmosphere.

Requirements

COLD

Fluid Properties Apparatus - F1-30

This apparatus provides an introduction to the fundamental properties of liquids that affect their behaviour in practical applications.

This unit includes:

- Universal hydrometer
- 2 calibrated falling-sphere viscometer tubes
- 3 steel spheres
- Thermometer
- Aneroid barometer
- 6 varying diameter capillary tubes
- Pycnometer and a dual scale level balance

Requirements

COLD

Pascal's Apparatus - F1-31

The F1-31 provides a simple but effective demonstration that the intensity of pressure in a liquid depends only on the depth of the liquid and not on the shape of the vessel, container, reservoir etc.

By comparing the pressure/force at the base of three vessels with different shapes when filled to the same depth with water.

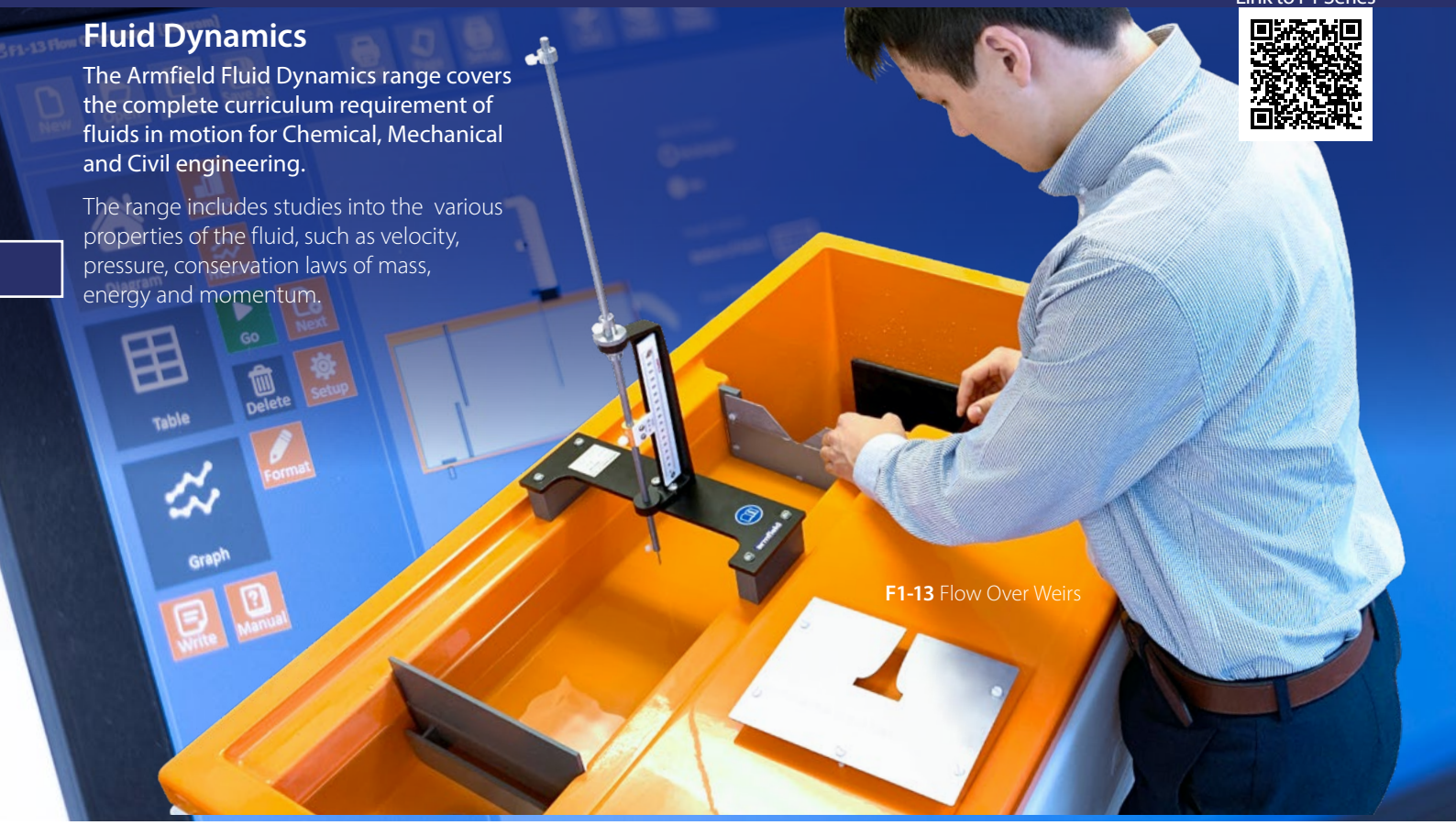
Fluid Mechanics - F Series

Link to F1 Series

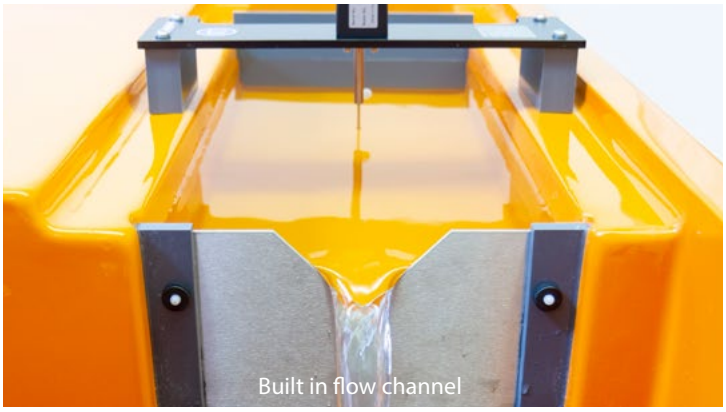
Fluid Dynamics

The Armfield Fluid Dynamics range covers the complete curriculum requirement of fluids in motion for Chemical, Mechanical and Civil engineering.

The range includes studies into the various properties of the fluid, such as velocity, pressure, conservation laws of mass, energy and momentum.



F1-13 Flow Over Weirs



Built in flow channel

Optional Digital Flow Meter

Basic Hydraulics Bench - F1-10 (Factory fit, digital flow meter option shown)

The Armfield F1-10 Hydraulics Bench and its comprehensive range of optional accessories have been developed to instruct students on the many different aspects of hydraulic theory.

Each accessory to the F1-10 is supplied as a complete piece of equipment needing no additional service items other than the Hydraulics Bench. When coupled to the bench they are immediately ready for use.

- Fluid Mechanics Software F1-aBASIC included as standard
- The GRP bench top incorporates an open flow channel with weir carrier and ledges along both sides to support appropriate accessories on test
- Quick-release pipe connector for rapid exchange of accessories, no need for hand tools
- The volumetric measuring tank is stepped to accommodate low or high flow rates
- Optional F1-10-1 External Flowmeter accessory for existing F1-10 bench's available
- Optional F1-10-2 Hydraulics Bench with integrated digital flow meter available

Requirements

1Ph
PC
USB
COLD

Requirements

F1-10

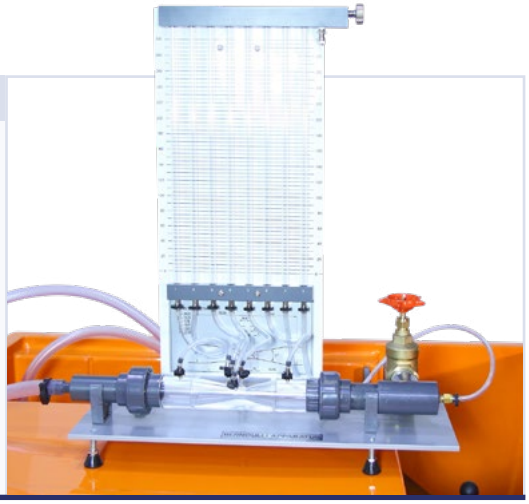
Bernoulli's Theorem Demonstration - F1-15

The F1-15 Bernoulli's Theorem Demonstration Apparatus consists of a classical Venturi shape machined from clear acrylic. A series of wall tappings in the longest taper allows measurement of static head changes as the cross section varies.

A total head tube can be traversed along the centreline of the test section to obtain total head readings at any location along the test section.

The apparatus enables students to investigate the validity of the Bernoulli equation when applied to the steady flow of water in a converging or a diverging duct.

The test section can be reversed to show applications where the Bernoulli equation applies and applications where it breaks down because of frictional losses.



Requirements

F1-10

Impact of a Jet - F1-16-MKII

The Impact of Jet Apparatus, F1-16-MKII consists of clear acrylic test cylinder, into which water is fed vertically through a nozzle. The water strikes a target mounted on a stem. A weight pan mounted at the top of the stem allows the force of the water to be counterbalanced by applied masses.

The F1-16-MKII allows students to investigate the reaction forces produced by the change in momentum of a fluid flow, by measurement of the forces produced by a jet impinging on solid surfaces which produce different degrees of flow deflection.

- New models included

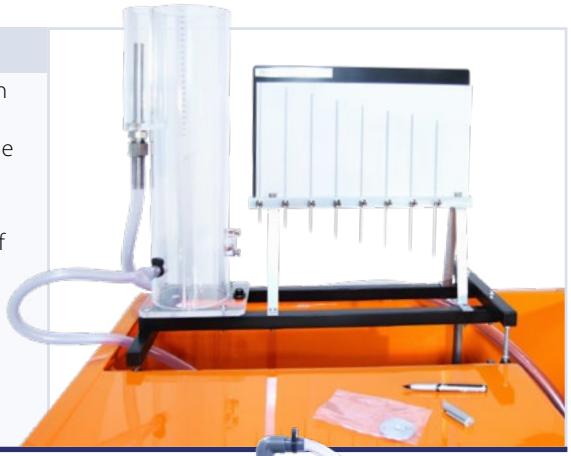
Requirements

F1-10

Orifice and Free Jet Flow - F1-17

The Orifice and Jet Apparatus, F1-17 consists of a reservoir of water with an orifice plate (3mm or 6mm) set into it. A jet of water issues from this hole and its trajectory may be measured using 8-point gauges to determine the discharge coefficient.

The F1-17 allows students to determine the coefficient of velocity by measurement of the trajectory of a jet issuing from an orifice in the side of a reservoir under steady flow conditions (constant reservoir head).



Requirements

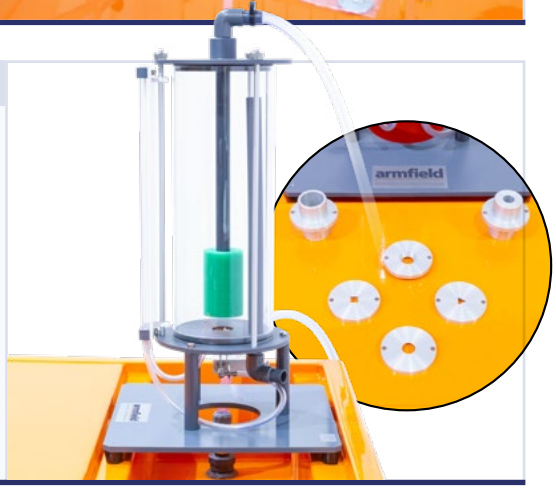
F1-10

Orifice Discharge - F1-17a

The Orifice Discharge accessory enables full analysis of the flow through different orifices over a range of flow rates.

It consists of:

- Seven orifice plates
- A cylindrical clear acrylic tank, with an orifice fitted in the base
- A carrier enables a pitot tube to be accurately positioned anywhere in the jet
- A wire micrometre is used to accurately measure the jet diameter and the vena contracta diameter and so determine the contraction coefficient



Energy Losses in Pipes - F1-18

The Energy Losses in Pipes Rig consists of a test pipe which may be fed water at high or low flow rates.

A pressurised water manometer or optional H12-8 Digital Pressure meter can then be used to measure the head losses in the pipe.

The F1-18 allows students to investigate the head loss due to friction in the flow of water through a pipe and to determine the associated friction factor. Both variables are determined over a range of flow rates and their characteristics identified for both laminar and turbulent flows.

Requirements

F1-10

Osborne Reynolds' Demonstration - F1-20

The Osbourne Reynolds' Apparatus is a classic experiment and is a visualisation of flow behaviour by injection of dye into a steady flow in a pipe.

The apparatus enables students to observe laminar, transitional, and turbulent pipe flow.

A header tank containing stilling media provides a constant head of water through a bellmouth entry to the flow visualisation pipe. Flow through this pipe is regulated using a control valve at the discharge end.

The flow rate can be measured using the volumetric tank (or measuring cylinder) of the Hydraulics Bench. Velocity of the water can therefore be determined to enable calculation of Reynolds' number.

Requirements

F1-10

Osborne Reynolds' Apparatus - F5

This equipment has been designed to allow the classical experiments conducted by Professor Osborne Reynolds (British Physicist 1842-1912) into laminar and turbulent flow, to be reproduced by students in the laboratory.

The three objectives are:

- To compute Reynolds No. (Re)
- To observe and quantify transitional flow
- To observe the paraboloid velocity profile

Requirements

COLD

Flow Meter Demonstration - F1-21

The Flow Meter demonstration unit consists of a Venturi meter, a variable area meter and an orifice plate installed in a series configuration to allow for direct comparison.

The apparatus allows students to investigate the operation and characteristics of three different basic types of flowmeter, including accuracy and energy losses, by measurement of volume flow rates and associated pressure losses with three flowmeters connected in series and using timed volume collection to produce a reference measurement of flow rate.

Requirements

F1-10

Requirements

F1-10

Energy Losses in Bends and Fittings - F1-22

This accessory permits losses in different bends, a sudden contraction, sudden enlargement and a typical control valve, to be demonstrated.

- Mitre bend - 90° elbow - Swept bends (large and small radius)
- Sudden contraction and sudden enlargement.

Fully Instrumented with upstream and downstream pressure tappings.

A bank of 12 water manometer tubes, mounted on the framework for visualisation of the pressure drop profiles.

Requirements

F1-10

Free and Forced Vortex - F1-23-MKII

The Free and Forced Vortex equipment is designed to produce and measure the characteristics of free and forced vortices.

It enables students to determine the surface profile of a forced vortex, and compare with theoretical values, by measuring the speed of rotation and length of needles that represent the forced vortex.

Coupled with the ability to measure the profile of a free vortex, and investigate the changes in velocity head throughout the vortex. By employing the Pitot tubes and measuring the elevation of water in the cylinder at different radius of the vortex.

Requirements

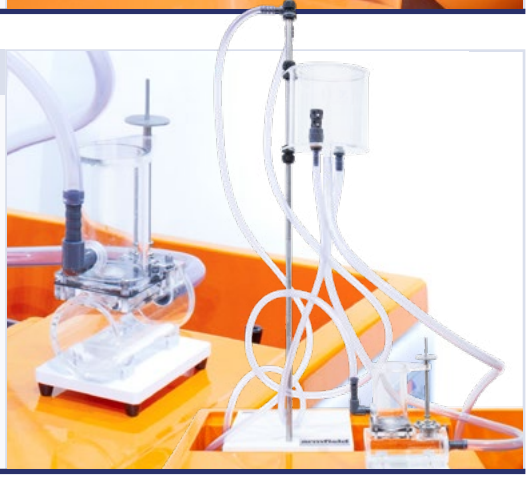
F1-10

Hydraulic Ram - F1-24

If flowing water is suddenly brought to rest in a long pipe, a phenomenon known as water hammer occurs, which produces a pressure wave that travels along the pipe.

This principle is used in the hydraulic ram to pump water. The F1-24 Hydraulic Ram Pump apparatus consists of a base unit incorporating two fluid chambers, pulse and non-return valves and a supply reservoir on a stand.

The unit allows students to demonstrate the operating principles of the hydraulic ram.



Requirements

F1-10

Cavitation Demonstration - F1-28

The Cavitation Demonstration Apparatus, demonstrates to students visually, audibly and numerically the phenomenon of Cavitation and its association with the vapour pressure of a liquid. The following demonstrations are possible using the F1-28 in conjunction with the F1-10:

- Observation of the phenomenon of Cavitation in a liquid (by reducing the static pressure of the liquid to its vapour pressure)
- Comparison of theoretical and actual pressure at Cavitation conditions
- Observation of air-release due to free and dissolved gasses in a liquid
- Demonstration of reducing Cavitation by increasing the static pressure in a liquid

Pitot Tube Demonstrator - F1-33

Requirements

F1-10

The Armfield unit is designed to demonstrate the operation and characteristics of a Pitot-static tube that is used to determine fluid velocity by measuring the difference between the total head and the static head of water flowing inside a pipe using a manometer.

A series of simple teaching exercises show how the Pitot-static tube works, how it can be used to measure fluid velocity using an appropriate instrument to measure differential head and how Velocity head and therefore fluid velocity varies across the diameter of a pipe.

The rigid horizontal cylindrical pipe, incorporating the Pitot-static tube, is constructed from clear acrylic and PVC for durability and ease of maintenance. The Pitot-static tube can be traversed across the diameter of the pipe to show changes in Dynamic head profile inside the pipe.

Flow Over Weirs - F1-13-MKII/F1-13a

Requirements

F1-10

The Flow Over Weirs accessory is used in conjunction with the flow channel in built to the Hydraulics bench. The apparatus demonstrates the characteristics of flow and the relationship between upstream water level and weir discharge for various notch's.

F1-13-MKII Flow Over Weirs	F1-13a Advanced Weirs
Stilling Baffle And Inlet Nozzle Vernier Hook And Point Gauge And Instrument Carrier Large Notch Plate Weir 30mm Large Notch Plate Weir 50mm Large V Plate Weir 90° Regular V Plate Weir 90°	Large Trapezoidal Weir 30mm Large Trapezoidal Weir 50mm Large V Plate Weir 30° Dog Bone Weir

Flow Channel - F1-19

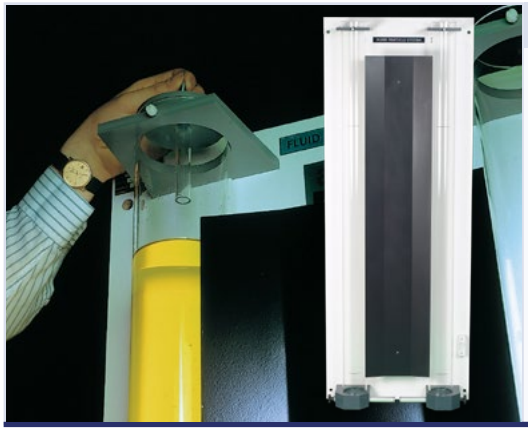
Requirements

F1-10

The Flow Visualisation Apparatus consists of a perspex channel with a large depth to width ratio, which is fed with water, into which dye may be injected.

This apparatus allows students to achieve two objectives.

- To visualise a range of open-channel flow behaviour, by creating flow phenomena in an open channel, using an undershot weir, overshot weir, sharp-edged and broad-crested weirs including both super-critical (fast) and sub-critical (slow) behaviour
- To visualise flow patterns around immersed objects in steady flow by creating a relatively low Reynolds number and quasi-2-dimensional flow around models located in a narrow channel
- To visualise the flow patterns by dye streak lines, which in steady flow are the same as streamlines



Particle Drag Coefficients - F12

Requirements

1Ph

A wall mounted apparatus in which particles of various size and density can be used to introduce the fundamental characteristics of the behaviour of particle/fluid systems. In particular, the relationship between the drag coefficients of falling particles and their Reynolds' number value.

- Compact, wall mounted apparatus to study the behaviour of particles and shapes within fluids
- 2 x Ceramic Spheres (One off each: 6.35mm and 9.5mm Diameter)
- 4 x Stainless Steel Spheres (One off each: 3.17mm, 6.35mm, 7.9mm and 9.5mm Diameter)

Rotodynamic Machines

The Rotodynamic Machines range from Armfield introduces students to kinetic machines in which energy is continuously imparted to the pumped fluid by means of a rotating impeller, propeller, or rotor.

The range also offers a comparison with positive displacement pumps.

Requirements

F1-10

Demonstration Pelton Turbine - F1-25

The Demonstration Pelton Turbine provides a simple low cost introduction to turbine performance.

The unit consists of:

- Turbine wheel inside cast housing with acrylic panel to enable viewing
- Mechanical torque measured using dynamometer with spring balances
- Inlet pressure gauge
- Quick-release fitting for easy connection to Hydraulics Bench
- 100 2/1 Tachometer

Requirements

F1-10

Demonstration Francis Turbine - F1-32

This demonstration turbine provides an introduction to the Francis inward flow reaction turbine.

The unit consists of:

- Francis runner surrounded by six guide vanes inside a volute with clear acrylic front panel for visualisation
- Guide vanes adjustable when turbine is running with scale to indicate degree of opening
- Francis runner 60mm diameter with 12 blades
- Brake force determined using Prony-type brake dynamometer
- Inlet pressure gauge with range 0-2 bar
- 100 2/1 Tachometer

Requirements

1Ph

F1-10

Centrifugal Pump Characteristics - F1-27

The Centrifugal Pump Characteristics Accessory, used in conjunction with the sump tank and volumetric tank on the F1-10 bench to demonstrate the characteristics of a single centrifugal pump by the measurement of the pump head, discharge and power characteristics at varying speeds.

The speed of the pump on F1-27 can be varied to demonstrate the characteristics of two dissimilar pumps when connected in series or parallel.

Requirements

1Ph

F1-10

Series/Parallel Pumps - F1-35

The Series/Parallel pumps accessory is used to demonstrate the head / flowrate characteristics of a centrifugal pump for several different configurations, by measurement of pressure at pump inlet and outlet and discharge flowrate.

The F1-35 Series / Parallel pumps apparatus enable students to gain an understanding of the following pump theory.

- Series Pump Operation, that pumps can be combined in series to obtain an increase in head at the same flowrate as the single pump
- Parallel Pump Operation, that pumps can be combined in parallel to obtain an increase in flowrate at the same head as the single pump

Fluid Science - FS Series

Link to FS Series

Independent Learning

Introduce students to the world of engineering at the earliest opportunity with Armfield's new Fluid Science range.

Built on a proven track record of developing innovative hands-on teaching equipment the Fluid Science Series enables students to gain an understanding of the fundamentals of Fluid Mechanics and Thermo Fluids via hands-on experimentation.

NEW

Fluid Science Service Unit - FS-SU

The Fluid Science Service Unit is designed to be used in conjunction with the fluid science experiments offered by Armfield. The unit incorporates a pump and rotameter to vary the water flow rate and a heating system. The built-in safety features of the unit include a thermal cut out that prevents the hot water circuit exceeding 55°C and a low voltage water resistant power supply unit.

The high precision elements are supplied as modular tray-based systems which operate in conjunction with the Fluid Science Service Unit, multifunctional work panel and instrumentation enabling the student to conduct their individual or group experiments.

Requirements

NEW

Fluid Science - Fluidised Bed - FS-4.1

The Fluidised Bed tray introduces students to the concepts of bed fluidisation commonly encountered both in nature and in industry. Natural occurrences include the movement of ground water, the movement of crude petroleum or the movement of natural gas through porous media.

Industrial occurrences include operations such as back-washing filters, ion-exchange processes, extraction of soluble components from raw materials and certain types of chemical reactor.

Requirements

Requirements

FS SU

DRAIN COLD

LEVEL SURFACE

Fluid Science Flow Measurement - FS-1.1

Combined with the Fluid Science Service Unit the Fluid Science Flow Measurement Tray provides hands on experimentation designed to demonstrate flow measurement and the relationship between velocity and pressure drop.

Utilising the FS-SU Service Unit the flow meters experiment rapidly mounts onto the multifunctional work panel and is connected to the built-in water supply via quick connect couplings. Differential pressure reading is taken using a digital manometer against varying flow rates.

Requirements

FS SU

DRAIN COLD

LEVEL SURFACE

Energy Losses - Straight Pipes - FS-1.2

The Fluid Science Energy Losses in Straight Pipes Tray provides hands on experimentation designed to demonstrate energy losses due to the geometry of the flow path at different flow rates.

Utilising the FS-SU Service Unit the experiments rapidly mount onto the multifunctional work panel and is connected to the built-in water supply via quick connect couplings. Differential pressure reading is taken using a digital manometer against varying flow rates.

The tray includes the following Hydraulic Circuits:

- Smooth and Roughened pipe 6mm diameter
- Contraction and expansion 8mm – 4mm – 8mm diameters

Requirements

FS SU

DRAIN COLD

LEVEL SURFACE

Energy Losses - Bends - FS-1.3

The Fluid Science Energy Losses in Bends Tray provides hands on experimentation designed to demonstrate energy losses due to the geometry of the flow path at different flow rates. Utilising the FS-SU service unit the experiments rapidly mount onto the multifunctional work panel and is connected to the built-in water supply via quick connect couplings. Differential pressure reading is taken using a digital manometer against varying flow rates. The tray includes the following Hydraulic Circuits:

Energy losses in bends - Shallow bend radii 75mm
- Tight bend radii 25mm
- Mitre bend

Requirements

FS SU

DRAIN COLD

LEVEL SURFACE

Fluid Science Manometer - Inclined - FS-2.1

The Fluid Science Inclined Manometer tray includes experiments to measure small pressure differences and the effect of change in manometer inclination.

The tray additionally includes a stepped manometer that incorporates changes in cross section to demonstrate that the level of a free surface is not affected by the size or the shape of the tube.

Requirements

FS SU

DRAIN COLD

LEVEL SURFACE

Fluid Science Manometer - U Tube - FS-2.2

The Fluid Science U-Tube Manometer tray includes experiments to compare the pressure created with varying flow rates against atmospheric pressure for both ends of a straight pipe.

It also demonstrates how the differential pressure changes as flow rate changes across a straight pipe.

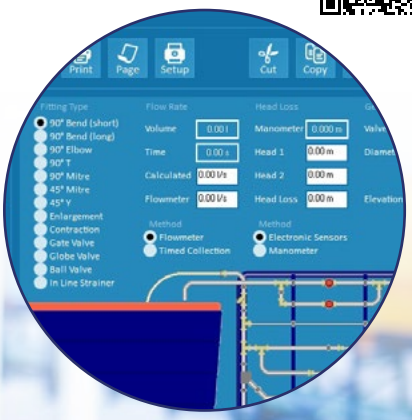
Fluid Dynamics

The Armfield C6-MKII-10 Fluid Friction Measurements

This unit provides facilities for the detailed study of fluid friction head losses, which occur when an incompressible fluid flows through pipes, fittings and flow metering devices.

A wide range of measurements, demonstrations and training exercises are possible:

- Confirming the relationship between head loss due to fluid friction and velocity for flow of water
- Determining the head loss associated with flow through a variety of standard pipe fittings
- Determining the relationship between pipe friction coefficients and Reynolds' number for flow through a pipe with roughened bore
- Demonstrating the application of differential head devices in the measurement of flow rate and velocity
- Providing practical training of pressure measurement techniques
- Enhancing understanding of the hydraulic principles involved through the use of complementary computer software



C6-MKII-DTA-ALITE software (optional)

Fluid Friction Measurements - C6-MKII

The head loss caused by fluid friction in straight pipes and the effects of fluid velocity, pipe diameter and surface roughness can be fully investigated using this apparatus.

The complete system enables the investigation of the phenomenon associated with incompressible fluid flow in pipes.

- ArmSoft educational software for fluid friction measurements is optional
- Data logging accessory available

Requirements

F1-10

PC

USB

Requirements

F1-10

PC

USB

Pipe Surge & Water Hammer Apparatus - C7-MKII

The Armfield Pipe Surge and Water Hammer Apparatus contains two independent pipe systems: one demonstrates pipe surge and the use of a surge shaft to attenuate changes in pressure following slow changes to the flow in a system, the other pipe system allows a detailed examination of the shock waves (Water Hammer) generated by rapid changes to the flow in a system such as a valve closing quickly.

A single USB connection to a PC (not supplied) provides power for the three pressure transducers on the unit and allows the readings from the pressure transducers to be recorded and stored using the PC. Data logging software allows the relatively slow oscillations in the surge shaft to be viewed in real time and stored for analysis.

A virtual oscilloscope allows the rapid changes in pressure, associated with water hammer, to be viewed for analysis after the event due to the short duration of pressure transients following operation of the fast-acting valve.

Requirements

1Ph

PC

USB

COLD

Comprehensive Flow Meter Demonstration - C9

A self-contained apparatus to demonstrate the characteristics of flow meters used in measurement of water flow through pipes or open channels.

Configurable with 14 Accessories:

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

Requirements

F1-10

Pipe Networks Accessory - C11-MKII

Specifically designed to allow the study of a wide range of different pipe networks.

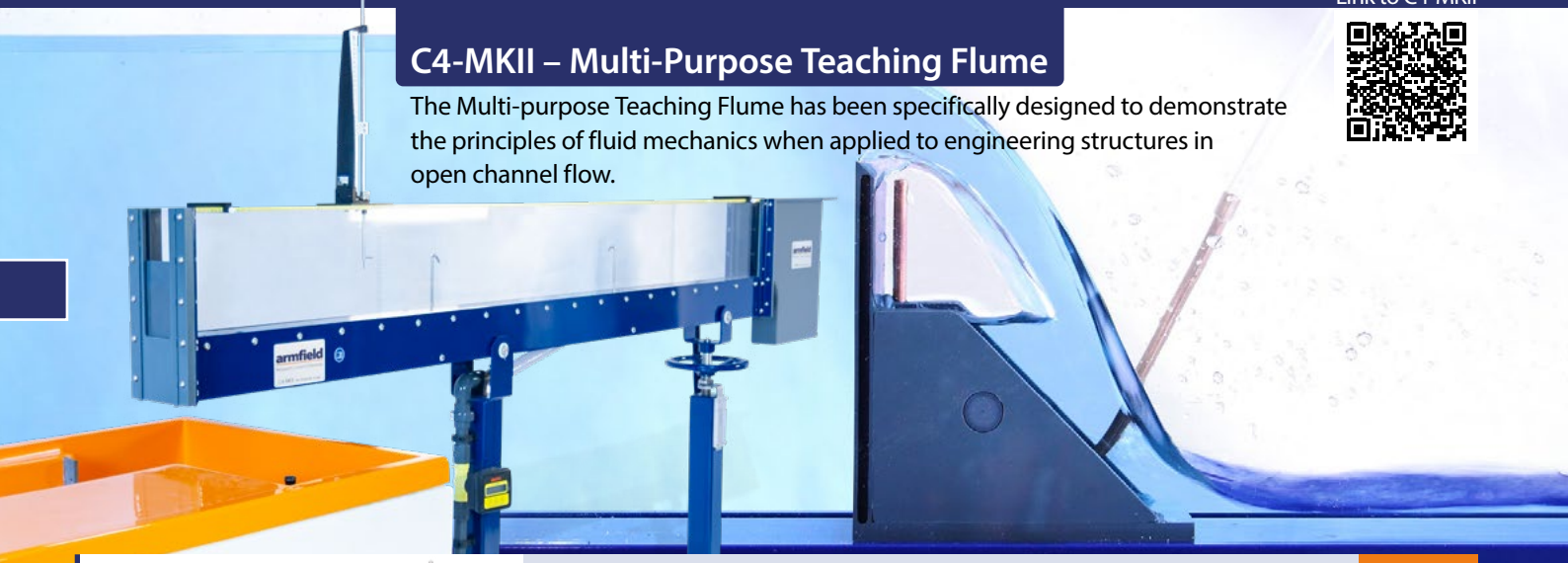
The unit consists of:

- Pipe network mounted on free standing support frame
- Clear acrylic test pipes all 0.70m long
- Inside diameters of 1x 6mm, 2x 9mm, 1x 10mm, 1x 14mm
- 10 Isolating valves
- Hand-held electronic pressure meter with self-sealing quick-release connections

Link to C4-MKII

C4-MKII – Multi-Purpose Teaching Flume

The Multi-purpose Teaching Flume has been specifically designed to demonstrate the principles of fluid mechanics when applied to engineering structures in open channel flow.



Multi-Purpose Teaching Flume - C4-MKII-10

- C4-MKII-11 - With Flow Meter

A low cost laboratory flume with an experimental range and accuracy comparable with larger-scale research flumes. Students can clearly see the models under investigation through the transparent side walls.
A wide selection of open channel experiments can be performed.

A set of models and gauges are provided with the flume as standard.

- Venturi flume
- Sharp and broad crested weirs
- Crump weir
- Adjustable undershot weir
- Two Vernier level gauges

Available in 2.5m and 5.0m working section lengths.

Optional educational software is available (C4-MKII-ABASIC) offering a complete teaching package of coursework.

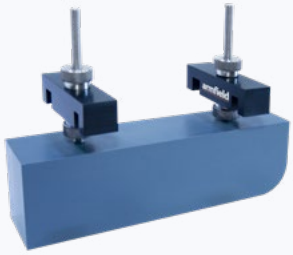
Requirements

F1-10
PC
USB

Set of models provided with the flume as standard

Additional C4-MKII accessories:

C4-61 Pitot Tube and Manometer Board
C4-62 Culvert Fitting
C4-63 Flow Splitters
C4-64 Spillway and Toe Blocks
C4-65 Siphons (2 types)
C4-66 Radial Gate Model
C4-67 Wave Generator and Beach
C4-68 False Floor Sections
C4-69 Roughened Bed Plates, 2.5m long
C4-MKII-ABASIC Teaching Software For Multi-Purpose Flume



Requirements

C4-MKII

Open Channel Flow (Free Surface Flow)

Armfield supplies a range of Open-channel flow products, ranging from an introduction to the characteristics of flow in an open channel, free surface flow and closed conduit flow.

Requirements

F1-10

Hydraulic Flow Demonstrator - S16

The S16 operates as an accessory to the F1-10 Hydraulics Bench, offering a highly visual demonstration of flow through both open channels and closed conduits. Includes a unique elevating bed section, and models of various hydraulic structures.

Hydraulic Flow Demonstrator - S16-11 (direct reading flowmeter)

Covers both fluid dynamics and open channel flow topics:

- Demonstrate flow through both open channels and closed conduits
- Unique elevating bed section
- Models of various hydraulic structures demonstrating critical flow and energy changes
- Clear acrylic sides for good visibility of flow patterns created

Requirements

COLD

Laminar Flow Table - C10

Enables comprehensive grid measurement and photography of two dimensional laminar flow patterns in incompressible fluids.

The equipment extends the classical Hele-Shaw approach by including eight sinks and sources, plus a dye injection system, enabling flow patterns to be seen more vividly.

Requirements

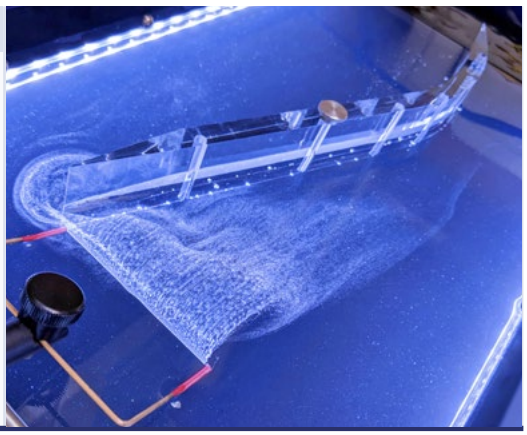
1Ph

Hydrogen Bubble Flow Visualisation System - C16

An elegant method of flow visualisation, where hydrogen bubbles are used to visualise fluid mechanics phenomena so difficult to describe theoretically.

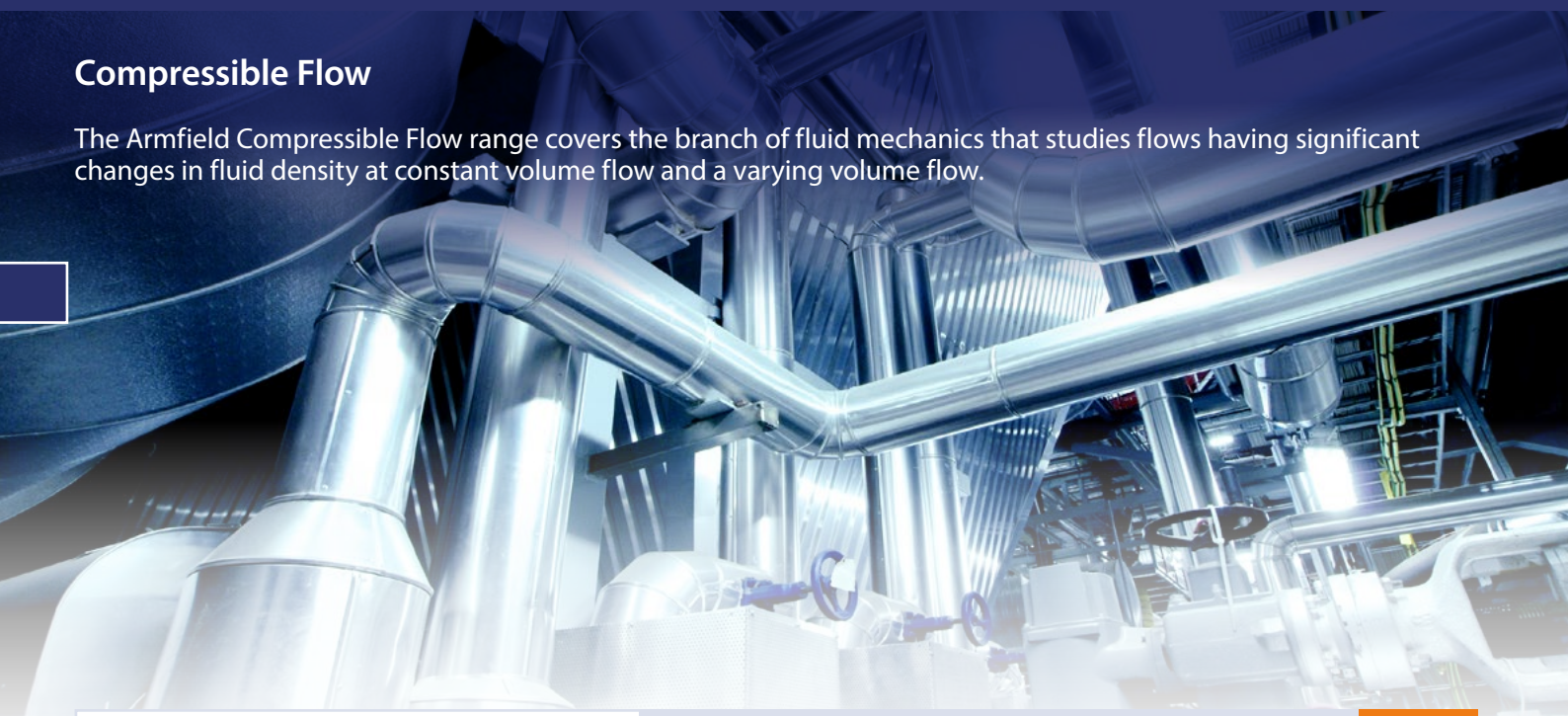
The system utilises a unique fluid drive unit to provide smooth flow in the working channel.

An optional high resolution firewire webcam can be used to link to projectors or displays for large-scale presentations.



Compressible Flow

The Armfield Compressible Flow range covers the branch of fluid mechanics that studies flows having significant changes in fluid density at constant volume flow and a varying volume flow.



Air Flow Studies - F6

Requirements

⚡ 1Ph

The movement of air is a concept which relates to many disciplines in engineering. The losses incurred in pipes or ducts, the losses in associated fittings and measurement of the air flows involved form a basic part of most engineering courses.

The Armfield Air Flow Studies apparatus is a self-contained unit, providing a long, smooth-walled pipe connected to the suction inlet of a centrifugal fan, is used to demonstrate how to measure important characteristics of industrial air distribution systems. It can also show how certain principles of fluid mechanics may be applied to analyse flow in ducts and jets the unit incorporates the following experiments:

- Dispersion of a jet
- Boundary layer growth in pipe flow
- Discharge measurement by orifice plate meter
- Head losses in bends and elbows
- Inlet nozzles used as flowmeters

Optional Data logging accessory H14/2 available

Software inc

Compressible Flow Unit - C1-MKIII

Requirements

⚡ 1Ph

PC

USB

A versatile apparatus, based around a multi-stage air compressor, designed to teach the concepts of compressible flow.

The basic unit contains all that is required to demonstrate the fundamental principles, but an accessory is also available, containing a number of interchangeable test sections to give a wider knowledge and understanding to the student.

Additional Test Sections - C1-MKIII-30 (Option)

Compressor Test Accessory - C1-MKIII-35 (Option)
Compressor performance tests

C3-MKII – Multi-Pump Test Rig

The Armfield Multi-Pump Test Rig has been designed to demonstrate the operating characteristics (headflow curves and efficiency) of a series of different types of pumps, each having a broadly similar input power.

- Up to four pumps at the same time
- Rotodynamic and positive displacement pumps
- Electronic instrumentation, control & data logging supplied as standard
- Centrifugal Pump & Gear Pump supplied as standard

Requirements

1Ph

PC

USB

Multi-Pump Test Rig - C3-MKII

The rig can accommodate both rotodynamic and positive displacement pumps, and is supplied with the most common example of each type as standard (i.e. a centrifugal pump and a gear pump). A range of other pump types are available as accessories, including axial, turbine, flexible impeller, diaphragm and plunger; plus a second centrifugal pump for series/parallel demonstrations.

Up to four pumps can be accommodated within the rig simultaneously for use within a single laboratory period, and each can be run without disconnecting any pipework or connections.

ArmSoft Educational software and data logging hardware included as standard.

C3-MKII-20	Centrifugal Pump (Supplied as standard)
C3-MKII-20SP	Second Centrifugal Pump
C3-MKII-21	Gear Pump (Supplied as standard)
C3-MKII-22	Axial Flow Pump
C3-MKII-23	Flexible Impeller Pump
C3-MKII-24	Turbine Pump
C3-MKII-25	Diaphragm Pump (requires C3-MKII-40)
C3-MKII-26	Plunger Pump (requires C3-MKII-40)
C3-MKII-40	Volumetric Measurement System

C3-MKII Software screen

Link to C Series

C SERIES

Advanced Fluid Mechanics

Covering the complete curriculum requirements of fluid in motion for Chemical, Mechanical and Civil engineering.

The range includes studies into the various properties of the fluid, such as velocity, pressure, conservation laws of mass, energy and momentum.

The Armfield **C30-Subsonic Wind Tunnel** enables the user to carry out advanced studies in the aerodynamics fields including boundary layer experiments, flow visualisation, pressure distribution, study of turbulence and offering the possibility of developing self-design aerodynamics profiles to be tested.

The wind tunnel comprises outstanding features such as computer control, up to 40m/s flow velocity, remote operation, datalogging and diagram plotting in real time.

Note: Accessories are available for both the C30 and C15 wind tunnels

Computer Controlled
Driven 3-Component Balance

C30 - Computer Controlled Subsonic Wind Tunnel

Computer Controlled Subsonic Wind Tunnel - C30

The Wind Tunnel is a computer controlled subsonic wind tunnel designed for undergraduate teaching.

It has a 600mm long (23.6 inches) transparent working section and offers a wide range of models for aerodynamic and air flow studies.

An extensive range of models, accessories & instrumentation is available for the C30.

Requirements

PC

USB

1Ph

Requirements

⚡ 1Ph
PC
USB

Computer Controlled Subsonic Wind Tunnel - C15

The unit is a computer controlled subsonic bench-top wind tunnel designed for undergraduate teaching.

It has a 150mm (six inch) transparent working section and offers a wide range of models for aerodynamic and air flow studies.

An extensive range of models, accessories & instrumentation is available for the C15.

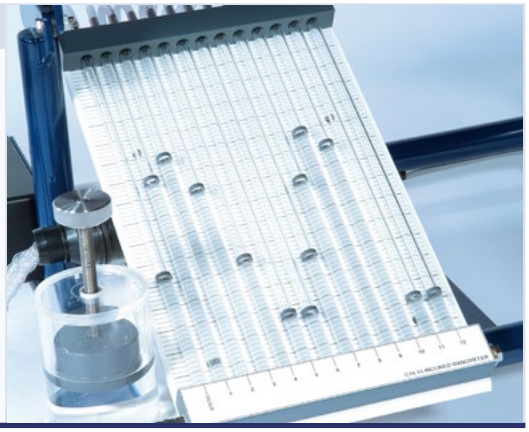
Requirements

C15
C30

Inclined Manometer Bank - C15-11/C30-11

A bank of 13 transparent tubes inclined at 30° to measure small pressure differences (0–160 mm H_2O).

It includes a water reservoir with screw operated displacer to allow rapid adjustment of the datum level in the manometer, and is fitted with quick release connectors for rapid connection to models and instruments.



Requirements

C15
C30

Electronic Manometer Bank C15-12/C30-12

An electronic console incorporating 16 differential pressure sensors, each with a range of 0-178mm H_2O.

(It connects to the control PC using a second USB port, and the readings are fully integrated with the wind tunnel control software.)

A common tapping allows all sensors to be referenced to atmospheric pressure. Quick release connectors allow for rapid connection to models and instruments.

Requirements

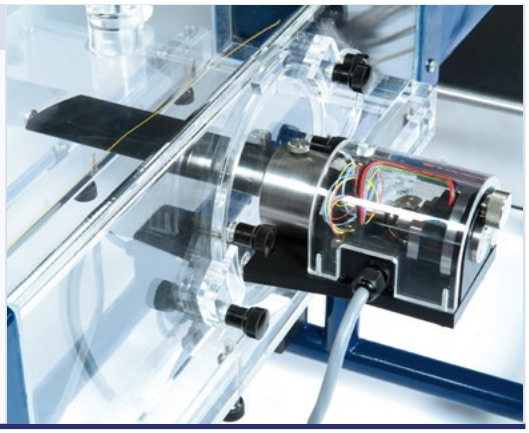
C15
C30

Lift and Drag Balance - C15-13/C30-13 (*requirement)

A 2-component, electronic balance used to measure the lift and drag on appropriate models (not used with models having multiple internal tapping points).

The lift and drag models connect to the balance using a simple fixing that ensures correct orientation of the model.

*requires essential accessory C15-20/C30-20 or C15-22/C30-22)



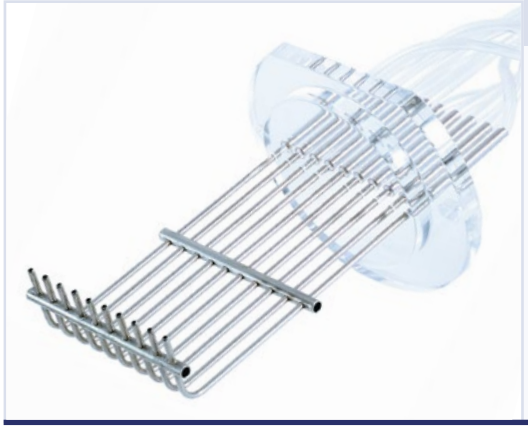
Pitot Static Tube - C15-14/C30-14 (requires C15-20/C30-20 or C15-20/C30-22)

A small Pitot static tube mounted in a bush that can be located in the roof of the working section at three alternative positions i.e. the start of the working section and upstream and downstream of the model mounting position.

Requirements

C15

C30



Wake Survey Rake - C15-15/C30-15 (requires C15-11/C30-11 or C15-12/C30-12)

The rake consists of 10 tubes positioned vertically in a row and pointing towards the airflow.

The rake is mounted downstream of the model being used.

Requirements

C15

C30

3-Component Balance - C30-16-Asoft

A 3-component balance used to measure lift, drag and moment forces on appropriate models. The models connect to the balance using a simple fixing that ensures correct orientation of the model. The system is designed to work with a series of Armfield models and also enables the user to manufacture and test their own 3D printed or fabricated wings to test and evaluate for project work.

Integrated electronic sensors are used to measure the lift, drag and moment forces. The model being tested can also be rotated on the mounting and the angle of rotation measured electronically. The readings from the lift, drag, moment sensors and the rotation sensor are displayed on the control software screen running on the PC, and are available for data logging.

Requirements

C30

3-Component Driven Balance - C30-17-Asoft (*requirement)

A PC controlled Driven 3-component balance incorporates a closed loop stepper drive for precise driven rotation angles particularly beneficial for remote operation/ remote learning activities and repetitious test and development.

*requires essential accessory C30-19

Requirements

C30

C30-19

Requirements

C30

Driven 360° Model Unit - C30-18 (requires C30-19)

A PC controlled driven 360-degree model interface with single pressure tapping take off to allow test models to be fitted with incorporated pressure tapping.

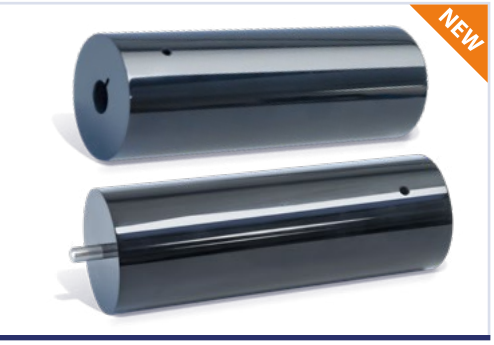
Suitable for use with C30-18-01 pressure cylinder or for users to manufacture and test their own 3D printed or fabricated samples to test and evaluate for project work. Particularly beneficial for remote operation/ remote learning activities and repetitious test and development.

Requirements

C30

Cylinder with Pressure Tapping for 360° drive - C30-18-01

Cylinder with single pressure tapping to interface with the driven 360-degree model unit enabling the study of pressure acting on a cylinder at various velocities and angular positions.



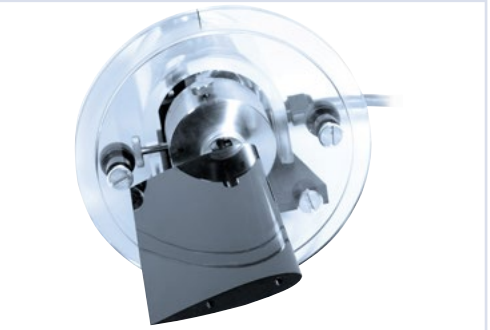
Requirements

C15

C30

Lift & Drag Aerofoil - C15-20/C30-20 (requires C15-13/C30-13)

A plain symmetrical aerofoil to NACA 0015 profile, incorporating a mounting rod that allows it to be installed on the C30-13/C15-13 Lift & Drag Balance, thus allowing the lift and drag to be measured with the aerofoil at different angles of attack.



Requirements

C15

C30

Pressure Wing- C15-21/C30-21 (requires C15-11/C30-11 or C15-12/C30-12)

A symmetrical aerofoil incorporating 10 tapping points distributed along the wing profile on one side, which allows the pressure distribution to be measured from the leading edge to the trailing edge.

The pressure distribution on the upper and lower surface can be obtained by inclining the aerofoil at positive and negative angles of attack. Machined to NACA 0015 profile, the aerofoil has the same section as the C15-20/C30-20 to allow direct comparison of pressure distribution with the lift characteristics.

Requirements

C15

C30

Drag Models - C15-22/C30-22 (requires C15-13/C30-13)

Seven different models are provided for use with the C15-13 Lift and Drag Balance for investigations into the influence of shape on the drag forces.

Five models are supplied with a common equatorial diameter of 50mm, thus all presenting the same cross section to the airflow: Sphere - Hemisphere, convex to airflow - Hemisphere, concave to airflow - Circular disk - Streamlined shape. Additionally a dimpled golf ball and plain sphere demonstrate the difference in drag force due to the dimples.

Pressure Cylinder - C15-23/C30-23 (requires C15-12/C30-12)

A plain cylinder, 30mm diameter, incorporating 10 equi-spaced tapping points around half of the circumference that allow the pressure distribution around the cylinder to be measured.

The cylinder can be rotated through 180° to plot the pressure distribution over the whole circumference.

Requirements: C15, C30

Bernoulli Apparatus - C15-24/C30-24 (requires C15-11/C30-11 or C15-12/C30-12)

A Venturi profile that is installed in the working section of the tunnel via the removable floor. The Venturi incorporates 11 pressure tappings in the floor, connected via flexible tubing to quick release connectors.

The Venturi occupies the full height of the working section and the width varies from 150mm (full width of the working section) at the inlet and outlet to 100mm at the throat.

It is manufactured from clear acrylic for full visualisation.

Requirements: C15, C30

Boundary Layer Plate - C15-25/C30-25 (requires C15-20/C30-20 or C15-22/C30-22)

A flat plate, with a bevelled leading edge, that is mounted vertically in the working section via the removable floor. A flattened Pitot tube, mounted on a traversing micrometer, allows the air velocity to be measured at different distances from the surface of the plate.

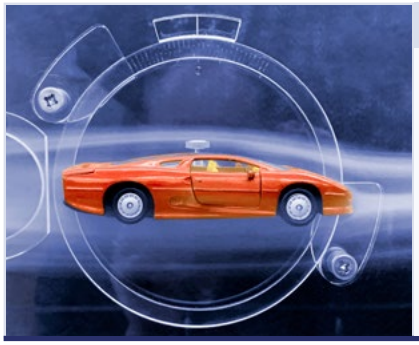
A smooth plate and artificially roughened plate (above) are included to show the difference between laminar and turbulent boundary layers. The flexible tubing from the Pitot tube incorporates a quick release connector.

Project Kit - C15-26/C30-26 (requires C15-20/C30-20 or C15-22/C30-22)

A selection of components that allow alternative models to be constructed by the user.

Includes a floor panel, a circular hatch and a set of connectors with appropriate flexible tubing. The Pitot tube incorporates a quick release connector.

Requirements: C15, C30



C-Smoke: Probe Smoke Generator

The C-Smoke smoke generator is designed to facilitate the observation of air movements and air tracing in wind tunnels.
With a rapid warm up time and simple to set up and use, it produces a controllable, non-hazardous smoke effect. The system produces a point source of smoke on the end of a 425mm long stainless steel "wand". Commonly used when a very precise point source of aerosol smoke is required. The probe is shaped to minimise wake generation, ensuring that the smoke can be entrained into the airstream smoothly.

Supplied with:

- Control Box
- Swan Neck Probe - 425mm long
- 2 x Vaporisers
- 3 x 500ml Bottle of Oil

Requirements: C15, C30

Requirements

C30

C30-13 or C30-16

Wing Model Type 1 Gottingen 535 - C30-30-01

Wing model designed with a **Gottingen 535 Air foil** profile, as used on a slingsby T21b glider.

The high camber profile is designed into an air foil to maximise its lift coefficient.

*requires C30-13 or C30-16

Requirements

C30

C30-13 or C30-16

Wing Model Type 2 NACA 633-618 - C30-30-02

Wing model designed with a **NACA 633-618** profile, as used on the Schleicher Ka6b Glider.

The profile is less cambered than the Gottingen 535 allowing direct comparison.

*requires C30-13 or C30-16

Requirements

C30

C30-13 or C30-16

Wing Model Type 3 NACA 64-212 C30-30-03

Wing model designed with a **NACA 64-212** profile, as used on the MDM-1 Fox aerobatic glider.

The profile is almost symmetrical and cuts through the air evenly.

*requires C30-13 or C30-16

Requirements

C30

C30-13 or C30-16

Wing Model Type 4-Fauvel F2 - C30-30-04

Wing model designed with a **Fauvel F2** as used on the FV-36 Flying Wing. The profile is a reflexed camber air foil where the camber line curves back up near the trailing edge.

Such an air foil is useful in certain situations such as with tailless aircraft.

*requires C30-13 or C30-16

FM SERIES

Fluid Machines

Link to FM Series

Computer Controlled Fans, Compressors, Pumps and Turbines

The Armfield Fluid Machines range introduces students to a range of Desktop Computer-Controlled Turbo Machines covering Fans & Compressors,Pumps and Turbines.

These highly visual products offer full computer control and data logging as standard.

Software inc

Propeller Turbine Demonstration Unit - FM63

A miniature-scale propeller turbine unit, which is supplied as a floor-standing unit complete with a sump tank and recirculating pump.

The turbine is housed in clear acrylic pipe work permitting excellent visibility.

The turbine is loaded by an electronically controlled brake fitted with a load cell to measure the torque.

Requirements

- 1Ph
- IFD 7
- PC
- USB

Requirements

IFD 7

Turbine Service Unit - FM6X

A bench mounted unit consisting of a clear acrylic reservoir and a variable speed centrifugal pump, which provides water to power the accessory on test.

The service unit also incorporates a water flow meter and electrically controlled dynamometer, which puts a load on to the turbine and measures the torque and speed.

FM6X Turbine Service Unit shown with FM62 Pelton Turbine Demonstration Unit.

Pump Test Accessory - FM64

The FM64 is a compact accessory, which allows the FM6X service unit to be used as a pump test accessory.

Software inc

Requirements

FM 6X

IFD 7

Axial Flow Impulse Turbine - FM60

A miniature-scale axial flow, impulse turbine consisting of a brass runner, which is acted on by four jets of water.

The flow to the turbine can be adjusted by changing the pump speed or closing off any of the nozzles.

The turbine is housed in clear acrylic for excellent visibility.

The unit is designed to mount on the FM6X Turbine Service Unit.

Software inc

Requirements

FM 6X

IFD 7

Radial Flow Reaction Turbine - FM61

A miniature-scale radial flow reaction turbine, where water enters through a face seal and exits tangentially through two orifices. The reaction of these jets causes rotation of the runner.

The turbine is housed in clear acrylic for excellent visibility.

The unit is designed to mount on the FM6X Service Unit.

Software inc

Requirements

FM 6X

IFD 7

Pelton Turbine - FM62

A miniature-scale Pelton wheel turbine, complete with a spear valve to control the water flow. The turbine buckets are shaped to extract maximum momentum from the passing jet of water, while the spear valve is designed to enable adjustment of the cross sectional area of the jet.

The turbine is housed in clear acrylic for excellent visibility.

The unit is designed to mount on the FM6X Service Unit.

Software inc

Centrifugal Fan Demonstration Unit - FM40

The centrifugal fan is a radial flow machine, which produces the necessary pressure to move gas by the centrifugal force built up inside the fan casing. The design of the fan blade has a primary influence on performance.

These types of fans are usually employed for ventilating duties requiring a somewhat higher delivery pressure than that available from axial fans.

Requirements

IFD 7

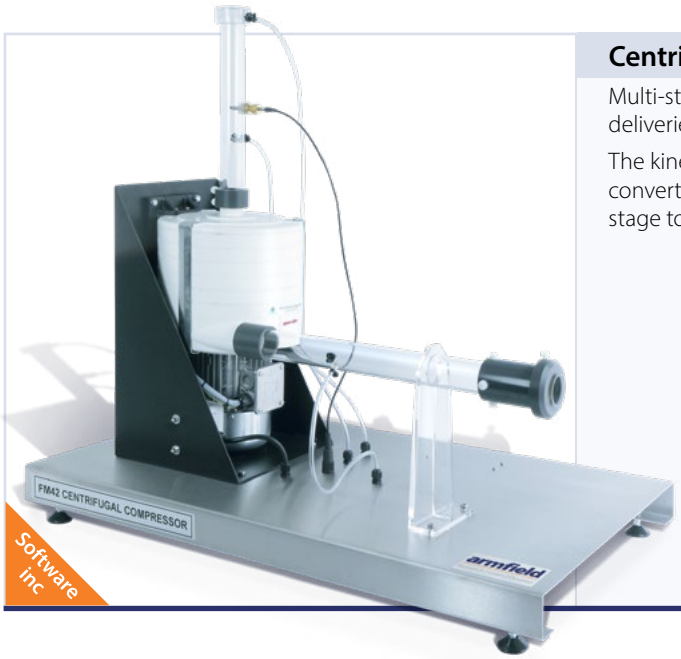
Axial Fan Demonstration Unit - FM41

The axial fan produces gas flow by virtue of the momentum changes imparted across the rotary blades, parallel to the axis of rotation. Such fans are more suitable for higher flows at lower delivery pressures than their centrifugal counterparts.

Comparison of the performance characteristics of the FM41 Axial Fan with those of the FM40 Centrifugal Fan thus provides an instructional exercise of valuable practical application.

Requirements

IFD 7



Centrifugal Compressor Demonstration Unit - FM42

Multi-stage compressors are used industrially for high pressure deliveries of gas flows or suction duties.

The kinetic energy imparted to the gas by the impeller rotation is converted into pressure energy, which progressively increases from stage to stage.

Requirements

IFD 7

Requirements

IFD 7

Centrifugal Pump Demonstration Unit - FM50

The centrifugal pump is the machine most commonly used to move liquids from one place to another. As such it's a particularly instructive unit, which introduces students to the whole subject of rotodynamic fluid machines.

Discovering the relationship between head, flow, rotational speed and power provides a framework of general applicability.

For example, matching the required duty point to the conditions of maximum energy efficiency may be explored as a creative student project.

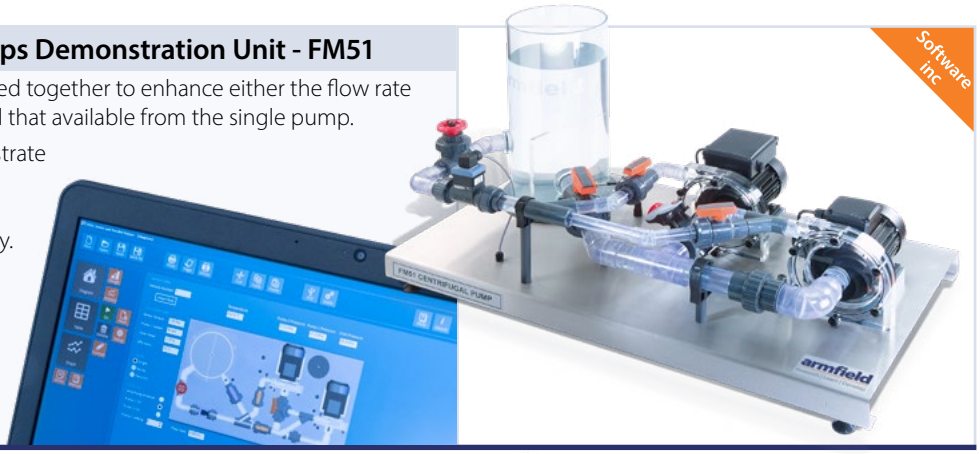
Requirements

IFD 7

Series and Parallel Pumps Demonstration Unit - FM51

Centrifugal pumps are often used together to enhance either the flow rate or the delivery pressure beyond that available from the single pump.

The unit is designed to demonstrate the operational advantages of parallel or series operation, depending on the required duty.



Requirements

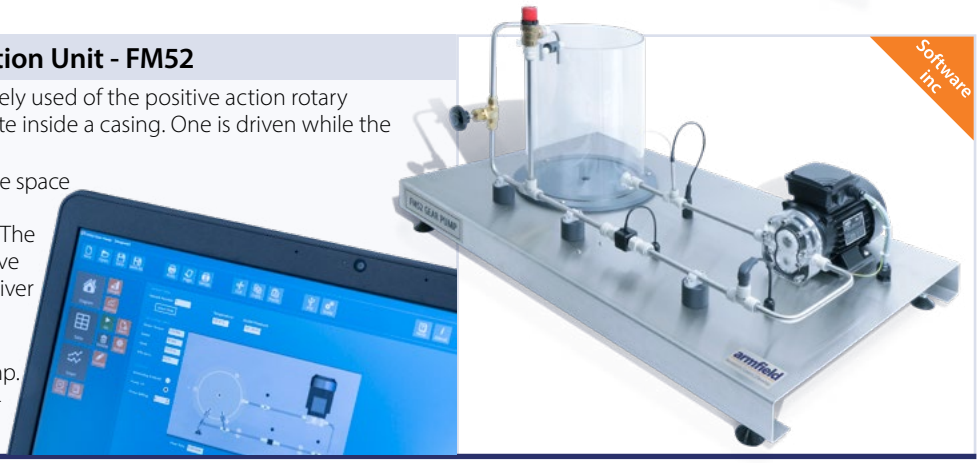
IFD 7

Gear Pump Demonstration Unit - FM52

The gear pump is the most widely used of the positive action rotary pumps. Two gear wheels operate inside a casing. One is driven while the other rotates in mesh with it.

The liquid is carried around in the space between consecutive teeth and then ejected as the teeth mesh. The pump has no valves. It is a positive displacement pump and will deliver against high pressures.

The output is a more even flow than that of a reciprocating pump. It is particularly suitable for high-viscosity fluids.



Requirements

IFD 7

Plunger Pump Demonstration Unit - FM53

The plunger or ram pump is a positive displacement pump and is used for pumping small quantities of liquid at high pressures. It is similar to a piston pump except that the sealing gland is at one end of the cylinder.

The reciprocating motion of the plunger gives an uneven flow, although the inclusion of a damping vessel can reduce this effect.

**Priming is unnecessary.*

Link to S Series

S SERIES

Hydraulics & Hydrology

Rainfall, Drainage, Sediment Flow and Erosion

This range of products offers both laboratory and field-learning opportunities. It also introduces such diverse topics as crop water requirements, erosion, soil moisture content, ground water flow, plant water need and sprinkler irrigation systems.

Piezometric surface studies

Scouring around a circular bridge pier

Riverbed morphology

Environmental Hydrology System - S12-MKII
Advanced Environmental Hydrology System - S12-MKII-50

This floor-standing Hydrology System includes features suitable for studying fluvial geomorphology. It combines the capabilities of the Rainfall Hydrographs and Ground Water Flow Unit into a single comprehensive facility. The system is fully instrumented for investigation of rainfall/run-off hydrographs, ground water abstraction studies and unique to this apparatus, fluvial mechanics.

Data logging accessory available.

- Includes the following accessories: Impermeable catchment - Permeable catchment - Cylinder - Rectangle - Rounded bridge pier - Streamlined bridge pier

S12-Models for use with S12-MKII

An optional accessory comprising of a set of shapes and models for use when investigating surface flow effects and run-off effects

Requirements

1Ph
PC
USB
COLD

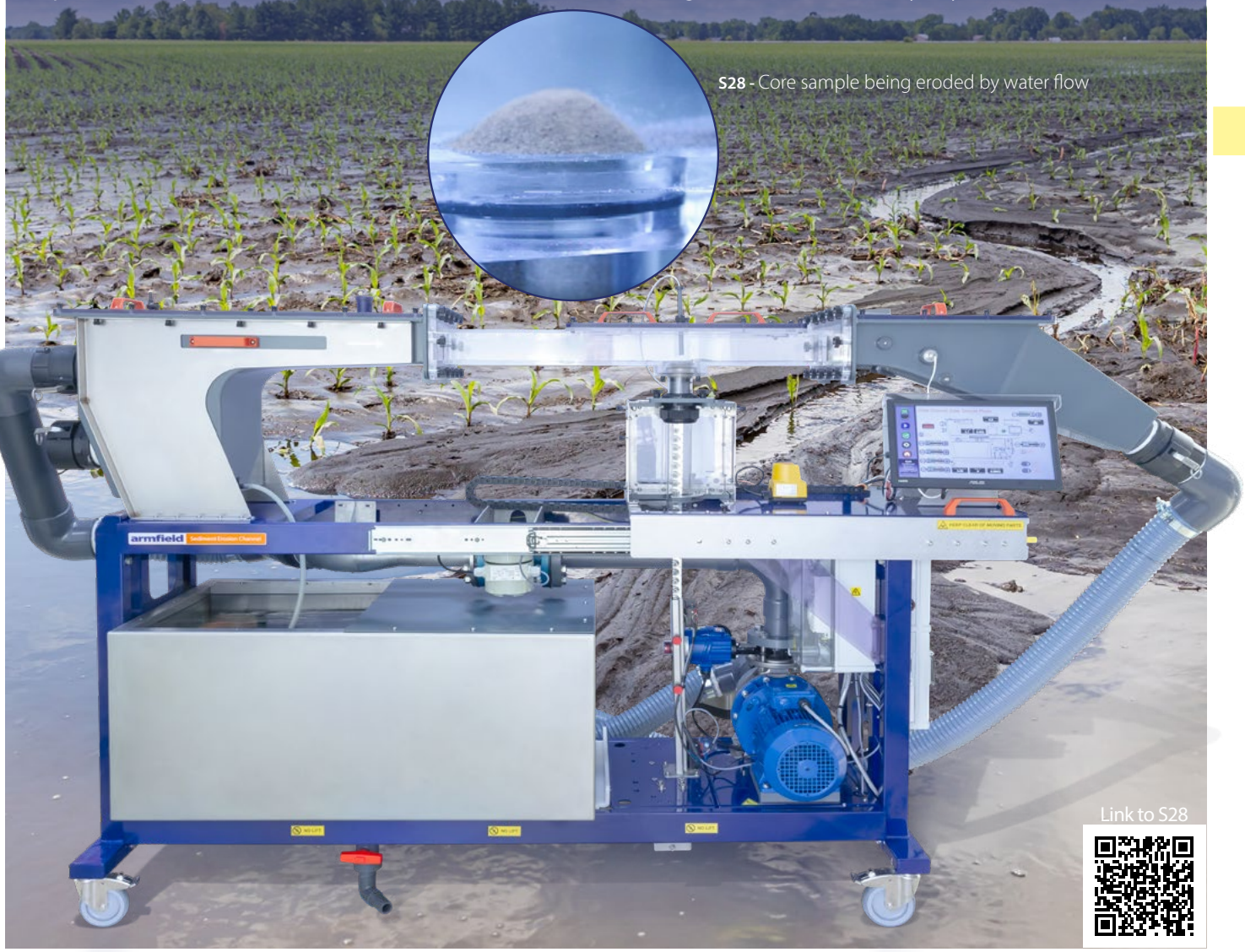
Sediment Erosion Flume – S28

Armfield S28 Sediment Erosion Flume is a multipurpose research tool developed to enable investigations into the erosion, transportation and sedimentation of cohesive particles in piped networks and natural systems.

The recirculation–style flume uses a set of interchangeable channel sections that allow a broad range of experimental capabilities.

Test medium can be in the form of core samples, general soil or vegetation samples.

The flume has been developed to generate variable flow across a range of shear stresses, fully automated and precisely incremented to accurately determine erosion thresholds for poorly consolidated sediment (e.g. silty mud) through to consolidated heavy clay-like soils.



S28 - Core sample being eroded by water flow

Link to S28

Requirements

1Ph

COLD

DRAIN

Sediment Erosion Flume – S28

A multi purpose, automated mobile research platform designed to facilitate the study of sediments and erosion, test medium can be in the form of core samples, general soil or vegetation samples.

Options, models and instruments available

- Sediment Core Module (150 x 75mm Section) (supplied as standard)
- Wide Erosion Studies Module (300 x 100mm Section) + Bridge Insert (option)
- Narrow Erosion Studies Module (150 x 50mm Section) + Bridge Insert (option)
- Sediment Core Module (105 x 50mm Section) (option)

Software inc

Drainage and Seepage Tank - S1

This self-contained facility is designed to enable a comprehensive study of flow through permeable media. Using sand and the various two dimensional models supplied, it is possible to determine flow lines, seepage rates and the distribution of uplift pressures.

A useful facility for student project work in engineering hydrology.

- Flow line visualisation
- Flow net construction
- Determining seepage rates
- Verification of Darcy's Law
- Comparison of experimental results with analytical solutions

Requirements

1Ph

COLD

Rainfall Hydrographs - S10

The unit is a compact unit for the study of a variety of rainfall run off situations.

A range of accessories enables the effects on the flood hydrograph of surface reservoir retention, depression, storage effects and land drainage to be demonstrated.

Requirements

1Ph

COLD

Ground Water Flow Unit - S11

A bench standing sand tank capable of demonstrating hydrological principles of ground water flow and the applications of these to certain water resource engineering constructions.

Demonstrations of flood risks associated with land drainage works, the use of wells for both water abstraction, de-watering and the drainage of lakes and polders are all readily performed.

The unit enables simple three-dimensional flow situations to be set up quickly and measurements of piezometric levels taken at appropriate positions within the model.

Requirements

1Ph

COLD

River Flow Simulator - S17

The Armfield River Flow Simulation tank demonstrates river feature formation, including flow and bed load motion.

It provides an excellent introduction to the study of fluvial geomorphology and can also demonstrate sophisticated and advanced concepts for research purposes.

Requirements

1Ph

COLD

Requirements

1Ph

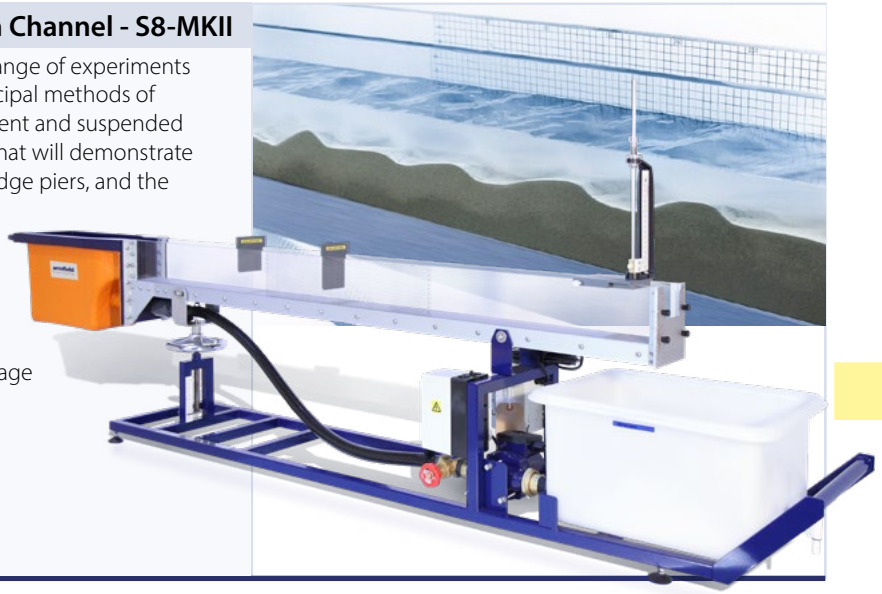
COLD

Sediment Transport Demonstration Channel - S8-MKII

This apparatus has been designed to allow a range of experiments to be performed to demonstrate the two principal methods of sediment transport in water: bed load movement and suspended sediment transport. In addition, experiments that will demonstrate local scour at channel obstructions such as bridge piers, and the secondary flow in channel beds.

Experimental content includes:

- Regimes of Fixed-Bed Flow
- Initiation of Bedload Motion
- Bedforms in Sand
- Hysteresis of Bedforms during Changing Stage
- Scour at Structures
- Sediment Transport Rate
- Flow Resistance in a Gravel Bed



Requirements

1Ph

COLD

Mobile Bed and Flow Visualisation Tank - S2

A versatile apparatus for teaching, project and research work. Available with 2.0m or 4.0m long working section.

The tank may be used in two principal fields of study:

- Hydraulic modelling of mobile bed situations such as water courses or civil engineering structures
- Two-dimensional flow visualisation using, for example, the Ahlborn dust indicator technique

Experimental content includes:

- Two-dimensional Flow Patterns
- Three-dimensional Flow Patterns
- Hydraulic Model Studies
- Unsteady Flow Patterns
- Loose Boundary Demonstrations

Requirements

1Ph

COLD

Hydraulic Flow Demonstrator - S16

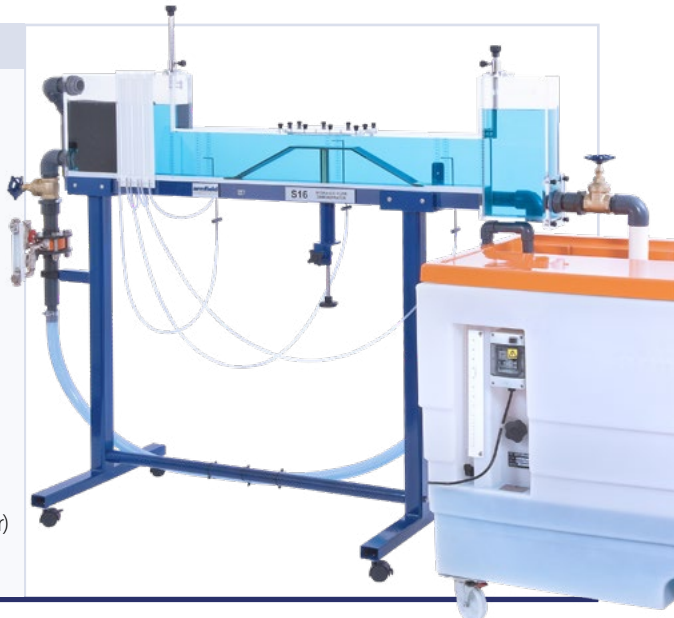
A free-standing accessory to the F1-10 Hydraulic Bench that enables hydraulic phenomena, associated with the flow of water through both open channels and close conduits, to be set up quickly, easily and visually demonstrated. Measurements taken in each configuration permit the associated flow conditions to be analysed.

An elevating section of the bed inside the channel and models of various hydraulic structures enable the difficult concepts of critical flow/velocity/depth and energy changes to be clearly demonstrated and analysed.

Models supplied include the Undershot Weir, Overshot Weir, Narrow crested Weir, Broad crested Weir, Ogee Weir and Culvert. In all cases, the effects of changes in upstream and downstream water level can be investigated.

Also available:

Hydraulic Flow Demonstrator - S16-11 (Direct Reading Flowmeter)

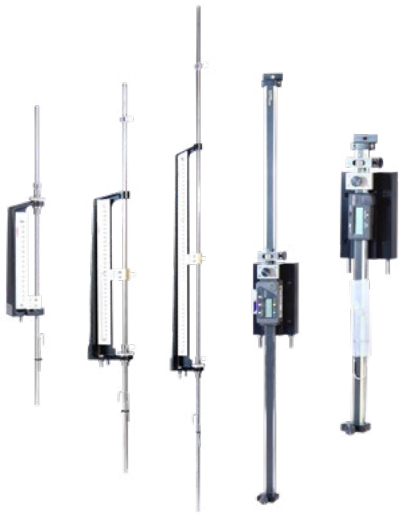


Link to H Series

H SERIES

Hydraulic Instruments

Armfield offer a range of instrumentation and measuring devises, these include gauges, manometers, pitot tubes, probes and laser PIV



Vernier Hook and Point Gauge

Requirements

The measurement of steady state water surface position is frequently needed during hydraulic investigations. This is done by using a small point or hook manually adjusted to touch the water surface, and a reading is taken of the vertical movement using a scale or vernier.

H1-1	150mm Scale Vernier Hook and Point Gauge
H1-2	300mm Scale Vernier Hook and Point Gauge
H1-3	450mm Scale Vernier Hook and Point Gauge
H1-7	300mm Scale Digital Hook and Point Gauge
H1-8	500mm Scale Digital Hook and Point Gauge
H1-11	Adjustable Tripod Stand with Mountings

Series Liquid Manometers

Requirements

PC

USB

A range of general purpose laboratory manometers using liquid displacement to measure differential pressure.

H12-1	1m Scale Open Water Manometer
H12-2	1m Scale Pressurised Water Manometer
H12-3	1m Scale Water-Mercury Manometer
H12-4	500mm Scale Water-Mercury Manometer
H12-5	500mm Scale Kerosene-Water Manometer
H12-6	Free Standing Support Column
H12-7	Pressure Tapping System
H12-8	Basic Portable Pressure Meter
H12-9	Portable Pressure Meter - 140mBar

Computer Compatible Manometer Bank - HT14/2

Requirements

PC

The Armfield H14/2 is a computerised manometer bank. It allows pressure measurements taken via electronic sensors to be displayed and logged on a suitable PC using the Armfield software supplied.

The unit contains 16 general purpose pressure measurement ports, and two pairs of high sensitivity, dry air, differential pressure ports.

- General purpose sensors working range: 0 to 350mm water
- High sensitivity sensors working range: 0 to 125mm water

Requirements

Pitot Tubes

A range of Pitot tubes for the measurement of water velocity in open channels and closed ducts.

H30-1H 150mm Pitot Tube

H30-2H 300mm Pitot Tube

H30-3H 450mm Pitot Tube

Requirements

Propeller Velocity Flowmeter

Used to measure and record very low point velocities in water and other conductive fluids, the H33 uses the change in impedance of a rotating multi-bladed impeller to indicate rotational speed caused by the flowing fluid.

H33-1	0.025-1.5 m/s Velocity Probe
H33-2	0.6-3 m/s Velocity Probe
H33-3	(+90 degree head), 0.025-2.5 m/s Velocity Probe
H33-10	Digital Indicator c/w 3m cable
H33-DTA-ALITE	Data Logger

Requirements

1Ph

Wave Probe System

The wave gauge is a simple and reliable device for measuring rapidly changing water levels in physical models. The wave probe case contains the signal conditioning circuitry for up to eight wave probes and a network connection to allow a computer to configure the probes via the built-in web page.

H40-MKII	Wave Probe Case 8 Channels
H40-MKII-1	Twin Wire Wave Probe 300mm
H40-MKII-2	Twin Wire Wave Probe 600mm
H40-MKII-3	Twin Wire Wave Probe 900mm
H40-MKII-4	Twin Wire Wave Probe 1200mm
H40-MKII-6	Twin Wire wave Probe stand (for 300mm wave probe)
H40-MKII-7	Twin Wire wave Probe Tripod (for 600mm to 1200mm wave probes)

Requirements

PC

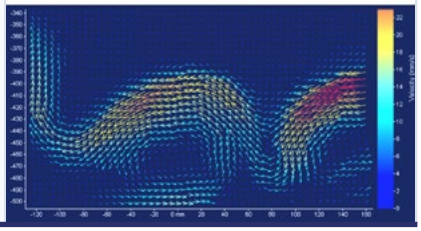
USB

Laser PIV System

The compact, portable H41 Laser PIV System uses particle image velocimetry to measure, non-intrusively, fluid velocities at multiple points in a flow, at rates of up to 16Hz.

An ideal, cost effective tool for research and demonstration.

H41-1	Standard rtCam & nanoLase PIV Kit
H41-2	Standard rtCam & submersible nanoLase PIV Kit
H41-3	20 degree Light Sheet Optic for nanoLase
H41-4	200g of Water Suitable Seeding Particles
H41-5	1.5m Tripod for the rtCam
H41-6	Snakearm with Magnetic Base for nanoLase
H41-7	Snakearm with G-Clamp Base for nanoLase



Link to S6-MKIII

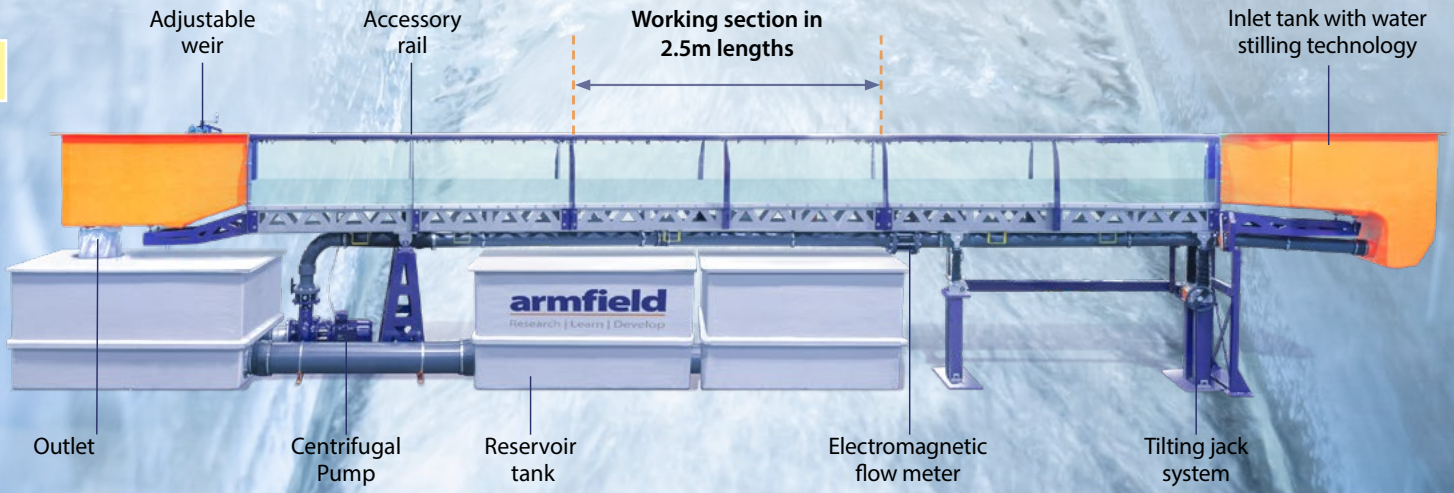
Standard Teaching Flume S6-MKIII

The Armfield S6-MKIII laboratory flow channel is one of the most important tools available to the hydraulics or civil engineer whether engaged in teaching basic principles or researching solutions to practical problems. Many applications in fluid mechanics are associated with the flow of water through an open channel where the water has a free surface that is exposed to the air at atmospheric pressure.

The flumes are available in different lengths from **5** to **17.5m** in 2.5m sections and examples are installed in educational and research establishments throughout the world.

A comprehensive range of accessories, and measuring instruments is available including discharge control, wave generation and a closed loop for sediment transport studies.

S6-MKIII - Teaching and research flume




Centrifugal pump

Crump weir model S6-31


Electrical jacking

Standard Teaching and Research Flume – S6-MKIII

Requirements

3Ph

0.3m wide x 0.45m deep x 2.5m section.
Flumes are available from 5 to 17.5m in 2.5m increments.

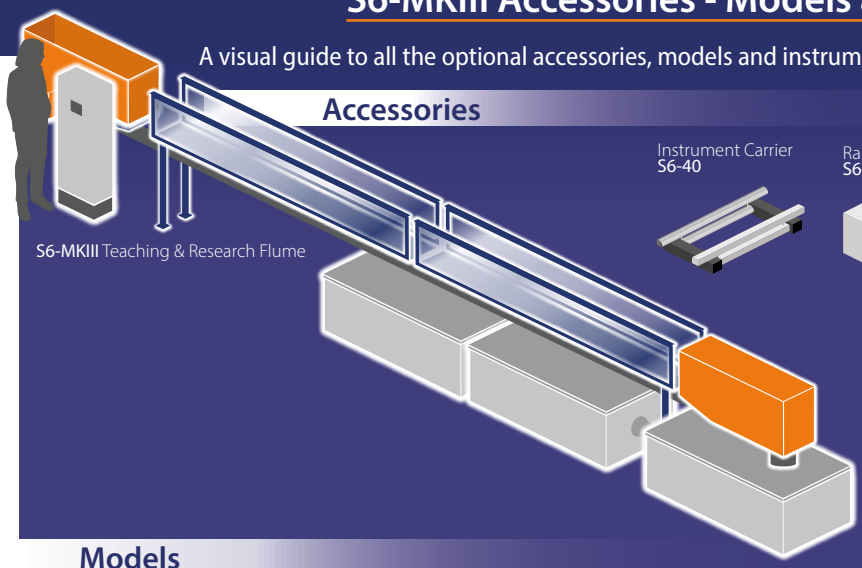
Options, models and instruments available

- Tilting up to 17.5 meters
- Sediment transport options
- Manual or electric jacking
- Software Control and Data Acquisition Package option
- Data Logging & Instrumentation Package option
- Multiple model options available

S6-MKIII Accessories - Models and Instruments

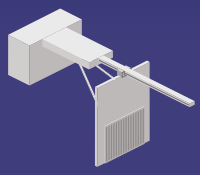
A visual guide to all the optional accessories, models and instruments available for the S6-MKIII Flume

Accessories

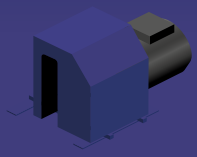


Instrument Carrier
S6-40

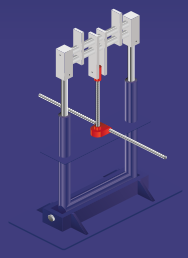
Random Wave Maker
S6-45



Wave Maker
S6-35



Power Jack
S6-14

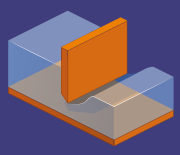


Sediment Loop
S6-MKIII-SL

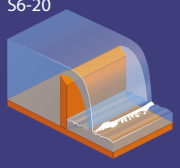
Models

Screw Operated Undershot Plate Weir
S6-20

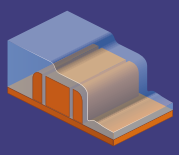
Undershot Weir
S6-20



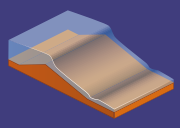
Sharp Crested Weir
S6-20



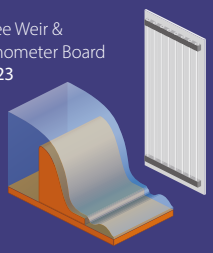
Broad Crested Weir
S6-21



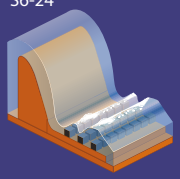
Crump Weir
S6-31



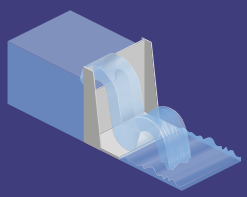
Ogee Weir & Manometer Board
S6-23



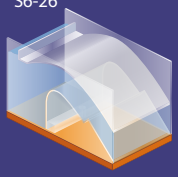
Dam Spillway
S6-24



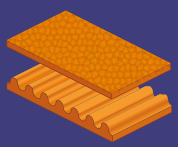
Syphon Spillway
S6-25



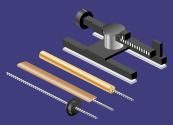
Self Regulating Syphon
S6-26



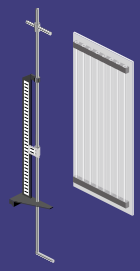
Roughened Beds
S6-27



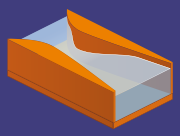
Lift & Drag Balance
S6-29



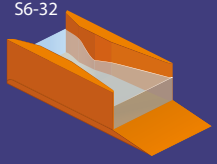
Pitot Tube & Manometer Board
S6-30



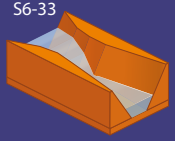
Venturi Flume
S6-22



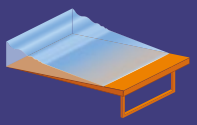
Parshall Flume
S6-32



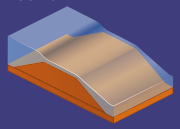
WSC Flume
S6-33



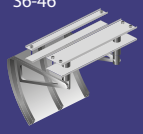
Beach
S6-36



Sill
S6-49

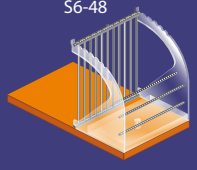


Radial Gate
S6-46

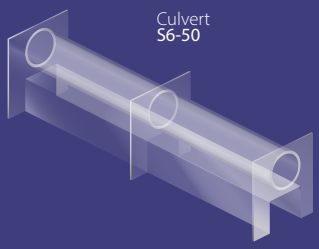


Set of Piers
S6-47

Trash Rack
S6-48



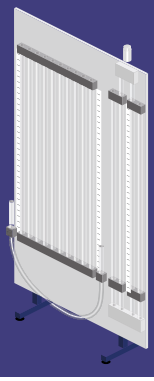
Culvert
S6-50



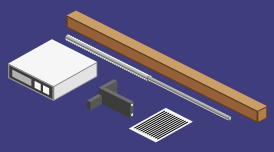
Vibrating Pile
S6-28

Instruments

Zagni Flow
S6-37

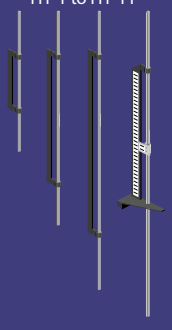


Velocity Meter
S6-42



Pitot Tubes
H30-1H to H30-3H

Vernier Hooks & Point Gauges
H1-1 to H1-11



Velocity Probes, Digital Indicators & Data Logger
H33 to H33-10

Wave Probe Systems
H40-1-4 to H40-2-3

Manometer including:
- water
- pressurised
- water over mercury

H12-1 to H12-9

Details of the H Series can be found on page **34 & 35**

Link to S Series

S SERIES

Research Flumes

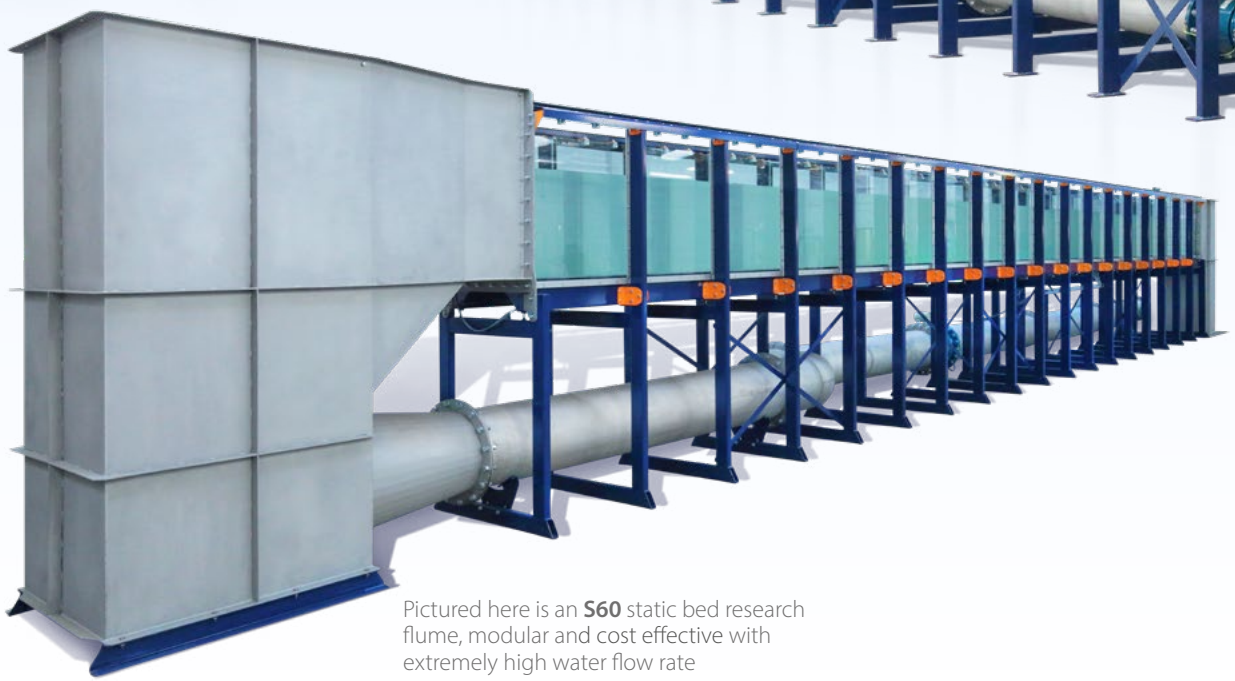
The world-leading fixed bed and tilting flume technology supplier for over 50 years

Representing innovative product evolution, Armfield's latest series of fully configurable, modular flume systems are designed to exceed the requirements of research and teaching facilities alike.

Available as free discharge, recirculation or a combination of both; flumes systems are accompanied by a range of Hydraulic & Hydrology equipment that includes tanks, basins, experimentation models and instrumentation.

- **Standard research flumes** (available as tilting or fixed bed and in several working lengths)
- **Standard computer controlled research flumes** (available as tilting or fixed bed and in several working lengths)
- **Special flumes, tanks and basins**
- **Ancillary equipment:**
  - Sediment transport facilities
  - Mono and random wave makers
  - Instrumentation
  - Wind simulation

The **S80** wind over wave research flume built to simulate enviromental effects



Pictured here is an **S60** static bed research flume, modular and cost effective with extremely high water flow rate

Example of a **S100** tilting bed research flume, engineered for minimum deflection in an easily shipped modular design

Bespoke system design for your application available from Armfield

As with all of our equipment, we can install, commission and offer full training and on site maintenance.

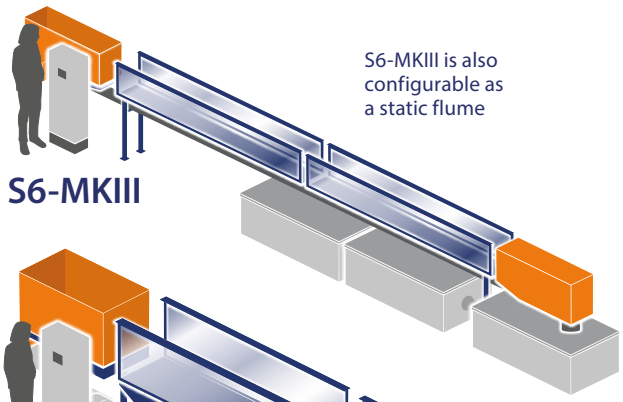
Channels can be designed to incorporate the following features (depending on customer requirements):

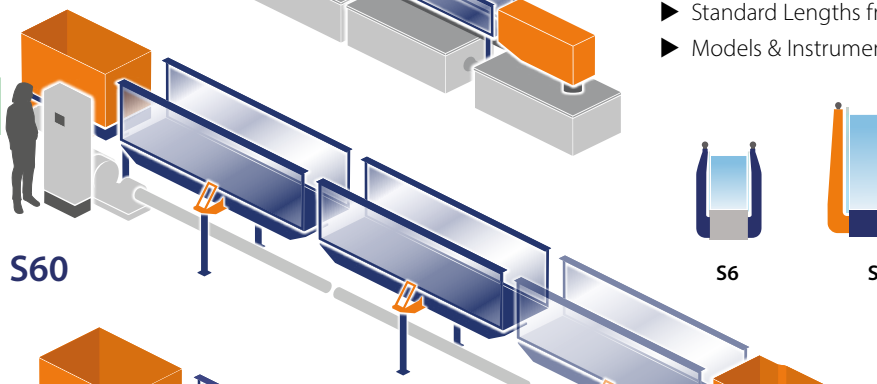
- Fixed bed or variable slope
- Self-contained or laboratory supplied water
- Open circuit or re-circulating sediment load
- Choice of working section materials (glass, metal, wood)
- Wind and wave generators
- Instrumentation systems for flow, velocity, level, etc.
- Sediment sampling and weighing
- Extremely high flow rates possible

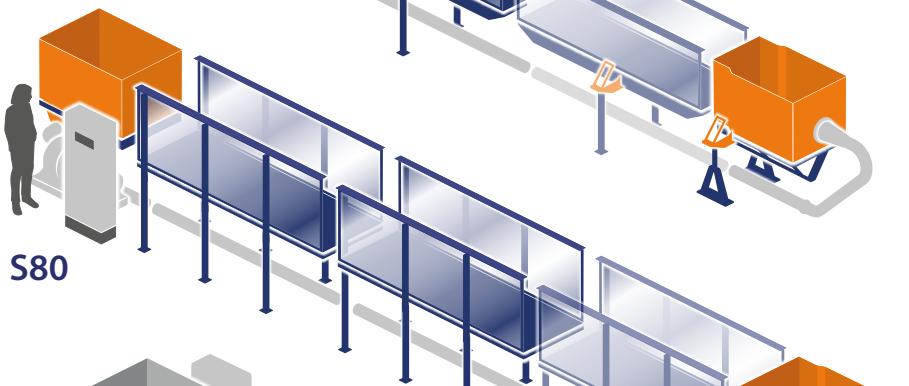
Modular Standard Fixed Bed and Standard Tilting Bed Flumes

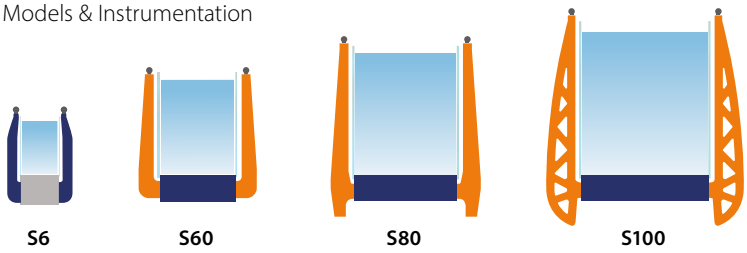
Armfield flumes are engineered with the industry's most comprehensive range of options:

- Control and acquisition
- Sediment transport / feeding / weighing / extraction
- Random and mono wave generation systems
- Walkways, gantries and jacking systems
- Bespoke pumping solutions from single to multiple pumps with flow rates ranging from 1-1000 l/sec
- Weir types including: venetian weir; base hinge; stop log; gate & sluice
- Integrated touchscreen PLC control and logging systems
- Optional glass base sections for full particle image velocimetry (PIV analysis)
- Standard Lengths from 5m- 50m
- Models & Instrumentation









Flume range cross section

Configurable modular flumes

Working section dimensions

Flume	Type	Width	Depth	Length (in 2.5m increments)
S6-MKIII	Tilting	0.3m	0.45m	From 5m-17.5m
S60ST	Static	0.6m	0.8m	From 5m-50m+
S60	Tilting	0.6m	0.8m	From 5m-30m
S80ST	Static	0.8m	1.0m	From 5m-50m+
S80	Tilting	0.8m	1.0m	From 5m-30m
S100ST	Static	1.0m	1.2m	From 5m-50m+
S100	Tilting	1.0m	1.2m	From 5m-30m

Standard size flumes, available in free discharge or recirculation. Bespoke lengths and widths can also be offered.

*Note: length of tilting flume subject to tilt requirements

Flumes can be built to length in multiples of 2.5m working sections (add end & feed tanks, plus pumps and any other outboard ancillaries to obtain overall flume length and width)

Requirements

3Ph
PC
USB
COLD

Standard Teaching and Research Flume – S60 PLC control included 0.6m wide x 0.8m deep x 2.5m sections

Options, models and instruments

- Free discharge or recirculation configurations
- Sediment transport options
- Tilting up to 30 meters
- Static bed up to 50 meters
- Weir options available

Tilting bed shown

Requirements

3Ph
PC
USB
COLD

Standard Teaching and Research Flume – S80 PLC control included 0.80m wide x 1.0m deep x 2.5m sections

Options, models and instruments

- Tilting up to 30 meters
- Static bed up to 50 meters
- Sediment transport options
- Weir options available
- Free discharge or recirculation configurations

Static bed shown

Requirements

3Ph
PC
USB
COLD

Standard Teaching and Research Flume – S100 PLC control included 1.0m wide x 1.2m deep x 2.5m sections

Options, models and instruments

- Free discharge or recirculation configurations
- Sediment transport options
- Tilting up to 30 meters
- Static bed up to 50 meters
- Weir options available

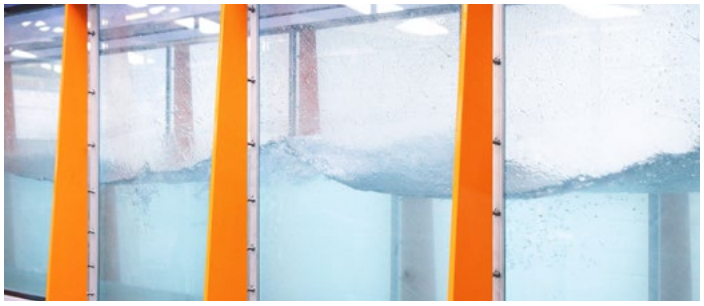
Tilting bed shown

Brouchure

Research Flume Options & Solutions

Wind Generation / Wave Generation / Sediment Transport / Electrical Jacking / Reservoir Tanks

Armfield offer numerous options for incorporation into our range of large Flumes (S60, S80, S100). Many of these options can be combined together to offer greater flexibility for simulation and research.



PLC Flume Computer Control

All Armfield large scale research flumes are supplied with a floor standing control panel. The cabinet houses the frequency inverters which control the tilt and pump motor speeds. As standard the Armfield flume is supplied with a PLC control system with HMI touch screen interface.

The system can be run in manual mode enabling the user to operate flow, depth, infeed, tilt etc. (depending on options).

When the system is set in automatic mode the desired water depth, incline and flow rate can be selected, the system will then monitor the settings and using PID control data maintain the desired output (depending on options).

Wind Simulation

An optional Integrated computer operated wind simulation system can be provided, offering mono or bi-direction wind.

The wind simulation is provided with a variable speed fan system connected to a clear cowling running over the flume.

Variable wind simulation speeds up to and more than 25 metres per second are available.

Wavemaking

Armfield offers multiple wave generator options from simple paddle systems, through to multi-paddle computer-controlled wave generating systems.

For many applications, particularly coastal models and flume studies, long crested and directional random waves are sufficient to model the sea state. For offshore studies and some shallow water problems multi-directional components are required.

Flumes may be used to study breakwaters, sea walls and beach behaviour or for fundamental research.

Flood Gate

Flood event research with a computer controlled release system, this option will open up environmental experimentation.

Our engineers have designed an option to carry out flood event studies, leaky barriers, dam research, effect on structures and more. This flume furthers our involvement in creating equipment for environmental erosion studies.

Braided river , accumulations of logs and flood sediment studied in an Armfield research flume

Research being conducted into macro algae at the total environment simulator built by Armfield for the University of Hull

Sediment Transfer

Armfield can offer options for running sediment transfer experimentation within the flumes.

Dedicated transfer – A separate solids handling pump is installed and connected to the drop out section. The pump can be used with sedimentation up to 10mm in size, which is then pumped to the start of the working section for redistribution. This system can be operated continuously.

Sediment transfer through the main circulation pump – This is particularly suitable for experimentation of fine suspended sediment. The pumps are lined and are designed to handle sedimentation up to 4mm in size. The suspended sediment is pumped through the main pipework and this system can be operated continuously.

Sediment collection and extraction – Where sediment needs to be collected and not automatically recirculated a series of valves are fitted to the drop out section enabling periodic extraction of deposited sediment.

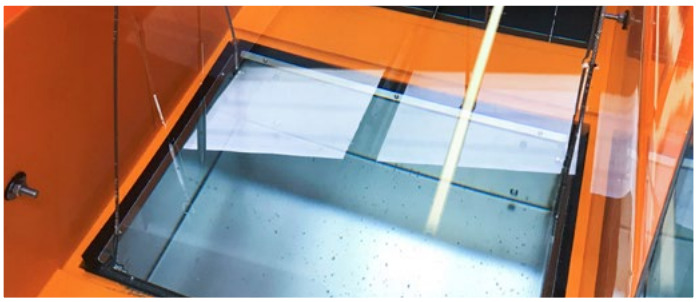
Sediment Weighing

Armfield offer a dedicated sediment weighing facility.

The system catches mobile bed sediment in conjunction with an expansion point and removable diverter plate to drop out suspended sediment.

The mass of the captured sediment is measured and shown on the main control console this is then recorded on the data logging system.

Note: *the weigh system needs to be removed if operating sediment transport option*



Reservoir Tanks

Storage/reservoir tanks can be offered along with walkways mounted above to give access to the flume working section.

The S6 flumes are supplied with reservoir tanks as standard.

- Armfield can use existing header tanks or sumps
- Flumes can be supplied as a fully self-contained system

Actuated Flume Tilt Control

This is available for S60, S80 and S100 flumes

- Tilting up to 30 meter working section
- Integrated control within our bespoke flume software
- Tilting flume configuration (maximum available tilt 5%)

River bed and bank studies into erosion via fish and crustacean activity

W SERIES

Water Treatment

Link to W Series

Common processes coverd by Armfield's Water Treatment range

- This range of simple yet comprehensive products covers the major elements of water treatment processes
- Several of the products can also be used industrially both for testing and experimentation

- Wastewater Treatment Process
  - Mechanical
    - Aeration W10-MKII
    - Sedimentation W2-MKII, W7
    - Filtration
      - RO,UF,MF,NF FT18-MKII
      - Deep Bed Filtration W4-MKII, W5-MKII
      - Surface Filtration FT17, W3-MKII
  - Chemical
    - Ion Exchange W9-MKII
    - Flocculation W1-MKII
    - Adsorption UOP15
  - Biological
    - Aerobic Process W11
    - Anaerobic Process W8, BE3, BE4

W10-MKII Aeration Unit

W11 Aerobic Digester

Requirements

1Ph

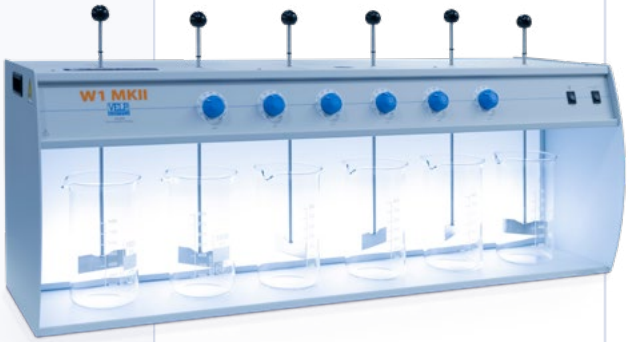
Flocculation Test Unit - W1-MKII

Analysis of a water or waste preparatory to help in the design of a treatment sequence often involves coagulation and flocculation experiments in the laboratory. These tests, called jar tests, are widely used for control of plant operations and are routinely performed by treatment plant operators.

The coagulation and flocculation tests serve to indicate the optimum chemical dosages for removal of turbidity and colour, including such auxiliary facets as pH adjustment, and the necessity for the supplemental use of activated carbon.

The Flocculation test unit allows students to investigate the following:

- Determination of optimum coagulant dosage
- Determination of optimum pH
- Effect of mixing time and intensity



Requirements

1Ph

Sedimentation Studies Apparatus - W2-MKII

The study of how particles settle in a liquid is of importance to many industries. The Armfield Sedimentation Studies Apparatus provides students with the opportunity of observing settling or sedimentation phenomena in a simple and readily identifiable manner. Students can measure settling rates as a function of particle size, density, and concentration in a static water system. From these results, batch settling curves may be deduced, which can then be used for the design of industrial settlers and thickeners. The equipment supplied also allows industrial tests to be made on any slurry system of interest. The equipment allows students to study the following topics:

- Effect of initial concentration on sedimentation characteristics
- Construction of the rate of settling curve against concentration from a single batch test
- Effect of initial height on sedimentation characteristics

Requirements

1Ph

PC

USB

Permeability/Fluidisation Studies Apparatus - W3-MKII – armBUS integrated

This apparatus is designed for students to measure and understand the characteristics of flow through a bed of particles. Such flows occur naturally and in process plant designs.

It may also be used for a part of the testing of media for water and waste water treatment processes.

Software inc

Requirements

1Ph

PC

USB

Filterability Index Unit - W4-MKII – armBUS integrated

The unit enables a water treatment test to be made on a suspension to be filtered through sand or similar granular media.

Whilst developed as a teaching tool, it can also be used in routine control at waterworks, or at a sewage treatment works that employs tertiary filtration.

Software inc

Water Treatment - W Series

Deep Bed Filter Column - W5-MKII – armBUS integrated

This laboratory deep bed filter column has been designed to operate identically to full-scale granular filters.

Using the same bed depth and filter media, tests on this unit provide operational data, which may be scaled up to full size. Pilot trials of possible filter designs for water and sewage works can be made reliably at low cost.

Requirements

Model Sedimentation Tank - W7-MKII

This unit has been designed to demonstrate the hydraulic characteristics and settling efficiencies of a model settling basin.

Although scale-up to industrial size sedimentation tanks is difficult, relevant deductions can be made as to how non-uniform flows occur and how these interact with the settling characteristics of particular suspensions.

Requirements

Anaerobic Digester - W8

Anaerobic treatment processes involve bacteria, which function only in the absence of air.

This digester is designed as a bench top training facility and as a means of providing operational process data for plant design purposes.

Requirements

Ion Exchange Unit - W9-MKII – armBUS integrated

A low cost, bench mounted unit designed to demonstrate the use of ion exchange resins for either continuous water softening or demineralisation.

The equipment is designed to emulate the industrial operation of such units, including monitoring 'break-through' and regeneration cycles.

Requirements

Requirements

1Ph
PC
USB

Aeration Unit - W10-MKII – armBUS integrated

The purpose of this aeration unit is to permit the study of the oxygen transfer characteristics of diffused air systems including the physical and chemical parameters that influence their oxygenation capacity.

These studies are a necessary prelude to the understanding of the biological treatment of waste waters.

Requirements

1Ph

Aerobic Digester - W11

The continuous activated sludge process has been successfully employed in public health engineering installations for nearly a century.

The bench top aerobic digester is a comprehensive study facility of this biological water treatment process using a safe, synthetically prepared waste water.

Chilled Water Circulation Unit - CW-17 (Option)

Requirements

1Ph
PC
USB

Cross Flow Membrane Filtration - FT17

A lab-scale system for evaluating membranes in a cross flow filtration application enabling rapid determination of cross flow filtration performance using a range of membrane types with small product volumes (1 litre).

It can also be used in teaching applications to demonstrate features of different membrane types and the effect of varying filtration variables.

Requirements

3Ph
COLD
COMP. AIR

Reverse Osmosis/Ultrafiltration Unit - FT18-MKII

A small pilot-scale cross-flow filtration system designed to operate with a range of membrane module configurations. It can be operated with as little as 5-10 litres of material to give data that is useful for process scale-up.

It can be used over the full range of cross-flow filtration applications from microfiltration through to reverse osmosis.

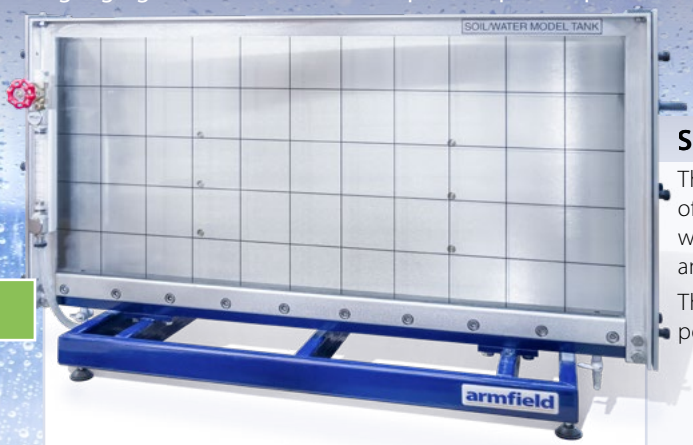
- Integral data logging of all parameters
- Capable of: **Microfiltration / Ultrafiltration / Nanofiltration & Reverse Osmosis**
- **Ceramic, Spiral Wound, Tubular** and **Hollow Fibre** membranes available

FE SERIES Irrigation Water Management

Link to FE Series

The Armfield FEL Series – With continued population growth in parts of the world where growing crops is most challenging, irrigation is the obvious way to maximise the potential.

This range of products offers both laboratory and field-learning opportunities. It also introduces such diverse topics as gauging and control structures plus evapotranspiration.



Soil/Water Model Tank - FEL2

Requirements: 1Ph, COLD

The soil/water model tank has been developed to help students of irrigation understand more fully the interaction of factors which influence water movement both on the soil surface and in the soil profile.

The equipment allows actual surface irrigation experiments to be performed on a small scale in the laboratory.

Rainfall Simulator - FEL3

Requirements: 1Ph, COLD

The Rainfall Simulator can also be used in the laboratory or in the field for a wide range of research from studies of infiltration under sprinkler irrigation to estimating soil loss in high intensity tropical storms.

Erodibility of soils can be studied in the laboratory and the influence of crop cover on the effect of rainfall can also be investigated.

It is ideal for investigating the relationship between rainfall and soil erosion, the nature of soil erosion potential on different soil types and identifying methods by which erosion may be prevented.

The simulator incorporates:

- Aperture adjustment
- Field and lab test plots
- Tilting stand
- Rain gauges

Soil Moisture Suction Sand Table - FEL4

Requirements: 1Ph, COLD

Primarily for the derivation of soil moisture characteristic curves, the unit helps in understanding the principle of water retentivity and its relationship with soil moisture levels.

Demonstrate and understand:

- The principles of water retentivity in terms of soil suction
- Relationship between soil texture and soil water characteristics
- The relationship between water retentivity and soil
- Influence of soil structure on the soil water characteristics of a soil
- Derive soil moisture characteristic curves for a variety of soil
- Relationship between applied suction and suction attained in a sand table

Requirements

COLD

Demonstration Infiltration Apparatus - FEL5-MKII

A simple but effective laboratory demonstration of the infiltration processes, which are fundamental to any form of irrigation study.

The unit comprises three transparent cylinders in which soil samples are placed. Water poured onto the soil surface can then be observed as it infiltrates the sample, experiments include:

- Demonstration of the effect of crusting on infiltration
- Understand the effects of soil texture and structure on infiltration
- The effects of existing soil moisture conditions on infiltration
- Relationship between soil type and infiltration/penetration rates
- Demonstration of the relationship between soil particle size and infiltration
- The effect of organic matter content on infiltration and penetration rate
- The effect of non-homogeneous soil strata on infiltration and penetration rates
- The effect of moisture content on infiltration and penetration rates
- The effect of straw mulch on infiltration rate

Requirements

COLD

Demonstration Lysimeter - FEL6

The lysimeter consists of three 300mm diameter containers in which a variety of crop types can be grown in any soil type.

Each container can then in turn be placed on a hydraulically mounted plate, which is used to monitor system weight changes arising from evapotranspiration, precipitation and drainage.

Despite its simplicity, the apparatus has a high degree of sensitivity and may be used for student project work as well as for demonstration purposes.

Requirements

COLD

Drain Permeameter - FEL10

The Drain Permeameter apparatus provides the student with a way of studying the interactions between drains, soils and filters in the laboratory.

The apparatus consists of a constant head permeator which allows the study of various combinations of soils, filters and drain types. Changes in permeability with time can be estimated by measuring the rate of drainage of water from the permeator.

The part of the soil/ drain system which is changing its permeability can be inferred from the series of piezometer tubes which are connected to the cylinder of the permeator.

Irrigation Water Management - FE Series

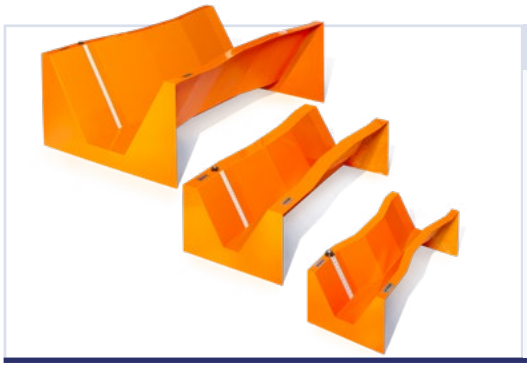
Link to FE Series

Parshall Flumes - FEX26-1/2/3

Requirements

Named after the inventor, this widely used flume causes little head loss and passes sediment readily.

Constructed in GRP, flumes are supplied with measuring scales, spirit levels and calibration curves.

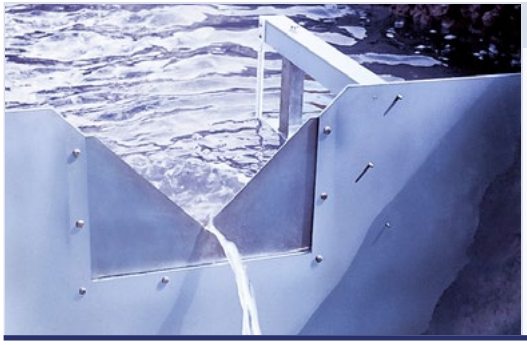


WSC Flumes - FEX26-4/5/6

Requirements

This trapezoidal design of flume, developed by Washington State College (WSC) for field irrigation.

It has the advantages over the rectangular flume of giving a greater depth range, of conforming more closely to the channel section and of allowing sediment to pass more freely.



Thin Plate Weirs & Accessories - FEX26-7

Requirements

Armfield Thin Plate Weirs are constructed of stainless steel and mounted on a painted weir plate carrier, which can set either into the banks and bed of a small stream or fixed to the end of a concrete channel.

A simple head scale is attached to each weir plate but a stilling well can be fitted for greater accuracy.

Stilling Well and Depth Gauge - FEX26-8

Requirements

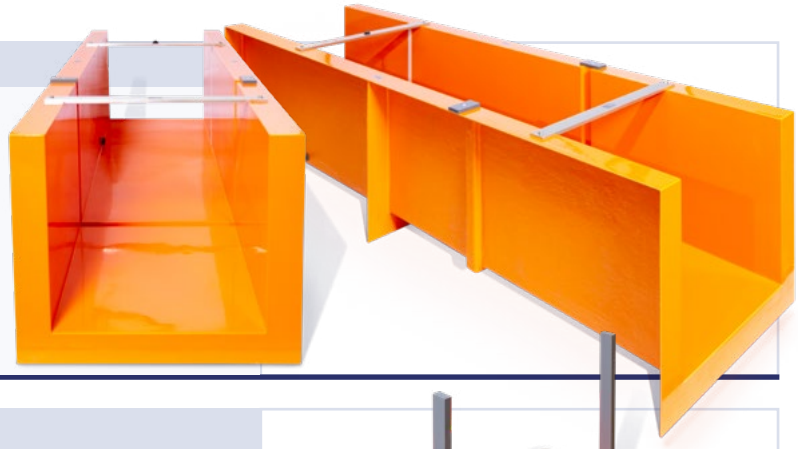
Stilling well with depth gauge comprising hook and point gauge.

- Depth gauge comprises 300mm hook and point gauge, resolution 0.1mm

Requirements

Channel Section - FEX26-9

A lightweight channel section made from corrosion-resistant material with the provision for easy mounting of the FEX26-10/11.



Requirements

Broad Crested Weir - FEX26-10

Used for controlling upstream water levels and measuring discharge rate. The weir is set perpendicular to the flow across the channel bed.

It is particularly useful in sediment-laden waters that can be detrimental to sharp edged weirs.

Made from durable glass-reinforced plastic.

Requirements

Crump Weir - FEX26-11

Named after its designer, C S Crump, this broad-crested weir is triangular in section making it less likely to trap silt and debris.

The weir is used for accurate measurement of discharge rates.

Made from durable glass reinforced plastic.

Requirements

Sluice Gates - FEX40-3/4

The two types of adjustable sluice gate, undershot and overshot, are widely used for the control of water in canal systems.

In the absence of more accurate devices they may be used for the approximation of flow rates.

Requirements

Automatic Water Control Gates - FEX40-5/6/7

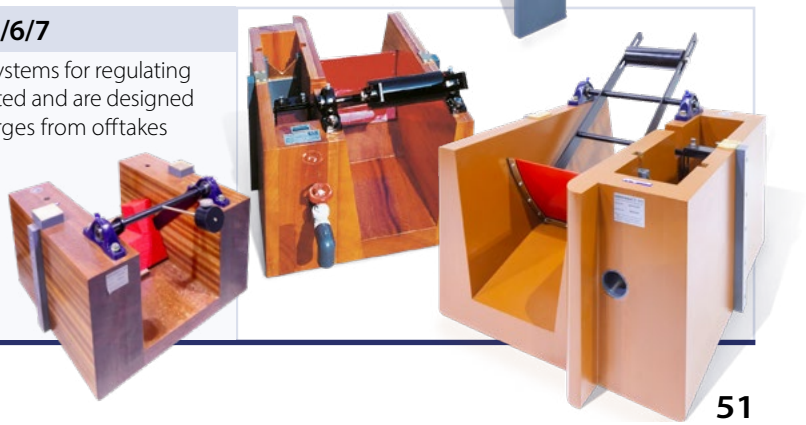
Automatic control gates are used extensively in canal systems for regulating water levels and discharge. They are usually float operated and are designed to maintain constant levels in the canal so that discharges from offtakes can be kept at a constant known rate.

Models of three types of commonly used gate:

Automatic Radial Gate - **FEX40-5**

Automatic Tilting Gate - **FEX40-6**

Automatic Flow Regulator - **FEX40-7**



Link to HT Series

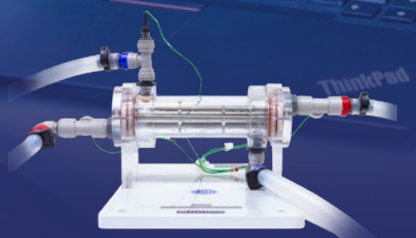
HT SERIES

Heat Exchangers

Computer Controlled Heat Exchanger

The Armfield range of small scale heat exchangers comprises units which represent the common types of heat exchanger found in industry and demonstrate different techniques for indirect transfer of heat from one fluid stream to another.

HT30XC - kitted for remote learning



HT33 - Shell and Tube Heat Exchanger

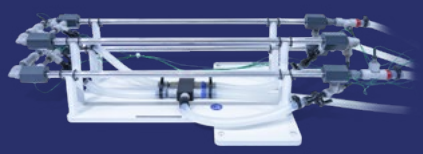
HT30XC – Computer Controlled Heat Exchanger Service Unit

The HT30XC is a service unit, to allow the operation of one of the Armfield range of small scale heat exchanger systems.

Their small size produces a fast system response to changes in variables such as water flow rate and temperature, so that training exercises can be carried out in a relatively short space of time.

HT36 - Extended Tubular Heat Exchanger

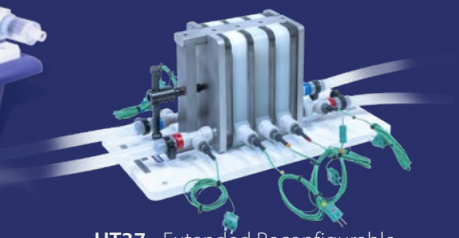
HT32 - Plate Heat Exchanger



HT34 - Jacketed Vessel with Coil and Stirrer

HT35- Cross Flow Heat Exchanger

HT31 – Tubular Heat Exchanger



HT37 - Extended Reconfigurable Plate Heat Exchanger

Requirements

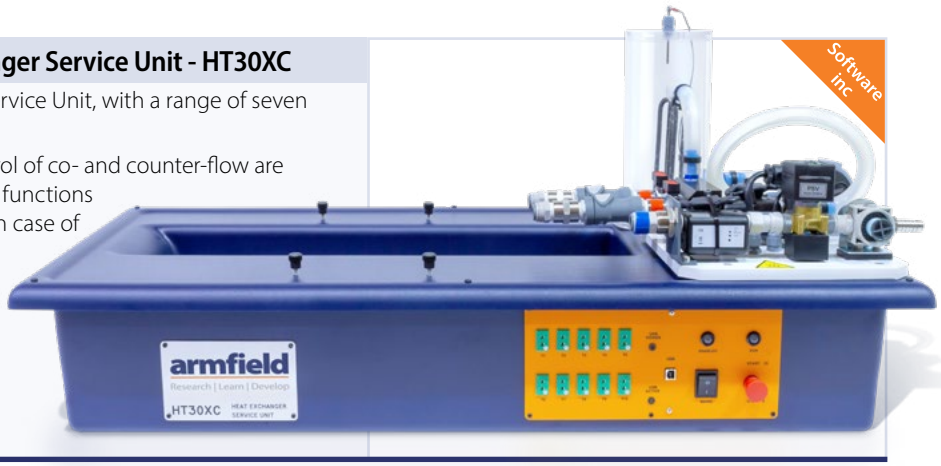
1Ph

COLD

Computer-Controlled Heat Exchanger Service Unit - HT30XC

Computer-Controlled Heat Exchanger Service Unit, with a range of seven interchangeable heat exchangers.

All operational functions, including control of co- and counter-flow are now under computer control, and safety functions implemented to shut down the system in case of software or communication breakdown.



Software inc

Requirements

HT 30XC

Tubular Heat Exchanger - HT31

The Tubular Heat Exchanger is the simplest form of heat exchanger and consists of two concentric (coaxial) tubes carrying the hot and cold fluids.

The HT31 is a basic version with two sections and a single interim temperature measurement point.

Software inc

Requirements

HT 30XC

Plate Heat Exchanger - HT32

The heat exchanger has a single heating section configured for multi-pass operation with passes in series.

It comprises seven individual plates, which are clamped together using two stainless steel threaded bars and nuts. It is possible to dismantle and reassemble the heat exchanger using only three plates to demonstrate a single pass.

Software inc

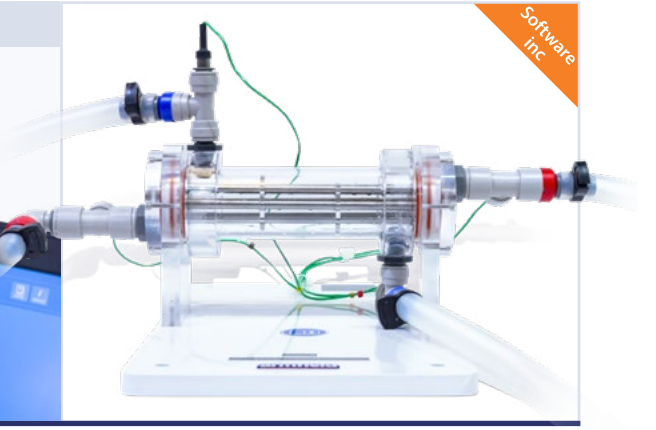
Requirements

HT 30XC

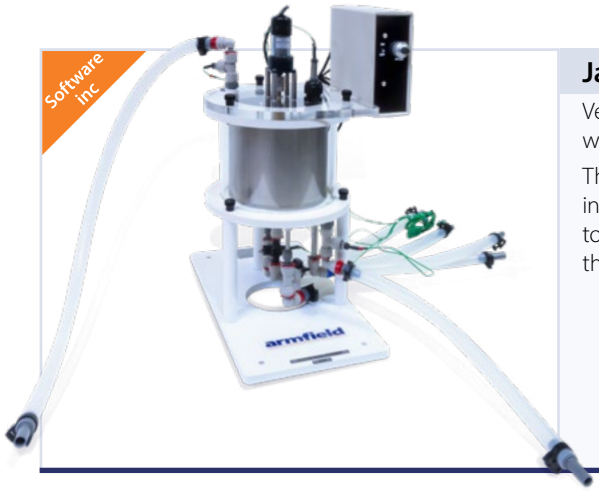
Shell and Tube Heat Exchanger - HT33

The Shell And Tube Heat Exchanger is commonly used in the food and chemical process industries. This type of exchanger consists of a number of tubes in parallel enclosed in a cylindrical shell.

Heat is transferred between one fluid flowing through the tubes and another fluid flowing through the cylindrical shell around the tubes.



Software inc



Jacketed Vessel with Coil and Stirrer - HT34

Vessel heating or cooling of a process liquid in a tank, either batchwise or with continuous product feed, is common practice throughout industry.

The characteristics of the heat transfer using an external jacket or internal coil can be demonstrated together with the effect of stirring the vessel contents.

Requirements

HT 30XC

Cross Flow Heat Exchanger - HT35

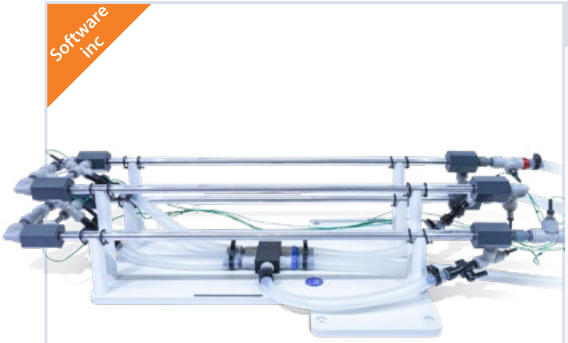
The Cross Flow Heat Exchanger is commonly used in applications such as heating, ventilating and air conditioning. It is also encountered as vehicle engine radiator.

This type of heat exchange occurs when the flow direction of the two fluids cross each other. In the HT35, hot water flows in and out of a radiator, perpendicular to air stream, which is being pulled into the radiator by an axial fan.

The convection between the two fluids through fins surface on the radiator implements the heat exchange.

Requirements

HT 30XC



Extended Tubular Heat Exchanger - HT36

The tubular heat exchanger is the simplest form of heat exchanger and consists of two concentric (coaxial) tubes carrying the hot and cold fluids.

In these miniature versions the tubes are separated into sections to reduce the overall length and to allow the temperature at points along both fluid streams to be measured.

Requirements

HT 30XC

Extended Reconfigurable Plate Heat Exchanger - HT37

The unit is designed to be reconfigurable by the student, and can accommodate up to four sections of heating, each section providing an additional temperature measurement point for each fluid stream.

In order to make the unit easy to reconfigure, these sections are supplied as pre-assembled groups of plates complete with an intermediate plate (containing the temperature measurement points).

Requirements

HT 30XC

Introduction to Heat Exchangers: **FS Series** (see page 102 for full range)

Requirements

1Ph

DRAIN COLD

LEVEL SURFACE

Fluid Science Service Unit - FS-SU

The Fluid Science Service Unit is designed to be used in conjunction with the fluid science experiments offered by Armfield. The unit incorporates a pump and rotameter to vary the water flow rate and a heating system. The built-in safety features of the unit include a thermal cut out that prevents the hot water circuit exceeding 55°C and a low voltage water resistant power supply unit.

The high precision elements are supplied as modular tray-based systems which operate in conjunction with the Fluid Science Service Unit, multifunctional work panel and instrumentation enabling the student to conduct their individual or group experiments.

Requirements

FS SU

DRAIN COLD

LEVEL SURFACE

Fluid Science Shell and Tube Heat Exchanger - FS-3.1

The Fluid Science Shell and Tube Heat Exchanger tray includes experimentation to demonstrate indirect heating or cooling by transfer of heat from one fluid stream to another when separated by a solid wall (fluid to fluid heat transfer) in a shell and tube heat exchanger.

The tray introduces students to concepts such as heat transfer coefficients, thermal resistances, controlling resistance and heat transfer driving forces. The heat exchanger can be used in a co-current or countercurrent configuration.

Requirements

FS SU

DRAIN COLD

LEVEL SURFACE

Fluid Science Tubular Heat Exchanger - FS-3.2

The Fluid Science Tubular Heat Exchanger tray includes experimentation to demonstrate indirect heating or cooling by transfer of heat from one fluid stream to another when separated by a solid wall (fluid to fluid heat transfer) in a tubular heat exchanger.

The tray introduces students to concepts such as heat transfer coefficients, thermal resistances, controlling resistance and heat transfer driving forces. The heat exchanger can be used in a co-current or countercurrent configuration.

Requirements

FS SU

DRAIN COLD

LEVEL SURFACE

Fluid Science Cross Flow Heat Exchanger- FS-3.3

The Fluid Science Cross Flow Heat Exchanger tray includes experimentation to demonstrate indirect heating or cooling by transfer of heat from hot water to air (fluid to air heat transfer) in a cross flow heat exchanger.

The tray introduces students to concepts such as heat transfer coefficients, thermal resistances, controlling resistance and heat transfer driving forces. The heat exchanger can be used in a co-current or countercurrent configuration.

Requirements

FS SU

DRAIN COLD

LEVEL SURFACE

Fluid Science - Plate Heat Exchanger - FS-3.4

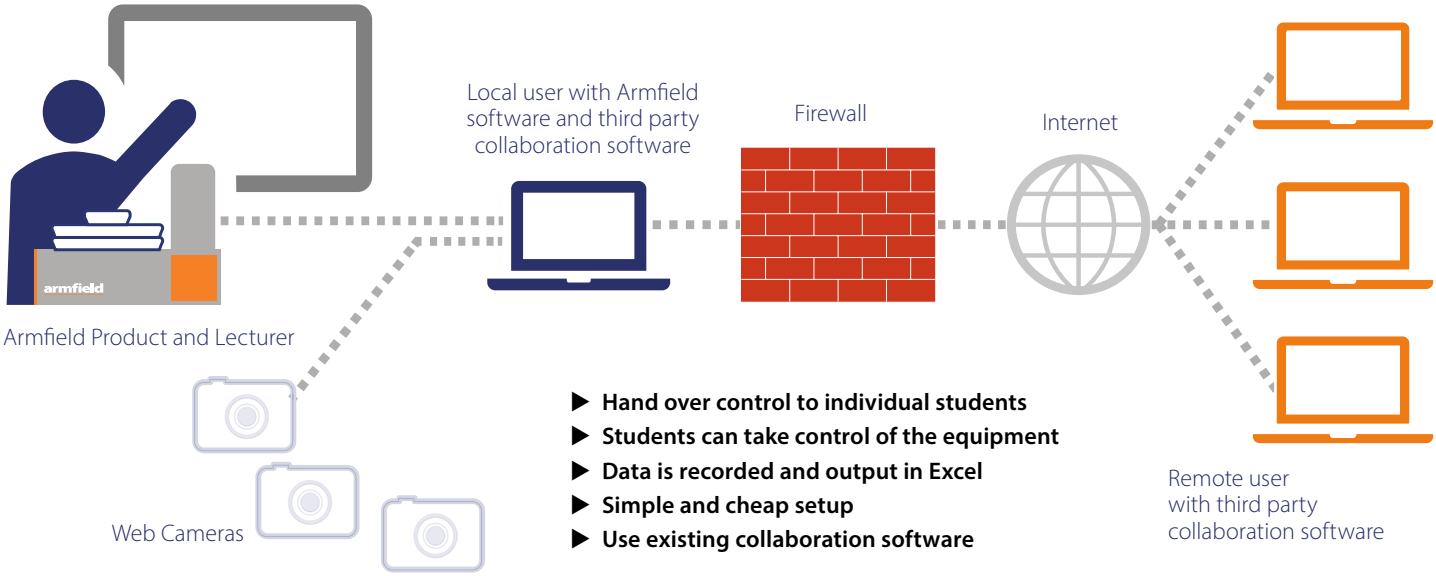
The Fluid Science Plate Heat Exchanger tray includes experimentation to demonstrate indirect heating or cooling by transfer of heat from one fluid stream to another when separated by a solid wall (fluid to fluid heat transfer) in a plate heat exchanger.

The tray introduces students to concepts such as heat transfer coefficients, thermal resistances, controlling resistance and heat transfer driving forces. The heat exchanger can be used in a co-current or countercurrent configuration.

Armfield Distance Learning

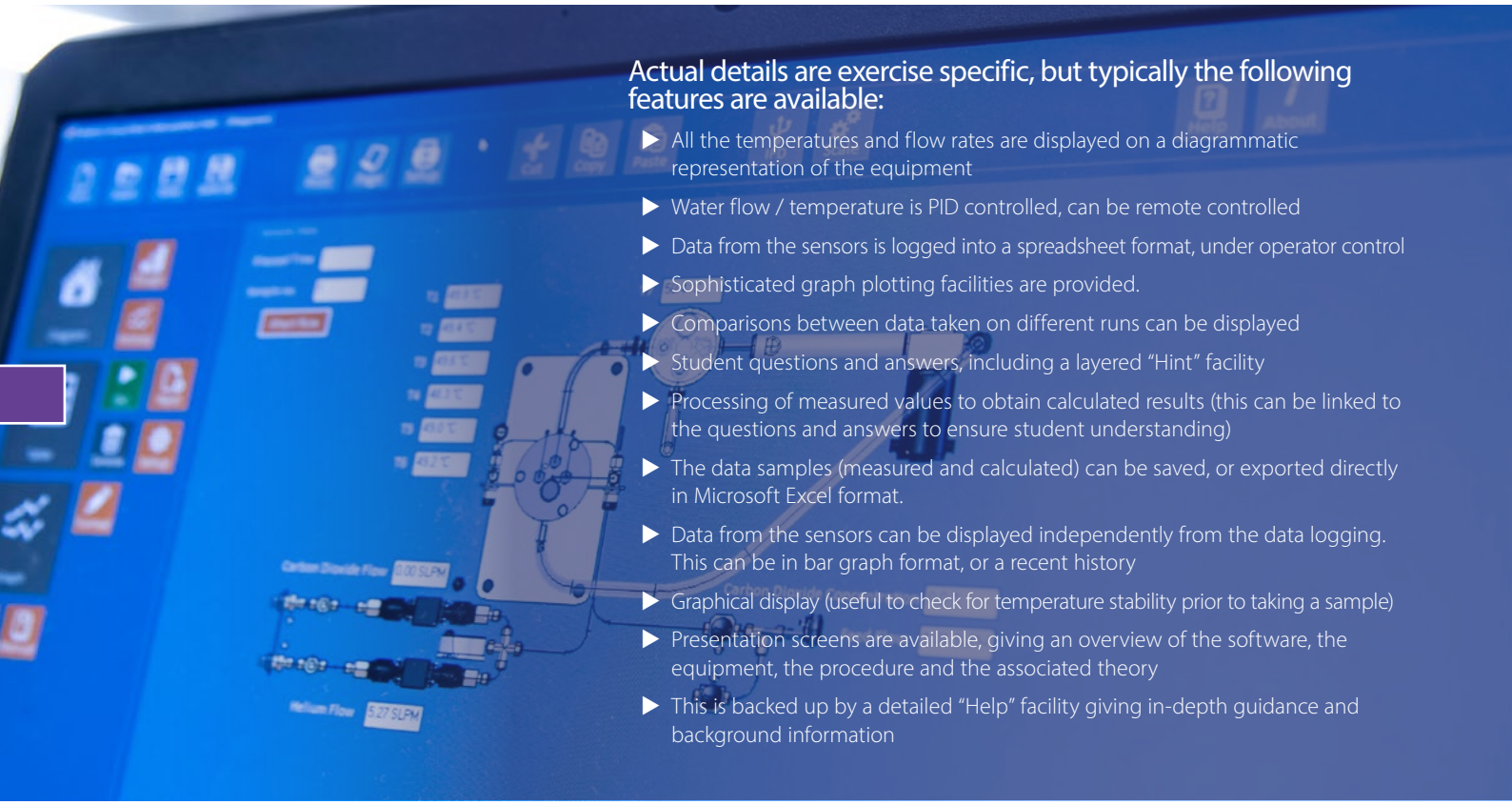
Real time remote control of our equipment and simultaneous recording of data

Our standard solution allows the student at a remote location to view the Armfield software and images from multiple webcam feeds produced via the collaboration software, as they would if they were present in the laboratory.



- **Hand over control to individual students**
- **Students can take control of the equipment**
- **Data is recorded and output in Excel**
- **Simple and cheap setup**
- **Use existing collaboration software**

armSOFT Educational Software: is available for many Armfield products, with a wide range of features



Actual details are exercise specific, but typically the following features are available:

- All the temperatures and flow rates are displayed on a diagrammatic representation of the equipment
- Water flow / temperature is PID controlled, can be remote controlled
- Data from the sensors is logged into a spreadsheet format, under operator control
- Sophisticated graph plotting facilities are provided.
- Comparisons between data taken on different runs can be displayed
- Student questions and answers, including a layered "Hint" facility
- Processing of measured values to obtain calculated results (this can be linked to the questions and answers to ensure student understanding)
- The data samples (measured and calculated) can be saved, or exported directly in Microsoft Excel format.
- Data from the sensors can be displayed independently from the data logging. This can be in bar graph format, or a recent history
- Graphical display (useful to check for temperature stability prior to taking a sample)
- Presentation screens are available, giving an overview of the software, the equipment, the procedure and the associated theory
- This is backed up by a detailed "Help" facility giving in-depth guidance and background information

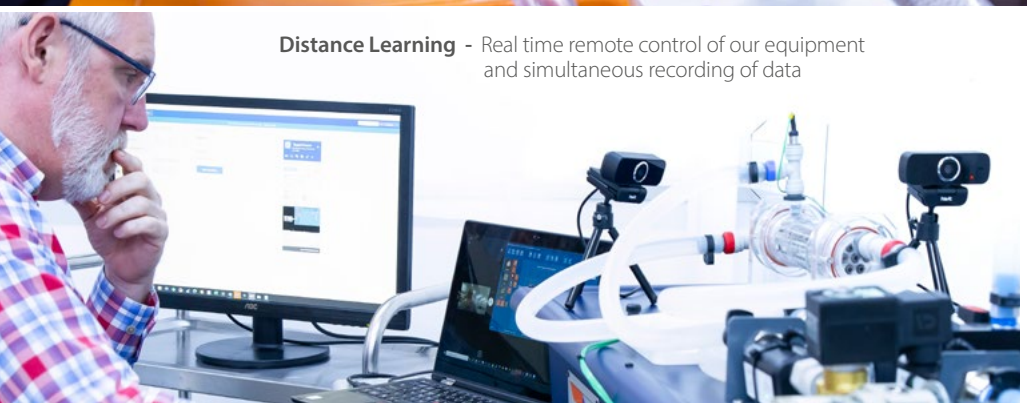
Contact Armfield

Educational Laboratory

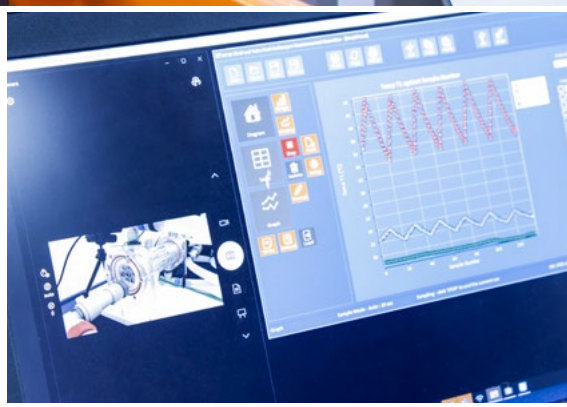
New for 2021, the Armfield Academy has opened its brand-new Educational classroom.

The fully functional classroom is available for training and demonstrations on Armfield's educational products

Contact us for more information:
www.armfield.com



Distance Learning - Real time remote control of our equipment and simultaneous recording of data



Link to HT Series

HT SERIES

Heat Transfer

Computer Controlled Heat Transfer

A range of small scale heat transfer equipment to demonstrate the three basic modes of heat transfer *(conduction, convection and radiation).*

Full educational software :
Provided with the HT10XC for all the Armfield heat transfer accessories

Computer-Controlled Heat Transfer Teaching Equipment - HT10XC

Requirements: 1Ph, PC, USB

The Armfield HT10XC is a service unit, which can be used in conjunction with a range of small scale accessories to demonstrate the three basic modes of heat transfer (conduction, convection and radiation). The factors that affect the rate of heat transfer can be investigated and some of the practical problems associated with the transfer of heat can be clearly demonstrated.

The heat transfer accessories may be individually connected to the HT10XC service unit, which provides the necessary electrical supplies and measurement facilities for investigation and comparison of the different heat transfer characteristics.

The HT10XC incorporates the facilities and safety features to allow the accessories to be remotely controlled from an external computer connected via a USB cable. All the facilities can also be accessed locally using the front panel controls and displays.

Software inc

Linear Heat Conduction - HT11
Linear Heat Conduction - HT11C (Computer Controlled)

Requirements: HT 10XC, COLD

The HT11 / HT11C are designed to demonstrate the application of the Fourier rate equation to simple steady-state conduction in one dimension.

The units can be configured as a simple plane wall of uniform material and constant cross-sectional area, or as composite plane walls with different materials or changes in cross-sectional area. This enables the principles of heat flow by linear conduction to be investigated.

- Steady-State Heat Conduction
- The Fourier Rate Equation
- The Overall Heat Transfer Coefficient
- Thermal Conductivity (the Constant of Proportionality)
- Inverse Proportionality of Temperature Gradient to Area
- Effect of Contact Resistance on Thermal Conduction
- Thermal Conductivity and Application of Insulators
- Unsteady State Conduction of Heat

Flow Sensor - SFT2 (Optional accessory) Turbine type flow sensor accessory to HT11 to provide readings of cooling water flowrate.

Optional HT11C Includes an integral cooling water flow rate sensor and electrically operated flow control valve allowing remote flow measurement and control directly from the Armfield software.

Requirements

HT 10XC

COLD

Radial Heat Conduction - HT12
Radial Heat Conduction - HT12C (Computer Controlled)

The Armfield HT12/HT12C 'Radial Heat Conduction' accessory has been designed to demonstrate the application of the Fourier Rate equation to simple steady-state conduction radially through the wall of a tube. The arrangement, using a solid metal disk with temperature measurements at different radii and heat flow radially outwards from the centre to the periphery, allows the temperature distribution and flow of heat by radial conduction to be investigated.

Experimental content includes:

- Steady-State Heat Conduction
- The Fourier Rate Equation
- Unsteady-State Heat Conduction

Optional HT12C Includes an integral cooling water flow rate sensor and electrically operated flow control valve allowing remote flow measurement and control from the Armfield Software.

Software inc

Requirements

HT 10XC

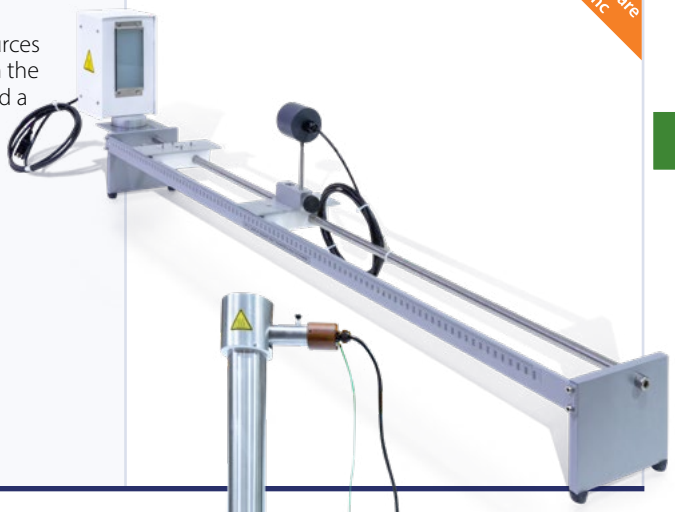
Laws of Radiant Heat Transfer and Radiant Heat Exchange - HT13

The 'Laws of Radiant Heat Transfer and Radiant Heat Exchange' accessory comprises of a track with interchangeable radiation sources (heat or light) at one end. A pair of moveable carriages located on the track support the appropriate radiation detector (heat or light) and a variety of different specimens of metal plates or plastic filters to demonstrate the laws of radiation.

Experimental content includes:

- The Inverse Square Law for Heat
- The Stefan-Boltzmann Law
- Determination of the View Factor
- Emissivity of Radiating Surfaces
- Effect of Emissivity on Surface Temperature and Emitted Heat
- Kirchoff's Law
- Exchange of Radiant Energy between Surfaces
- The Inverse Square Law for Light
- The Lambert Cosine Law
- Lamberts Law of Absorption

Software inc



Requirements

HT 10XC

1Ph

Combined Convection and Radiation - HT14
Combined Convection & Radiation - HT14C (Computer Controlled)

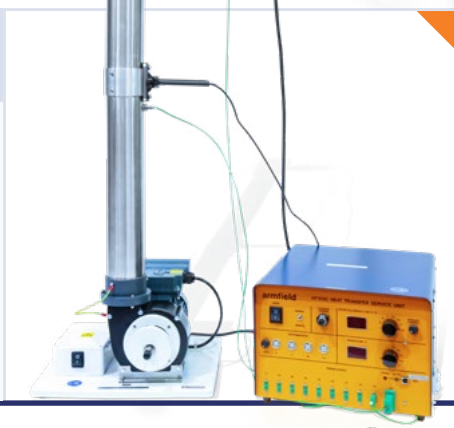
Designed to demonstrate heat transfer from a solid surface to its surroundings. A hot surface loses heat (heat is transferred) to its surroundings by the combined modes of convection and radiation.

Experimental content includes:

- Determination of the Combined Heat Transfer from a Horizontal Cylinder in Natural Convection
- Dominant Heat Transfer Coefficient
- Effect of Forced Convection on Heat Transfer
- Variation of Local Heat Transfer Coefficient

Optional HT14C allows Computer control of fan speed via software

Software inc



Requirements

HT 10XC

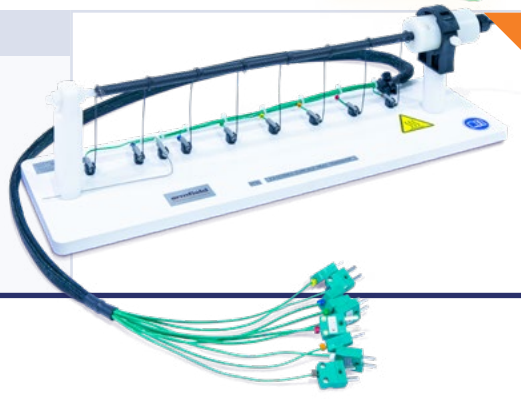
Extended Surface Heat Transfer - HT15

Designed to demonstrate the temperature profiles and heat transfer characteristics for an extended surface (cylindrical pin) when heat flows along the rod by conduction and heat is lost along the rod by combined convection and radiation to the surroundings.

Educational Content Includes:

- Temperature distribution along an extended surface
- Heat Transfer by free convection and radiation
- Constant of proportionality (thermal conductivity) k

Software inc



Heat Transfer - HT Series

Note: C = (Computer Controlled)

Software inc

Radiation Errors in Temperature Measurement - HT16
Radiation Errors in Temperature Measurement - HT16C

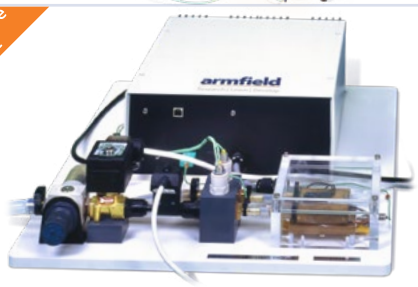
This has been designed to demonstrate how temperature measurements can be influenced by sources of thermal radiation.

Experimental content includes:

- Effect of radiative heat transfer on temperature measurement
- Methods for reducing errors due to radiation

Option HT16C allows velocity of the air past the test thermocouples and radiation shield to be adjusted under computer control.

Requirements: 1Ph, HT 10XC



Software inc

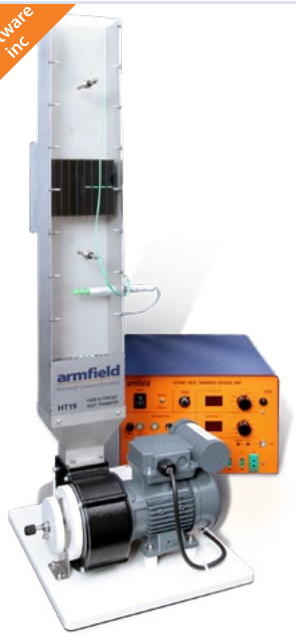
Thermo-Electric Heat Pump - HT18C (Computer Controlled)

The HT18C Thermoelectric Device is designed to allow students to investigate the performance of a thermoelectric (Peltier) and demonstrates how electrical power can be used to extract heat from a cool surface and transfer it to a hot surface.

Experimental content includes:

- The performance of a thermoelectric device in cooling mode
- The performance of the thermoelectric device when operated as a generator

Requirements: 1Ph, HT 10XC, COLD



Cylindrical pin surface

Finned surface

Flate plate surface

Software inc

Free and Forced Convection - HT19

The Free and Forced Convection unit has been specifically designed to demonstrate the phenomena of natural (free) and forced convection. Temperature profiles and heat flux over flat plate, pinned and finned surface heat transfer surfaces can be studied.

Educational content includes:

- Power input and surface temperature in free convection
- Power input and surface temperature in forced convection
- Extended surfaces to improve heat transfer
- Temperature distribution along an extended surface
- Horizontal and vertical free convection on a flat plate
- Determination of the characteristic velocity, and the Reynolds, Grashof and Rayleigh numbers for a flat plate in free convection
- Calculation of the average heat transfer coefficient of the pinned heater in forced convection
- Horizontal and vertical configurations for the finned heater in free convection

Requirements: 1Ph, HT 10XC

Software inc

Conductivity of Liquids and Gases - HT20
Conductivity of Liquids and Gases - HT20C (Computer Controlled)

HT20 / HT20C has been specifically designed to enable students to measure and compare the thermal conductivities of various liquids and gases. Construction is kept simple to facilitate quick and effective cleaning and to minimise thermal losses.

Educational content includes:

- Measuring the Thermal Conductivity of a liquid
- Measuring the thermal conductivity of a gas

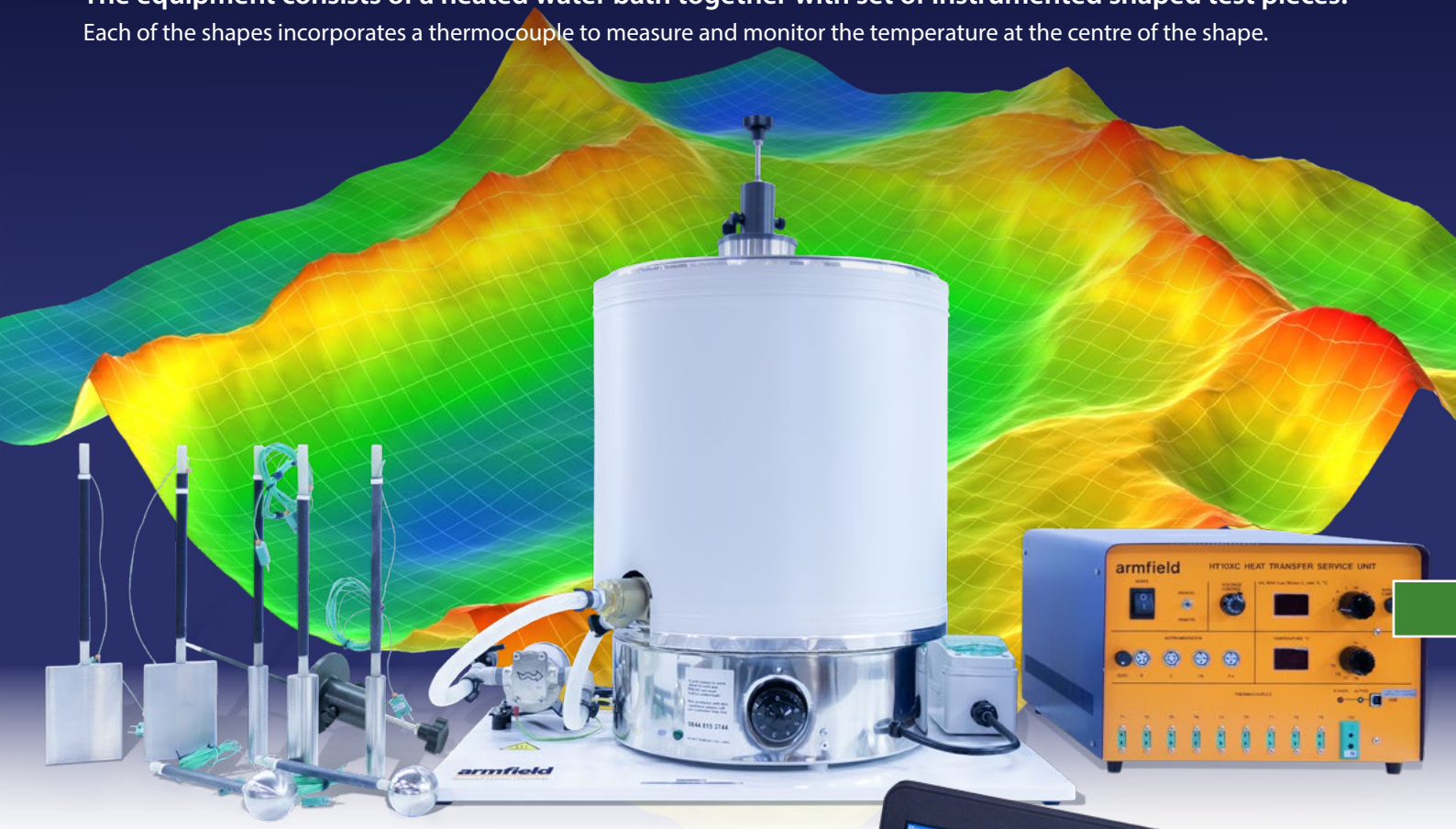
Optional HT20C Includes an integral cooling water flow rate sensor and electrically operated flow control valve allowing remote flow measurement and control from the Armfield Software.

Requirements: HT 10XC, COLD

The Armfield HT17 - Unsteady-State Heat Transfer

The equipment consists of a heated water bath together with set of instrumented shaped test pieces.

Each of the shapes incorporates a thermocouple to measure and monitor the temperature at the centre of the shape.



Unique Features

- To observe unsteady state conduction of heat to the centre of a solid shape when a step change is applied to the temperature at the surface of the shape
- Using analytical transient-temperature/heat flow charts to determine the conductivity in cylinders with different conductivity
- Investigating the effect of shape, size and material properties on unsteady heat flow using analytical transient-temperature/heat flow charts

Requirements

⚡ 1Ph

HT 10XC

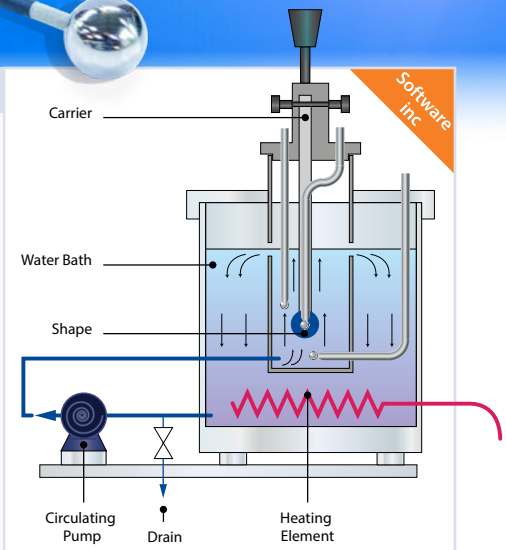
Unsteady-State Heat Transfer - HT17

The 'Unsteady State Heat Transfer' accessory has been designed to allow exercises to be performed in unsteady state heat conduction when simple solid shapes which are suddenly subjected to convection with a fluid at a constant temperature.

A set of simple solid shapes are supplied, each instrumented with a thermocouple to monitor the temperature at the centre of the shape. Each shape is allowed to stabilise at room temperature then suddenly immersed in a bath of hot water at a steady temperature. Monitoring of the changing temperature at the centre of the shape allows analysis of the heat flow through the shape using the appropriate transient-temperature/heat flow charts provided.

Educational content includes:

- Heat Conduction with Step Change in Surface Temperature
- Determination of Thermal Conductivity
- Effect of shape, size and material on unsteady heat flow



Link to TH Series

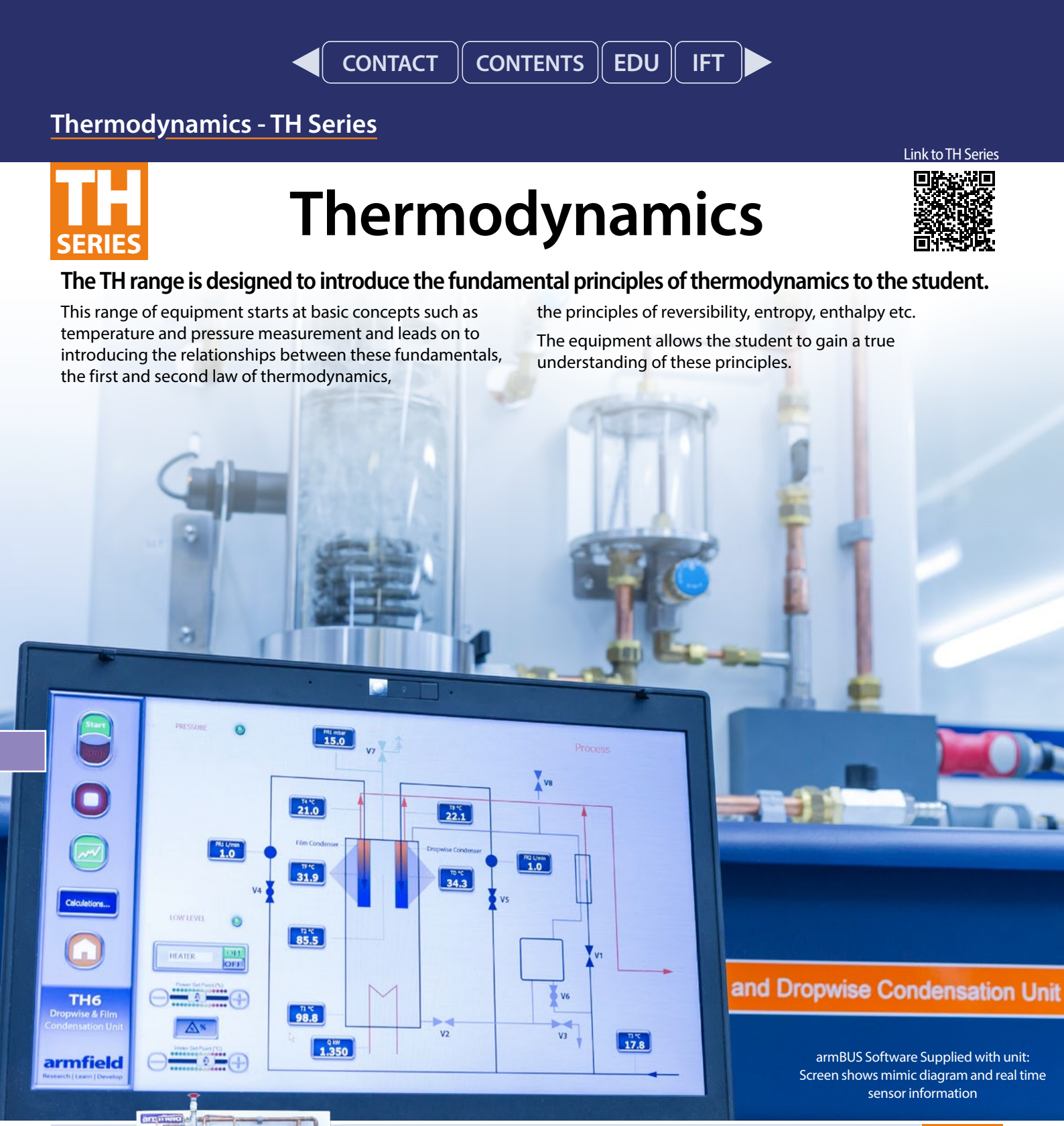
TH SERIES

Thermodynamics

The TH range is designed to introduce the fundamental principles of thermodynamics to the student.

This range of equipment starts at basic concepts such as temperature and pressure measurement and leads on to introducing the relationships between these fundamentals, the first and second law of thermodynamics, the principles of reversibility, entropy, enthalpy etc.

The equipment allows the student to gain a true understanding of these principles.



armBUS Software Supplied with unit: Screen shows mimic diagram and real time sensor information

Film and Dropwise Condensation Demonstration Unit - TH6

The unit has been designed as a highly visual means for students to observe the two condensation processes and study the effects of varying the vacuum and heat input whilst gathering data concerning temperatures, pressure and flowrates to be able to undertake a variety of calculations involved in the condensation process. Additionally, the unit will allow the operator to understand the influence of air as a non-condensable gas on the condensation processes.

Using the latest ArmBUS technology to collect, display and store data in a clear format as well as control certain parameters. Other parameters can be controlled manually by the student by manipulation of valves on the working face of the unit.

Safety features are also designed into both software and hardware to greatly reduce the risk of over-pressurisation and thus safeguard students undertaking experimental work.

Requirements

Requirements

1Ph

Temperature Measurement and Calibration - TH1

The 'Temperature Measurement and Calibration' apparatus that has been designed to introduce students to temperature and how different techniques can be employed to measure this variable.

The system is supplied with three different heat sources and five different temperature sensors.

To demonstrate the thermometric properties of different temperature sensors and the use of fixed points for calibration.

Educational Software & Data logging is optionally available - **TH-DTA-ALITE**

Requirements

1Ph

Pressure Measurement and Calibration - TH2

The 'Pressure Measurement and Calibration' apparatus has been designed by Armfield to introduce students to pressure and how different techniques can be employed to measure this variable.

Different fixed pressures are generated using a simple Dead-weight Pressure Calibrator for calibrating the measuring devices. A Bourdon type pressure gauge and electronic type pressure sensor are connected to the calibrator to allow their characteristics, including accuracy and linearity, to be determined.

Educational Software & Data logging is optionally available - **TH-DTA-ALITE**

Requirements

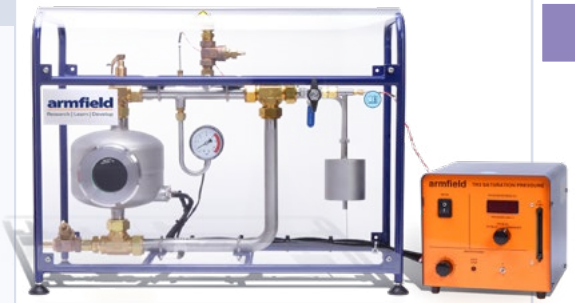
1Ph

Saturation Pressure - TH3

The 'Saturation Pressure' apparatus that has been designed to introduce students to the concept of saturation pressure and how different techniques can be employed to measure this variable.

The system allows students to investigate the behaviour of a fluid at its boiling point and how the temperature varies with pressure. It also provides the capability to determine the condition of the wet steam produced by the apparatus. Saturation curves can be obtained & compared with published steam tables.

Educational Software & Data logging is optionally available - **TH-DTA-ALITE**



Requirements

1Ph

COLD

Recycle Loops - TH4

The 'Recycle Loops' apparatus that has been designed to demonstrate clearly, both visually and experimentally, what recycle is and to allow mass and energy balances to be performed under steady state and unsteady state conditions.

The system includes experimentation and calculation of the heat transfer rate at a range of recycle rates, using the steady flow energy equation.

Educational Software & Data logging is optionally available - **TH-DTA-ALITE**

Requirements

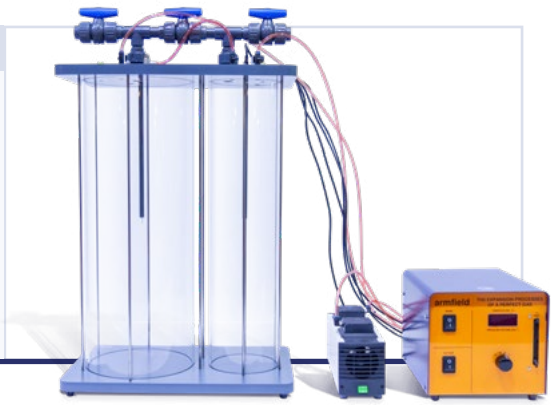
1Ph

Expansion Processes of a Perfect Gas - TH5

The TH5 'Expansion Processes of a Perfect Gas' apparatus that has been designed to introduce students to a range of basic thermodynamic processes using air as the working fluid.

The system enables investigation into the behaviour of a gas under pressure and vacuum, to determine the ratio of specific heats. Includes concepts such as Adiabatic, Isothermal, Reversible and Irreversible Processes.

Educational Software & Data logging is optionally available - **TH-DTA-ALITE**



RA SERIES Refrigeration & Air Conditioning

The Armfield RA series is designed to clearly demonstrate the principles behind modern refrigeration and air conditioning systems

The series includes four separate units:

- RA1-MKII Vapour-Compression Refrigeration Unit
- RA2 Air Conditioning Unit
- RA3 Recirculating Air Conditioning Unit
- RA4 Air Conditioning Training Unit

Link to RA Series

Vapour-Compression Refrigeration Unit - RA1-MKII

The Vapour-Compression Refrigeration System is the most common refrigeration system used today.

RA1-MKII is a computer-controlled vapour-compression refrigeration unit with automatic recording of appropriate process variables using an integral USB interface device.

This allows the student to gain a thorough understanding of the refrigeration process by changing the operation of different parts of the process and recording the response of the complete system.

- Computer controlled with real time data logging of results

Requirements

- 1Ph
- PC
- USB

Requirements

1Ph

PC

USB

Air Conditioning Unit - RA2

The Armfield RA2 unit represents a model of an Air Conditioning system by demonstrating the effects of essential air conditioning processes:

- Cooling
- Heating
- Humidifying
- Dehumidifying

The effect and relationships of the primary processes involved in air handling systems can be investigated.

The RA2 unit is designed so that the student can simulate different environments and perform measurements to allow psychrometric data analysis.

- Computer controlled with real time data logging of results

Software inc

Requirements

1Ph

PC

USB

Recirculating Air Conditioning Unit - RA3

The Armfield RA3 unit represents a model of a Recirculating Air Conditioning system by demonstrating the effects of essential air conditioning processes: cooling, heating, humidifying and dehumidifying.

The effect and relationships of the primary processes involved in air handling systems can be investigated.

The system additionally features an enclosed climate control chamber, adjustable recirculation of air leaving the chamber back into the conditioning duct and pressure gauges and temperature sensors to allow the refrigerant temperature change across the condenser and evaporator to be established.

The refrigerant flow rate is also measured using a variable area flow meter.

- Computer controlled with real time data logging of results

Software inc

Requirements

1Ph

Air Conditioning Training Unit - RA4

The RA4 is a standalone desktop refrigeration demonstrator based on a vapour compression refrigeration system (VCRS). The most common refrigeration system used today, this is where the refrigerant undergoes phase changes to absorb and reject heat in a controlled manner.

The RA4 Unit is designed so that the student can understand the fundamental components and operation of a refrigeration/air conditioning system.

The system can be used as a demonstration, fault diagnosis and as a service training unit.

Link to CM Series

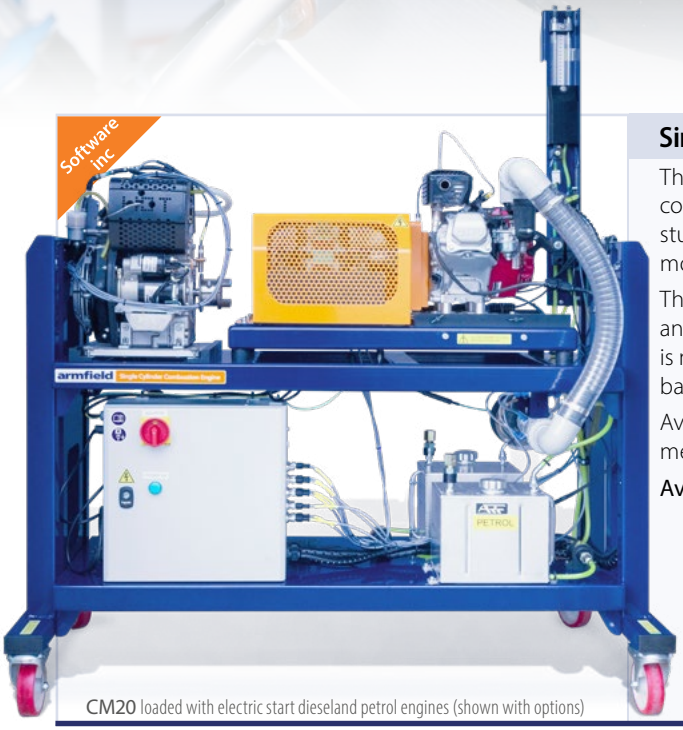
CM SERIES

Internal Combustion Engines

Armfield's range of internal combustion engines encompasses automotive and aviation power units, mounted on test beds they provide a complete engine learning system.

CM11-MKII / CM12 / CM14 all come with ArmSoft™ software, which can be used to run the engine from a PC. The software incorporates the full range of facilities as outlined in the ArmSoft™ software section. (Page 122)

CM20 has the armBUS control system integrated into the product (Page 124 armBUS).



CM20 loaded with electric start dieseland petrol engines (shown with options)

Single Cylinder Combustion Engine - CM20 – armBUS integrated

The Gasoline Engine Apparatus is a self-contained computer controlled engine test rig which has been designed to allow the study and comparison of the basic operating characteristics of modern spark ignition and compression ignition engines.

The unit consists of a selection of engines which can be coupled to an eddy current dynamometer which acts as a brake. This assembly is mounted on a painted steel framework. Fuel tanks, electrics and batteries are all mounted underneath the engine.

Available options include an engine indicator set which allows cyclic measurement of cylinder pressure.

Available Options: Petrol Engine with Electrical Start **CM20-10-1**
Petrol Engine Indicator Set **CM20-10-12**
Diesel Engine with Electrical Start **CM20-20-1**
Diesel Engine Electrical Start Sensor Prep **CM20-20-3**
Diesel Engine Indicator Set **CM20-20-12**
Pressure Sensor Amp **CM20-12-12**
Fuel Level **CM20-30**
5 Gas Analyser **CM50**

Requirements

Requirements

1Ph
PC
USB
EXTRACTOR
HEARING PROTECTION
COLD

Gasoline Engine - CM11-MKII

Software inc

The Gasoline Engine Apparatus is a self-contained engine test rig which has been designed to allow the study of the basic operating characteristics of a modern four-stroke spark ignition engine.

The unit consists of an engine which is coupled to an eddy current dynamometer which acts as a brake. This assembly is mounted on a painted steel framework. Fuel tanks, batteries and electrics are all mounted underneath the engine.

Available options include an engine indicator set which allows measurement of cylinder pressure and an LPG fuel system.

The CM11-MKII is supplied with electronic sensors to monitor key parameters and a USB interface which allows direct connection to a PC. All control functions are designed to be performed from the computer.

Data logging and control software is supplied, allowing students to control the engine and view and record real time sensor outputs.

Available Options: Engine Indicator Set **CM11-MKII-12**
LPG Fuel System **CM11-MKII-13**

Requirements

1Ph
PC
USB
EXTRACTOR
HEARING PROTECTION
COLD

Automotive Diesel Engine - CM12

Software inc

The Armfield Diesel Engine Apparatus is a self-contained engine test rig which has been designed to allow the study of the basic operating characteristics of a modern four-cylinder compression ignition engine.

The unit consists of an engine which is coupled to an eddy current dynamometer which acts as a brake. This assembly is mounted on a painted steel framework. The fuel tank, battery and electrics are all mounted underneath the engine.

An optional engine indicator set is available which allows cylinder pressure to be measured and plotted against volume.

The CM12 is supplied with electronic sensors to monitor key parameters and a USB interface card which allows direct connection to a PC. All control functions can be performed from both a local control panel and remotely from the computer. Data logging and control software is supplied, allowing students to control the engine and view and record real time sensor outputs.

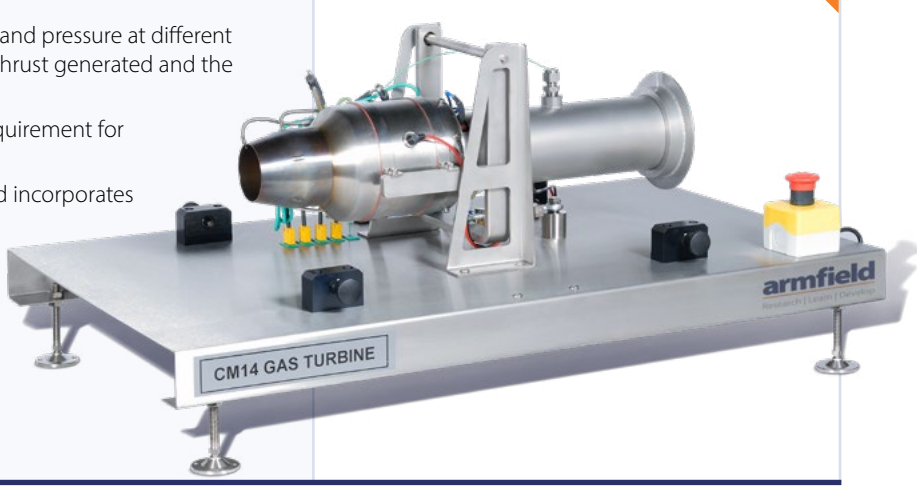
Available Options: Engine Indicator Set **CM12-12**

Requirements

1Ph
PC
USB
EXTRACTOR
HEARING PROTECTION

Axial Flow Gas Turbine - CM14

Software inc



The CM14 is a complete, aeronautical axial flow gas turbine engine with full instrumentation and sensors.

Those sensors measure the gas temperature and pressure at different stages within the engine, together with the thrust generated and the fuel consumption.

It features simple electric starting with no requirement for propane gas or compressed air.

The turbine itself can be bench mounted and incorporates a transparent safety guard for full visibility. The units small size minimises the laboratory space required.

The control box can be located in an adjacent room if required.

Available Options: With Floor Stand **CM14-10**

Link to CE Series

CE SERIES

Chemical Engineering

Armfield's CE and UOP ranges of products, offer the most comprehensive, diverse and technically current group of products of any manufacturer

The CE range brings the many principles of chemical engineering to the modern educational laboratory.

Fully computer controlled and supplied with educational software specific to each reactor type, comprehensive instruction manual is included which details installation and operating procedures

Laminar Flow Reactor

Plug Flow Reactor

Continuous Stirred Tank Reactor

Transparent Batch Reactor

Tubular Reactor

Computer Controlled Chemical Reactors Training Equipment - CEXC

The Armfield CEXC Computer Controlled Chemical Reactors Teaching Equipment demonstrates the characteristics of the important types of chemical reactors. The self-contained benchtop service unit is designed to provide services for up to five different chemical reactors:

- Continuous stirred tank reactor
- Tubular reactor with plug
- Transparent batch reactor
- Plug flow reactor
- Laminar flow reactor

Requirements

1Ph

PC

USB

COLD

Requirements

CEXC

Continuous Stirred Tank Reactor - CEM-MKII

The continuous stirred tank reactor is used widely and is particularly suitable for liquid phase reactions. It is particularly used in the organic chemicals industry. Advantages include consistent product quality, straight forward automatic control and low manpower requirements.

The Continuous Stirred Tank Reactor is specially designed to allow detailed study of this important process. It is one of five reactor types which are interchangeable on the Reactor Service Unit (CEXC).

Reactions are monitored by a conductivity probe as the conductivity of the solution changes with conversion of the reactants to product and by temperature.

Chilled Water Circulating Unit - CW-17 (Optional)

Requirements

CEXC

Tubular Reactor - CET-MKII

Tubular reactors are often used when continuous operation is required but without back-mixing of products and reactants.

The Tubular Reactor is specially designed to allow detailed study of this important process. It is one of five reactor types which are interchangeable on the Reactor Service Unit (CEXC).

Reactions are monitored by a conductivity probe as the conductivity of the solution changes with conversion of the reactants to product.

This means that the inaccurate and inconvenient process of titration, which was formally used to monitor the reaction progress, is no longer necessary.

Requirements

CEXC

Transparent Batch Reactor - CEB-MKIII

Batch reactors are used widely in industry at all scales. Batch reactors are tanks, commonly provided with agitation and a method of heat transfer (usually by coils or external jacket).

This type of reactor is primarily employed for relatively slow reactions of several hours' duration, since the downtime for filling and emptying large equipment can be significant. Agitation is used to maintain homogeneity and to improve heat transfer.

The Transparent Batch Reactor is specially designed to allow detailed study of this important process. It is one of five reactors types which are interchangeable on the Computer Controlled Reactor Service Unit (CEXC).

Reactions are monitored by a conductivity probe as the conductivity of the solution changes with conversion of the reactants to product and visually due to the use of indicators.

Chemical Engineering- CE Series

Plug Flow Reactor - CEY

The Plug Flow Reactor is an example of an ideal tubular reactor.

It demonstrates step and pulse changes for plug flow characterisation and steady-state conversion for a second order reaction. It is a tubular packed column reactor made of clear acrylic and mounted on a steel frame.

A static premixer at the bottom of the column provides premixing of the reagents entering the reactor and improves the flow distribution. It is one of five reactor types which are interchangeable on the Computer Controlled Reactor Service Unit (CEXC).

Reactions are monitored as the conductivity of the solution changes with conversion of the reactants to product. In addition, all the experiments are followed visually by means of the reactor transparency and the use of colour indicators in all the experiments.

Laminar Flow Reactor - CEZ

The Laminar Flow Reactor is an example of an ideal tubular reactor.

It demonstrates step and pulse changes for plug flow characterisation and steady-state conversion for a second order reaction.

A tubular reactor made of clear acrylic and mounted on a floor standing steel frame, with two diffusers packed with glass beads located at the ends. A static premixer at the bottom of the column provides premixing of the reagents entering the reactor and improves the flow distribution. It is one of five reactor types which are interchangeable on the Computer Controlled Reactor Service Unit (CEXC).

Reactions are monitored as the conductivity of the solution changes with conversion of the reactants to product. In addition, all the experiments are followed visually by means of the reactor transparency and the use of colour indicators in all the experiments.

Requirements

CEXC

Stirred Tank Reactors in Series - CEP-MKII

The Stirred Tank Reactors in Series unit is designed to demonstrate the mechanism of a chemical reaction in series connected continuous stirred tank reactors as well as the effects of varying the process conditions such as stirring rate and feed rate.

The conductivity of the reacting solution in the reactors changes with the degree of conversion and this provides a convenient method for monitoring the progress of the reaction either manually or by computer.

Experimental content:

- Investigation of dynamic behaviour of stirred tank reactors in series
- Effect of step input change
- Response to an impulse change
- Influence of flow rate
- Investigation of time constant using a dead time coil
- Investigation of chemical reaction in a three-tank system

Requirements

1Ph

PC

USB

Requirements

1Ph

PC

USB

Catalytic Reactors - CEU

The Armfield catalytic reactor demonstrates the principles of packed bed catalysis.

The unit is fitted with two reactor columns as standard which are used to demonstrate chemical catalysis. A third column, which is available as an option, uses a biological enzymic catalyst.

CEU can be used to examine steady state and unsteady state reactor performance, to compare chemical and biological catalysis (requires CEU-5 option), to characterise the flow in a packed bed, to determine the relative effects of rate of diffusion and reaction rate (Thiele modulus), and to demonstrate the principles of flow injection analysis (requires CEU-3 option).

The supplied software allows experimental data logging and also takes the student through each of the exercises defined in the Laboratory Teaching Exercises.

Available options: Flow Injection Analysis Accessory **CEU-3**
Third Reaction Column **CEU-5**

Requirements

1Ph

PC

USB

COMP. AIR

Fixed and Fluidised Bed Apparatus - CEL-MKII

The Armfield CEL-MKII is designed to facilitate the study of flow through fixed and fluidised beds of solid granules.

Low flowrates allow the characteristics of a solid bed to be investigated. Increasing flowrates allow the onset of fluidisation and the characteristics of a fluidised bed to be investigated.

The CEL-MKII has three test columns, one for use with water and two for use with air.

With granules of the same size in the water column and one air column, the differences between 'particulate' and 'aggregative' fluidised beds can be demonstrated. The two air columns allow the effect of different granule sizes to be demonstrated without having to remove, empty and re-pack a column.

Electronic instrumentation is incorporated allowing all relevant flowrates and differential pressures to be displayed.

A USB connector allows the measured variables to be viewed and logged on a PC using the software supplied.

Optional Accessory: Air Compressor **AC1**

Wetted Wall Gas Absorption Column - CES

Requirements

1Ph

The process of absorption of gases in absorption towers is widely used in industry. The process facilitates the removal of one or more components from a mixture of gases.

This is achieved by diffusion into a suitable liquid.

The calculation of the size of the absorption tower for a given separation depends upon the height of the transfer unit which can be found if the transfer coefficient is known.

The Wetted Wall Gas Absorption Column provides a means of determining this coefficient and has been widely used in the development of correlations for packed towers.

Problems encountered in the determination of gas-film mass transfer coefficients include those of maintaining isothermal temperatures throughout the column. Some commonly used systems such as ammonia/water have large enthalpies of solution, making the maintenance of isothermal conditions impossible to achieve.

The Wetted Wall Column is designed to study the absorption of oxygen from air into oxygen-free water. In this system the solubility and enthalpy of solution are small; and by saturating the inlet air with water, humidification effects may be eliminated.

Students can use this apparatus to determine the power-law relationship between the transfer coefficient and the mass flow rate of the absorbing water at a number of different air flow rates.

Fluid Mixing Studies - CEK-MKII

Requirements

1Ph

PC

USB

HOT

Mixing of liquid / liquid or solid / liquid systems is a complex operation to analyse and subject to many variables. The choice of mixer for a particular application depends on the degree of bulk movement or shear mixing required by the process.

The CEK-MKII can be used to predict the power consumption of a full-sized mixer by equating Reynolds' number and Froude number. The effect of blade size / geometry and the effect of baffles in the mixing vessel are also investigated.

Effect of change in liquid viscosity or liquid density can be demonstrated by changing the liquid in the mixing vessel. An optional heat transfer coil with temperature sensor and meter is available that can be used to vary the characteristics of the liquid by raising or lowering the temperature of the liquid.

A suitable hot water circulator (not supplied) or chiller (not supplied) can be connected to the coil using flexible tubing to affect the required change in temperature.

Optional Accessories: Heat Transfer Coil Option **CEK-MkII-3**
Chilled Water Circulating Unit **CW-17**

Requirements

1Ph

COMP. AIR

SAND

Solids Handling Study Bench - CEN-MKII

The flow and handling characteristics of granular materials are relevant to many process industries, particularly in the handling of powders, pellets, crystals and aggregates.

The CEN-MKII introduces students to the behaviour of granular materials. The various teaching exercises are split between three units that can be purchased separately or as a complete set allowing only relevant equipment to be purchased.

The following equipment is available:

CEN-MKII-00 Solids Handling Study Bench
(incorporates CEN-MkII-11, -MkII-12 & -MkII-13)

CEN-MKII-11 Solids Handling

CEN-MKII-12 Powder Handling

CEN-MKII-13 Vibratory Shaker and Sieves

Requirements

1Ph

Corrosion Studies Kit - CEQ

The CEQ provides an introduction to corrosion, a significant factor in determining durability and safety of industrial processes.

The unit allows students to recognise and make provisions for potentially corrosive situations.

The equipment allows for the simultaneous study of up to eight corrosion cells. A pH meter and electrode are supplied to ensure the correct strength of initial test solutions.

For the study of electro-chemical corrosion effects, a low voltage supply is included, together with all necessary electrical connections.

Requirements

PC

USB

1Ph

Mass Transfer and Diffusion Coefficients - CERa-MKII & CERb

Two separate items of laboratory equipment have been designed to enable measurement of molecular diffusivities , to familiarise students with the basic notions of mass transfer theory.

The **CERa-MKII** utilises a high-definition digital microscope linked to a PC to observe and measure the movement of the phase boundary of the liquid inside a capillary tube as the liquid diffuses into stationary air. The time-lapse recording facility in the software and the use of a heated block rather than a water bath means that the equipment can be left unattended for extended periods. This allows measurements to be carried out using different liquids and especially liquids such as water with a low diffusion coefficient.

The **CERb** consists of a honeycomb of accurately dimensioned capillaries, positioned between two liquids of differing concentration of solute whose diffusion coefficient is to be determined. The solute is stirred by a battery-operated magnetic stirrer. Conductivity of the vessel contents is monitored using the supplied conductivity meter and electrode. The change in conductivity with time is used to determine the Diffusion Constant for the salt solution tested.

CERa-MKII

CERb

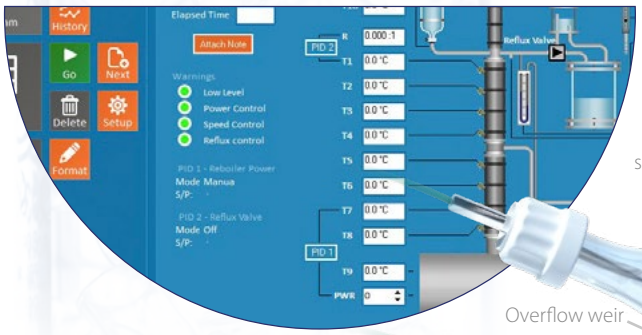
Link to UOP Series

UOP SERIES

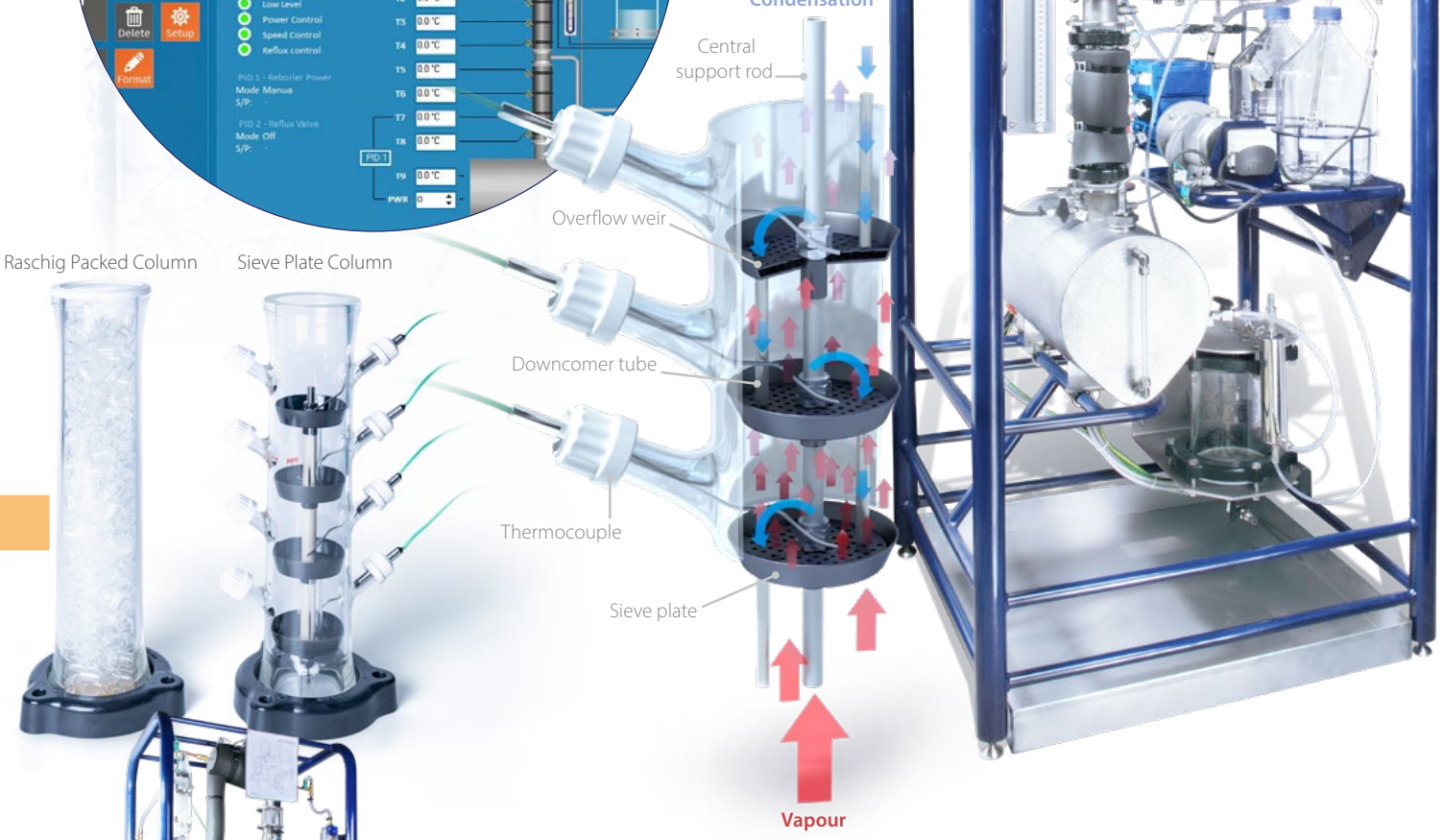
Unit Operations

The Armfield Unit Operations range provides a series of products designed to allow in depth teaching and investigation into the individual basic steps in a process relating to Chemical Engineering and associated fields.

Each product can be considered to have a single function in a potentially multiple step process, involving a physical change or chemical transformation such as separation, crystallization, evaporation, filtration, distillation, extraction, absorption and drying.



Mimic software screen supplied with **UOP3CC**



Software inc

Distillation Columns - UOP3CC & UOP3BM

Two laboratory-scale distillation columns enabling safe operation of a real industrial process.

UOP3CC: A continuous distillation column, which also performs batch experiments, can be controlled manually or externally by a PC. Individual loops can be controlled using an industrial PLC or a PID controller.

UOP3BM: A batch-only version is suitable for teaching the fundamentals of distillation. Both versions incorporate flameproof devices and intrinsically safe circuits plus feature plate and packed columns together with the display of temperatures on each of the eight sieve plates in the column.

Requirements

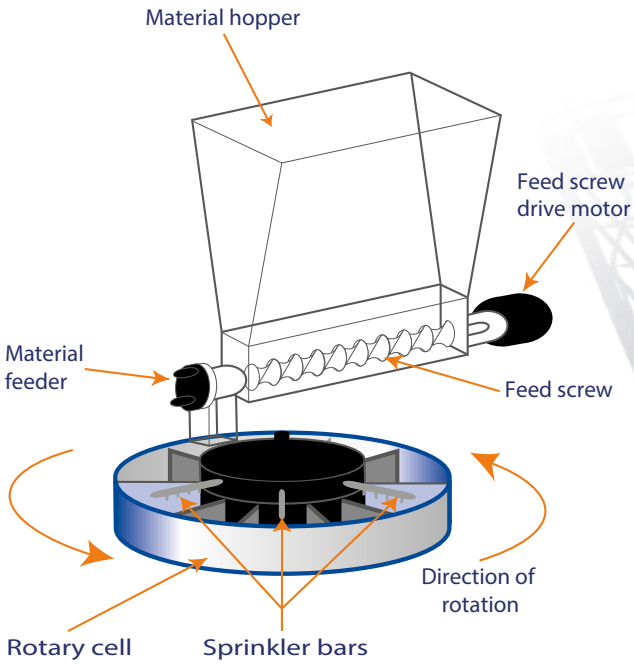
1Ph
PC
USB
COLD
SAFEVENTING

The Armfield UOP4-MKII - Laboratory-Scale Solid/Liquid Extractor System

The equipment utilises a sophisticated, continuous feed, counter-current flow, multiple-stage, rotary extractor system of the type frequently seen in industrial applications. This gives the student an insight into the practical implementation of the operation, including process economics and control problems.

Experimental Capabilities:

- Demonstration of the operation of a continuous multiple-stage process
- Closed-circuit percolation extraction (batch extraction)
- Open-loop percolation extraction (continuous operation)
- Investigation of continuous extraction in 1, 2 or 3 steps
- Investigation into effect of solvent temperatures
- Investigation into effect of solvent flow rates
- Investigation into effect of processing time
- Process economics
- Mass balances



Mimic software screen supplied with **UOP4-MKII**

Requirements

1Ph

PC

USB

COLD

Solid-Liquid Extraction Unit - UOP4-MKII

The Armfield unit is designed to demonstrate a simplified version of the moving-bed leaching process used by many industrial solid/liquid extraction systems.

The process used is a continuous multi-stage process, which gives counter current flow of the solvent and the solid phase.

A batch extraction vessel is also incorporated to allow demonstration of fixed-bed leaching with either open or closed loop circulation of the solvent.

The effects of temperature, throughput rate and the effect multiple stages can all be investigated.

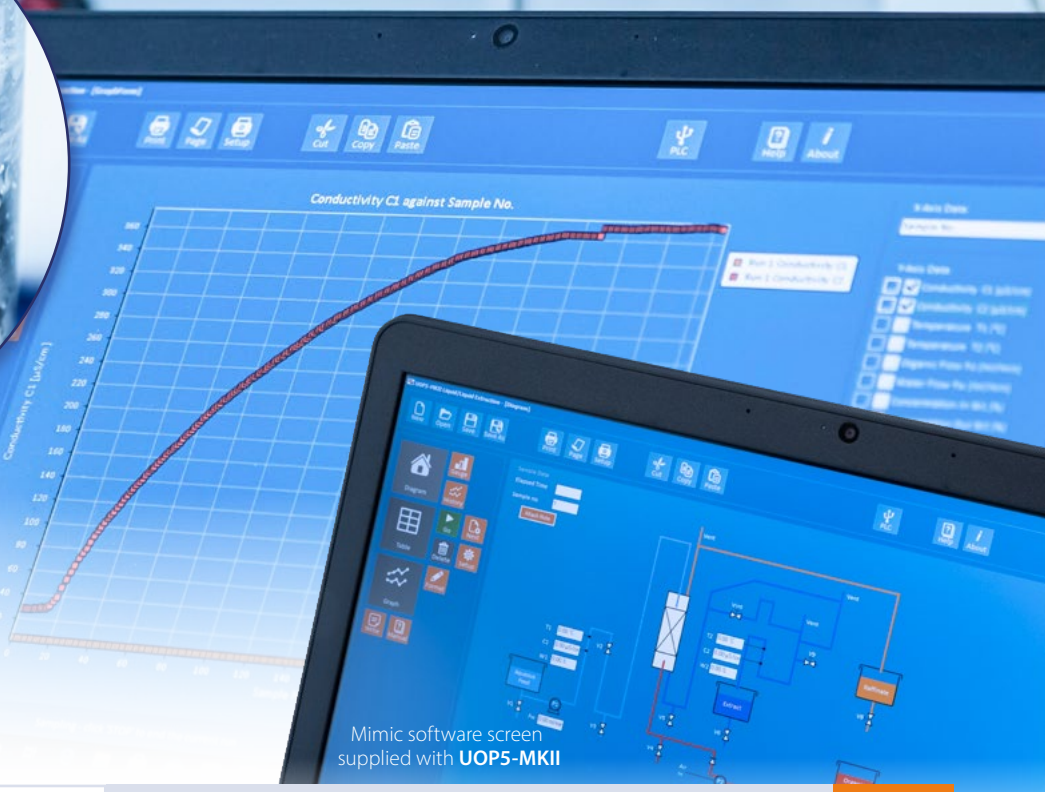
The Armfield UOP5-MKII - Liquid-Liquid Extraction Unit

Liquid / liquid extraction is an important operation in chemical engineering where the separation of one or more of the components from a liquid mixture is required. Traditionally this has been difficult to demonstrate in the laboratory, requiring the use of highly toxic, expensive and/or environmentally damaging solvents.

The Armfield UOP5-MkII introduces a system using 1-Octanol or Canola oil which are safe, readily available and inexpensive.

Experimental Capabilities:

- Hydrodynamics of a packed liquid / liquid extraction column
- Differences in extraction performance using the organic phase or the aqueous phase as the continuous phase
- Investigation into the effect of changes in aqueous and organic flow rate
- Mass balances and the calculation of mass transfer coefficient
- Mass balances



Mimic software screen supplied with **UOP5-MKII**

Software inc

Liquid-Liquid Extraction Unit - UOP5-MKII

This unit provides an introduction to the operation of an industrial type of liquid/liquid extraction system.

A vertical column is used to contact two essentially immiscible liquids flowing counter-currently through Raschig ring packing. Either liquid can be selected to be the continuous phase.

Traditionally this has been difficult to demonstrate in the laboratory, requiring the use of highly toxic, expensive and / or environmentally damaging solvents.

The Armfield UOP5-MKII introduces a system using Kerosene (Paraffin) which is simple, safe and inexpensive.

Option: **AC1** (Air compressor)

Requirements

- 1Ph
- PC
- USB
- COLD
- COMP. AIR

The Armfield UOP7-MKII - Gas Absorption Column

The Armfield Gas Absorption Column has been designed to demonstrate the principles of gas absorption and to provide practical training in the operation of a gas absorption plant.

In the process of gas absorption, a mixture of gases is contacted with a liquid, for the purpose of dissolving one or more components of the gas and to provide a solution of them into the liquid.

Experimental Capabilities:

- Study of basic principles of the absorption of a gas into a liquid using a packed column
- Determination of loading and flooding points
- Study of hydrodynamic characteristics of a packed column
- Demonstration of physical and chemical absorption
- Investigation of the effectiveness of CO_2 absorption in pure water and in an aqueous solution
- Demonstration of gas desorption
- Determination of the mass transfer coefficient

Mimic software screen supplied with **UOP7-MKII**

Requirements

1Ph
PC
USB
COLD
CO_2

Gas Absorption Column - UOP7-MKII

A pilot-scale apparatus enabling familiarity with the characteristics of packed tower hydrodynamics and absorption processes.

The gas absorption column has been designed to demonstrate the process of gas absorption, desorption and stripping.

The Absorption Column is scaled so that teaching exercises can be completed in a typical laboratory class period, while at the same time capable of demonstrating full-scale plant behaviour.

The system is supplied as standard with electronic control of fluid flow, electronic measurement of CO_2 concentration and full computer control and data logging.

Modular Evaporator Series - UOP20X (STM or PHW)

Requirements: 1Ph, PC, USB, COLD, SAFEVENTING

Maximum flexibility of choice and specification results from the modular approach, which offers a wide number of configurations.

The service unit is capable of housing one or two columns with rising or falling film evaporation and controlled recirculation in either position. High vacuum capability enables low temperature evaporation.

Integral pressurised hot water heating or external steam supply options are also available.

Full computer compatibility is provided and educational software is included detailing the equipment, evaporation theory, logging and analysis of results, questions and answers and a workbook facility.

If it is required to operate the system from an external steam supply, Armfield can provide a laboratory steam generator (UOP10) with a heat output of 30KW.

Rising film evaporator column (1st effect, 1st position)**-UOP22-11**

Rising film evaporator column (2nd effect, 2nd position)**-UOP22-22**

Falling film evaporator column (1st effect, 1st position)**-UOP23-11**

Falling film evaporator column (2nd effect, 2nd position)**-UOP23-22**

Falling film evaporator column (1st effect, 2nd position)**-UOP23-12**

Rising Film Evaporator - FT22 (Data Logging Included)

Requirements: 1Ph, PC, USB

A floor-standing unit using the steam-heated, climbing film principle to concentrate small quantities of liquid foods either continuously or in batches.

The important process parameters can be varied and monitored.

The rising film evaporator consists of a vertical tube within a shell. Steam in the shell increases the temperature of product entering the tube at the base.

As product boils, vapour rises up the tube, carrying a film of concentrated liquor up the inside walls of the tube. At the top of the tube the vapour is separated from the liquor in a cyclone separator and the vapour is then condensed.

Concentration of:

- Juices (fruit and vegetable)
- Milk and milk products
- Extracts (non-flammable)
- Effluents
- Nutritional products

Features & Benefits

- Small quantities of liquid products can be concentrated
- Easily cleaned and maintained
- Low product usage eases the disposal of waste
- Nominal throughput only 10 l/hr
- Single tube heat exchanger
- Integral CIP system
- Integral control console
- Integrated data logging and analysis

Requirements

3Ph

PC

USB

COLD

COMP. AIR

Filtration Unit - UOP12

The Filtration Unit has been designed to demonstrate the application of Darcy's Law of Filtration.

The unit is equipped with a fully functional Plate and Frame filter unit, the most commonly used dead end, batch filter design. As an option, a continuous, tangential flow filter is available which uses an industry standard, hollow fibre cartridge system.

In the case of batch filtration, measurement of operating pressure, volumetric flow rate and optical absorbance enables, cake and medium filtration resistances, benefits of filter aid, mass balancing and washing regimes to be investigated. For tangential flow filtration, similar measurements enable membrane flux and transmission relationships and washing regimes to be examined.

The plate and frame filter press can be readily switched for the hollow fibre, tangential flow unit enabling both methods of filtration to be investigated in a short period of time.

Tangential Flow Filter Accessory - UOP12-10

Option: AC1 (Air compressor)

Requirements

1Ph

PC

USB

COLD

Crystallisation Unit - UOP14-MKII

The Crystallisation Unit is a teaching unit which demonstrates the principles of crystallisation using batch cooling crystallisation. The system may also be used in a continuous mode when used with the Armfield Crystallisation Feed Unit UOP14-11. It is possible to run two basic modes of operation using the following units:

Batch operation - UOP14-MKII only

Continuous operation - UOP14-MKII with UOP14-11

Crystallisation takes place inside a jacketed vessel with a stirrer and baffle. The temperature of the crystallisation reaction is varied by changing the temperature of water circulated through the jacket. Heating to dissolve the crystals is affected by passing the hot water from the hot water vessel into the jacket whilst cooling is achieved using the mains cold water supply directly without heating. Alternatively, a chilled water supply (CW-17) may be necessary if the local cold-water supply is not sufficiently cold to form crystals in the saturated solution.

The unit is supplied with PC software and incorporates a USB computer interface to allow on-line control and monitoring as well as data logging.

The optional Armfield continuous Crystallisation Feed Unit UOP14-11 is totally self-contained and consists of a feed tank with PID controlled heater and a peristaltic pump. This option can be added at any time to turn the UOP14-MKII Batch Crystalliser into a continuous system.

An optional Buchner vacuum filtration system (UOP14-12) can be used to remove crystals suspended in the solution.

Available accessory's:

Continuous Feed Accessory - UOP14-11

Buchner Filtration Accessory - UOP14-12

Chilled Water Circulating Unit - CW-17

Computer Controlled Tray Dryer - UOP8-MKIIe

The most commonly used industrial method of drying solids in bulk consists of passing a hot air stream over fixed trays of wet material.

This small pilot-scale tray dryer uses this method and is designed for laboratory training programmes. Operating conditions may be varied in a way that provides data demonstrating both theoretical and practical aspects of industrial drying practice.

This equipment is applicable to the unit operations laboratory and also to food technology education and research.

Requirements

- 1Ph
- PC
- USB

3-Phase Horizontal Separator - UOP30

The Armfield 3-Phase Horizontal Separator is a small-scale unit capable of demonstrating the principles and operation of gravity separation and the effect of viscosity, flow characteristics and density difference on separation.

The UOP30 comes with two horizontal separator configurations interface/weir and bucket/weir making the UOP30 a versatile teaching unit.

The separation of two immiscible liquids and a gas using density difference is one of the most important process operations in the oil and gas industry.

Examples include separation of produced water and condensate from gas and the separation of gas and produced water from crude oil.

UOP30 armBUS-LCD-15.6 Touchscreen (Optional)

Requirements

- 1Ph
- PC
- USB
- COLD
- OIL

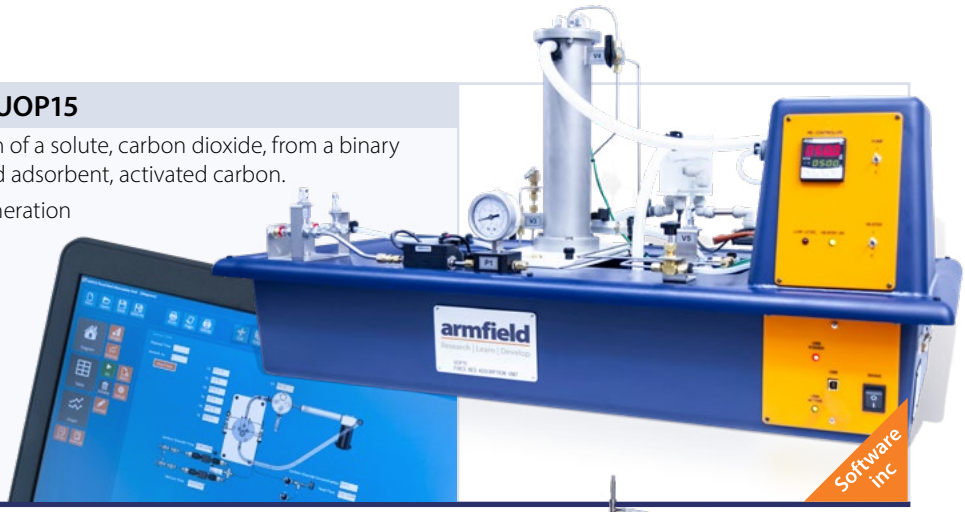
Requirements

1Ph
PC
USB
HE
CO_2

Fixed Bed Adsorption Unit - UOP15

The unit demonstrates the adsorption of a solute, carbon dioxide, from a binary gas mixture onto the surface of a solid adsorbent, activated carbon.

The adsorption and desorption/regeneration processes take place in a fixed bed adsorption column.



Requirements

1Ph
COMP. AIR

Spray Dryer - FT30-MKIII

A simple and effective laboratory scale spray dryer for product research and development. The spray dryer is designed to enable initial product trials and evaluation to be carried out quickly and efficiently.

The unit is supplied with a complete set of glassware comprising of main drying chamber, cyclone, sample collection and waste collection bottles, clamps, seals and all necessary tubing.

The chemically resistant housing includes the blower, heater and the controls for inlet temperature and pump speed. The drying air volume is fixed at 70m³/hr.

AC1 - Air compressor (Optional)

Requirements

1Ph

Fluidised Bed Dryer FT31

A range of materials from fine powders to food particulates can be used on this versatile laboratory-scale unit.

- High rates of heat and mass transfer
- Less than 15 minutes drying time
- Digital readout display

Requirements

1Ph
PC
USB

Basic Water Cooling Tower - UOP6-MKII

This Basic Water-Cooling Tower has been specifically designed to give students an appreciation of the construction, design and operational characteristics of a modern forced draught evaporative cooling system.

The unit is also an excellent example of an open system through which two streams of fluid (water and air) flow in counter-current directions with heat and mass transfer from one stream to the other. The system is supplied as standard 1/3 height and 2/3 height packing in addition to full height packing for comparison.

The tower is fully instrumented with electronic sensors and is operated and controlled via a USB port on a PC

UOP6-MKII-23 Packing Characteristics accessory (Optional)

Link to BE Series

BE SERIES

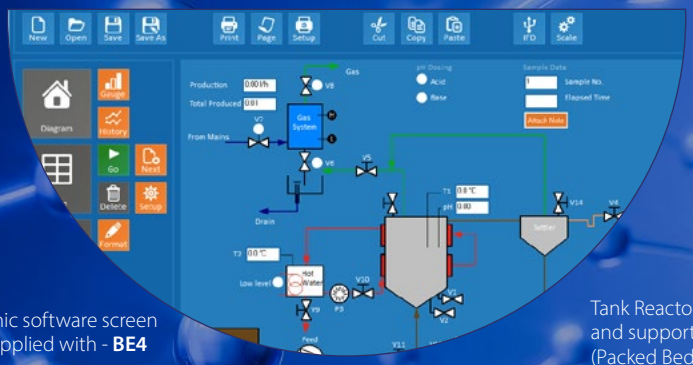
Biochemical Engineering

Biochemical Engineering is currently a growth area, attracting worldwide interest. Although many of the techniques and operations are common with Chemical Engineering, there are some important differences.

The BE series has four core products:

- BE1 Batch Enzyme Reactor
- BE2 Chromatography Unit
- BE3 Anaerobic Column Reactor
- BE4 Anaerobic Tank Reactor

Which together with CEU Catalytic Reactors from the CE series (pages 70-73), give students an introduction and understanding of important Biochemical Engineering principles.



Mimic software screen supplied with - **BE4**

Tank Reactor showing detail of bio-balls and supports, configured as **PBR** (Packed Bed Reactor)

Software inc

Anaerobic Tank Reactor - BE4

A self-contained, floor-standing anaerobic tank reactor, volume 20 litres, stirrer, motor and baffles are removable for non-stirred configurations.

- A self-contained, floor-standing anaerobic tank reactor, volume 20 litres
- Continuous stirred tank reactor (CSTR)
- Packed bed reactor (PBR)
- Upflow anaerobic sludge blanket reactor (UASB)
- Measures reactor temperature, jacket temperature and vessel pH
- Programmable logic controller (PLC) provides temperature control, pH control and gas collection (rate and totalisation) calculations
- Jacket heating system with pump and hot water vessel. Temperature is PID controlled room temperature to 55°C
- Automated volumetric gas collection system measures, which adds less than 10 mbar back pressure to the reactor
- Complete with automated pH dosing system to maintain the vessel pH within a predetermined range (user programmable)
- User calibration of pH and gas collection system
- Feed flow rates from 0.06-4.8 l/hr (using interchangeable peristaltic hoses)
- Gas sample point
- Data logger and software as standard (requires PC, not supplied)
- Stirrer, motor and baffles are removable for non-stirred configurations
- Variable depth liquid sampling point

Settling Reactor Tank BE4-1 (Optional)

An optional settler (BE4-1) is also available for the Anaerobic Tank Reactor BE4. Its function is to collect solid particles of biomass at the exit from the reactor for return to the reactor in the BE4. This biomass would otherwise be lost to the system.

Requirements

BE3 - Anaerobic Column Reactor Experimental Capabilities

- Optimising reactor start-up (acclimation of biomass)
- Effect of temperature, pH, residence time etc.
- Investigation of hydraulic loading (feed rate)
- Effect of effluent strength and nutrient deficiency
- Effect of recirculation ratio and fluidisation
- Comparing efficiency of different configurations (BE4)
- Investigation of bacteria type
- Acidogenesis and methanogenesis process demonstrations

Data logger and software supplied as standard

Requirements

1Ph

PC

USB

COLD

EXTRACTOR

Anaerobic Column Reactor - BE3

A self-contained, floor-standing anaerobic column reactor of a 9l volume.
It is configurable as a fluidised bed reactor and an expanded granular sludge bed reactor (EGSB). Incorporating a split heated column with central collar for instrumentation, dosing and liquid sampling.
It has a recycle pump capable of rates from 0-15 l/min and an electronic measurement of recycle rate.

- Fluidised bed
- Expanded granular sludge bed reactor (EGSB)
- Measures reactor temperature, jacket temperature and vessel pH
- Programmable logic controller (PLC) provides temperature control, pH control and gas collection (rate and totalisation) calculations
- Jacket heating system with pump and hot water vessel. Temperature is PID controlled room temperature to 55°C
- Automated volumetric gas collection system measures, which adds less than 10 mbar back pressure to the reactor
- Complete with automated pH dosing system to maintain the vessel pH within a predetermined range (user programmable)
- User calibration of pH and gas collection system
- Feed flow rates from 0.06-4.8 l/hr (using interchangeable peristaltic hoses)
- Gas sample point
- Data logger and software as standard (requires PC, not supplied)
- A self-contained, floor-standing anaerobic column reactor, 9l volume
- Configurable as a fluidised bed reactor and an expanded granular sludge bed reactor (EGSB)
- Split heated column with central collar for instrumentation, dosing and liquid sampling
- Recycle pump capable of rates from 0-15 l/min
- Electronic measurement of recycle rate

Software inc

Batch Enzyme Reactor - BE1

A batch enzyme reaction system that utilises the industrially important glucose isomerisation reaction, (converting glucose to fructose) catalysed by glucose isomerase.

The purpose of the unit is to demonstrate batch enzyme kinetics and enzyme characteristics.

The reaction takes place inside a stirred vessel where the stirrer itself is a porous basket inside which the enzyme is immobilised.

A polarimeter device, which is integral to the unit, monitors the glucose and fructose concentrations with time.

Requirements

1Ph

PC

USB

Chromatography Unit - BE2

To demonstrate the principles and practices of chromatography - an important operation for both small-scale analysis and large-scale production of biologics. BE2 features two chromatography columns of variable bed height, which are fed by a peristaltic pump.

An injection point enables samples to be introduced onto the column.

The unit has an on-line UV sensor for measuring protein concentration as it exits the column. The unit is also equipped with a timer-controlled fraction collector. Size exclusion chromatography is the primary separation technique used for the demonstrations.

Engineering principles, such as the effect of feed flow rate and bed height on process performance can be investigated.

Option:

Filtration/Degassing Assembly - BE2-1

Requirements

1Ph

PC

USB

Contact Armfield

Computer Control & Remote Access

Computer control is so much more than just datalogging a sensor!

Armfield's range of computer-controlled products, provide not only real time monitoring and datalogging, but additional computer control of multiple variables used when undertaking experimentation

This control is already available for remote access and distance learning in many Armfield products

Remotely enabling Armfield products

- Using standard IT equipment, such as a laptop or computer, it is relatively straight forward to extend the connectivity of the Armfield software to a remote location
- Distance learning is achieved by utilising TeamViewer, Microsoft teams or an alternative 3rd party collaboration software which allows the end user to take control of the local PC
- Using standard, IT hardware such as web camera's remote users and clearly see individual elements of the Armfield equipment, the only limitation to the number of cameras installed is the number of supported USB ports on the local PC/Laptop. Utilising standard USB Hubs can extend the number of USB devises if there is a hardware limitation on the local PC/Laptop
- The standard windows camera application is used to view the web camera feeds
- The collaboration software extends the capability of our existing software from a 1-to-1 local connection to 1-to-many network connections. *(The key benefit here would be to allow enhanced social distancing in a local environment with multiple local users able to view the Armfield software)*
- The onus is on the end user to install and provide support for any 3rd party collaborative software. Although Armfield can offer this as a chargeable professional service

Link to PCT Series

PCT SERIES

Process Control Technology

A range of process teaching equipment is available to demonstrate relevant measurement and control experiments using real engineering equipment.

The Armfield PCT range is designed on a building-block approach, which ensures that experimental set-ups can be assembled economically to meet individual course requirements.

Each practical work study system consists of a benchtop process demonstration unit and a control console, which contains the power supplies and interfacing for all measurement and actuation signals. Industrial controllers are available as accessories to further develop the practical instruction courses possible.

Additionally, the Essentials of Process Control (EPC) range of products takes students through the fundamentals and principles of process control, and progresses to give them a thorough grounding in the control of physical processes. Four independent process units demonstrate level, flow, temperature and pressure as the controlled variable.

The Process Plant Trainer incorporates an electrical console which provides access to the various signals associated with measurement and control of the process allowing a variety of control possibilities

Advanced educational software package included, which implements the control functions.

Software inc

Process Plant Trainer - PCT23-MKII

The Process Plant Trainer can be used to demonstrate a complete range of process control methods and strategies.

Manual control, single feedback loops, through to sophisticated cascade loops and distributed supervisory control of the whole process by a remotely located computer can be demonstrated.

The system is a miniature replication of a true production process. The student is presented with real process control problems, with realistic dynamic behaviour and instabilities.

Requirements

PC

1Ph

USB

COLD

Requirements

PC

1Ph

USB

COLD

Multi-Function Process Control Teaching System - PCT40

The Armfield system is designed for use in teaching a wide range of process control methods. The PCT40 basic unit is used under computer control to demonstrate a variety of process control loops.

Processes such as level control, temperature control, flow control and pressure control can all be investigated, as can manual, on/off, proportional and PID control. The software included with the unit allows the student to change the control parameters and analyse the results from different configurations.

More advanced aspects of control can be addressed by adding optional extras to the basic system.

Requirements

PCT 40

Process Vessel Accessory - PCT41

The process vessel expands on the capabilities of the PCT40 with a wider range of control loops and strategies, including Remote Set Points, dual loops and Fluid Property Control (using Conductivity as a representative example).

All these loops are under software control. It includes a stirrer with electric motor, as well as a second heating coil. It includes provision for the optional: **pH probe accessory PCT42.**

Requirements

PCT 40

PCT 41

pH Sensor Accessory- PCT42

This conductivity probe can be used to demonstrate fluid property control systems, without the maintenance problems which can be experienced with pH probes.

However, as pH control is probably the most common industrial application of this type of control system, users may wish to implement true pH control loops.

This can easily be implemented by adding the PCT42 pH sensor accessory to the combined PCT40 + PCT41 system.

Requirements

PCT 40

PCT 41

1Ph

Electronic Control Console - PCT43

The PCT43 is an electronic control console that can be used to control the PCT40, PCT41 and PCT42 instead of a computer. It includes controls for the pumps, valves and heater, plus a display for the sensors.

It incorporates a commercial PID controller, complete with RS232 interface. Other facilities include 4-20mA interfaces and selector switches to enable many of the different configurations to be implemented without using external jumper connections.

Requirements

PCT 40

PCT 41

COMP. AIR

Pneumatic Valve Module Accessory - PCT44

The unit is a pneumatic control valve, plus associated components, for use with the PCT40/PCT41 system.

Retaining the flexible concept of the whole range, it can be plumbed into many of the flow control loops, and provides a good illustration of pneumatic valve technology.

AC1 - Air compressor (Optional)

Software inc

EPC Level Control - PCT50

The Essentials of Process Control (EPC) range of products takes students through the fundamentals and principles of process control and progresses to give them a thorough grounding in the control of physical processes.

The PCT50 is a highly visible and easy to understand water level control process.

It comprises two clear acrylic tanks; a process tank mounted above a sump tank. Water is pumped up to the process tank and drains back to the sump tank via two valves, one manually variable and the other switched by software.

Requirements

PC
1Ph
USB
COLD

Software inc

EPC Flow Control - PCT51

The unit is a visible and easy to understand water flow control process.

Water stored in the sump tank is pumped through a parallel pipe arrangement mounted on the lid of the tank and returns to the tank via two outlets, a software switched divert valve prior to the flow meter and a manually operated variable valve after the flow meter.

Requirements

PC
1Ph
USB
COLD

Software inc

EPC Temperature Control - PCT52

The unit is a visible and easy to understand temperature control process.

A fan blows air over a heater with radial fins and through a vertical clear acrylic duct. Sensors measure the surface temperature of the heater and the air temperature in the duct.

Requirements

PC
1Ph
USB

Requirements

PC

1Ph

USB

COLD

EPC Pressure Control - PCT53

This highly visible and easy to understand pressure control process unit, uses pumped water to generate air pressure in a closed tank.

It comprises two clear acrylic vessels, an upper process vessel mounted above an open sump tank. The process vessel is sealed and so the air inside the tank is pressurised as water from the sump tank is pumped into it.

Water drains from the process tank back into the lower sump tank via two outlets, one continuous and one incorporating a remotely controlled solenoid valve. Both outlets incorporate interchangeable orifices plus a hand operated variable valve, allowing the flow of water to be varied continuously to suit particular demonstrations.

Requirements

1Ph

EPC Industrial PID Controller - PCT54

The unit is an industrial PID controller incorporated in a console with input and output connections and controls on the front panel, designed primarily for use with the Armfield EPC series of process control products.

Suitable for use as a general purpose PID controller.

Requirements

1Ph

EPC Programmable Logic Controller - PCT55

The unit is a programmable logic controller (PLC) with a graphical touchscreen control panel designed primarily for use with the Armfield EPC series of process control products, but can also be used to control other items.

It is supplied with PID control algorithms implemented in ladder logic and configured to suit each of the EPC processes.

Requirements

1Ph

EPC Sensor Conditioning and Calibration Trainer - PCT56

The unit is a trainer designed to introduce the essentials of signal conditioning applicable to process measurement sensors.

It comprises an electronic console with inputs for sensors with three different types of electrical output, voltage current and resistance.

The resistance input can be configured as a two-terminal or four-terminal bridge drive.

SV SERIES

Structures

Link to SV Series

A range of experiment frameworks that teach the principles of Structures for Mechanical, Civil, and Structural Engineering. This allows the experimental investigation into Forces in a Truss, Strength of Materials, Forces and Moments, Bridges, Beams, Arches, and cables.

Key features include:

- Intuitive design that can be operated by a Microsoft windows-based PC
- Single Application for all SV structures products
- Displays real-time data numerically and in graphical form
- Records data automatically or with manual input
- Allows Timed data capture
- Provide Diagrammatic view of product
- Supplied with Power graphing and analysis tools

Adjustable feet insures stable and level working area needed for accurate results

Measurments are printed onto the frame

Bench Mounted Frame – SV100

A lightweight Aluminium bench mounted frame that enables quick and easy attachment of the interchangeable experiment modules from the Armfield SV Structures range.

The frame is supplied with a fixing system that has been designed to be quick and easy to use. It allows students to change, position and secure each experiment.

Adjustable feet support the frame to allow students to level the apparatus before use.

Requirements

Structures Curriculum

Covering the Civil, Mechanical and Structural Engineering curriculum, using strain gauge, load cells (100kg) digital meters, DTI gauges and manual entry students can calculate loads, deformation etc. while they learn the principles of structures through Armfield's armBUS software.

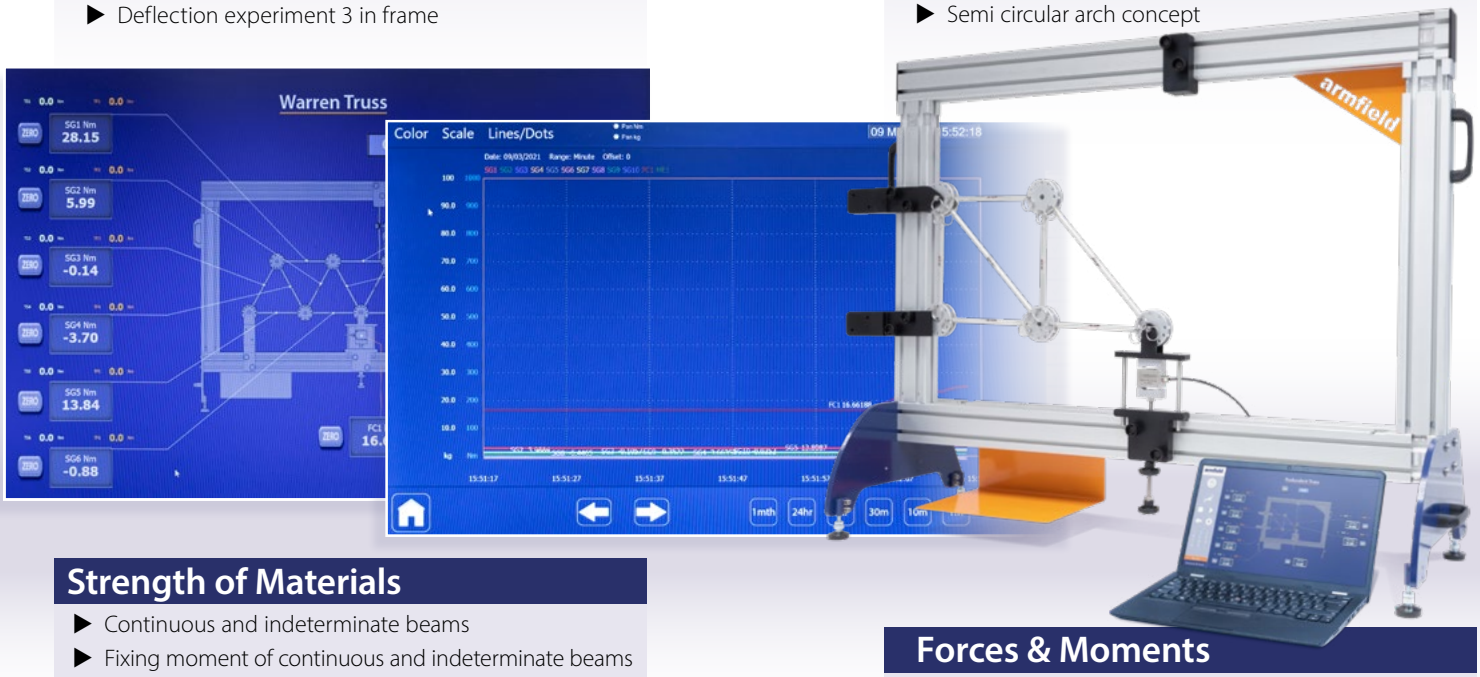
Armfield's new graphing tools will give incredibly accurate results that can be exported in Excel.

Forces in a truss

- Warren truss experiment in frame
- Roof truss experiment in frame
- Redundant truss experiment in frame
- Forces in a truss experiment in frame
- Deflection experiment 1 in frame
- Deflection experiment 2 in frame
- Deflection experiment 3 in frame

Bridges, Beams, Arches & Cables

- Simple suspension bridge
- Deflection of portal frame
- Deflection of 'S' frame
- Suspended centre span bridge
- Three hinge arch concept
- Two hinge arch
- Semi circular arch concept



Strength of Materials

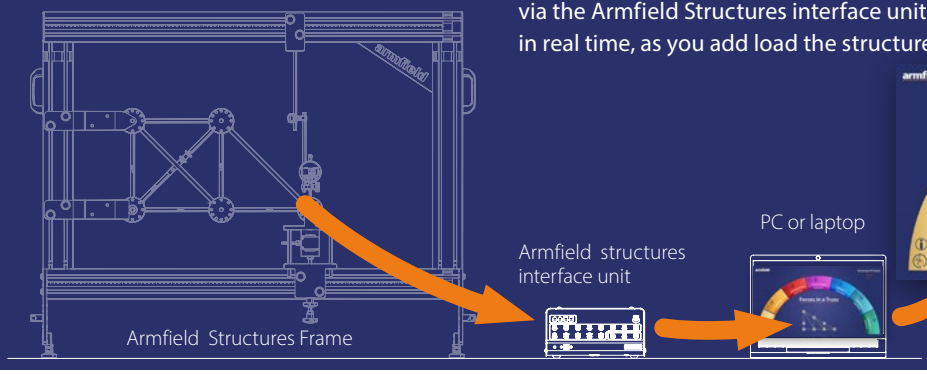
- Continuous and indeterminate beams
- Fixing moment of continuous and indeterminate beams
- Plastic bending of beams in frame
- Plastic bending of portals
- Deflection of curved beams semi circle specimen
- Deflection of curved beams quarter circle specimen
- Deflection of curved beams 45° davit specimen
- Deflection of curved beams curved davit specimen
- Deflection of curved beams 90° davit specimen
- Deflection of curved beams double davit specimen

Forces & Moments

- Combined bending moment and shear force experiment in frame
- Shear force experiment in frame
- Bending moment experiment in frame
- Deflection of beams and cantilevers
- Equilibrium of forces
- Suspension cable
- Bending stress in a beam in frame

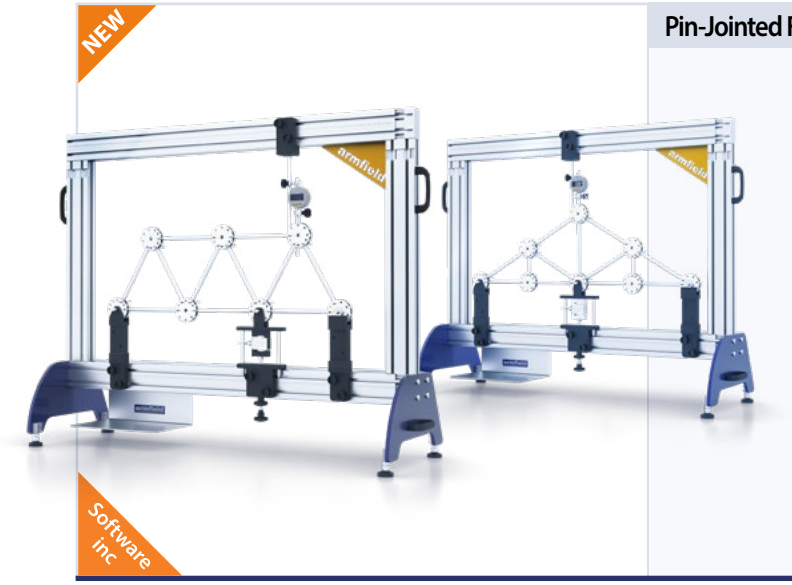
Connection to computer

The experiments are easily attached to the frame with very secure fixings, weights in excess of 50kg can be applied safely



Sensors on the connecting rods send load information to your computer via the Armfield Structures interface unit. Automatically updating tables in real time, as you add load the structure.

Forces in a Truss



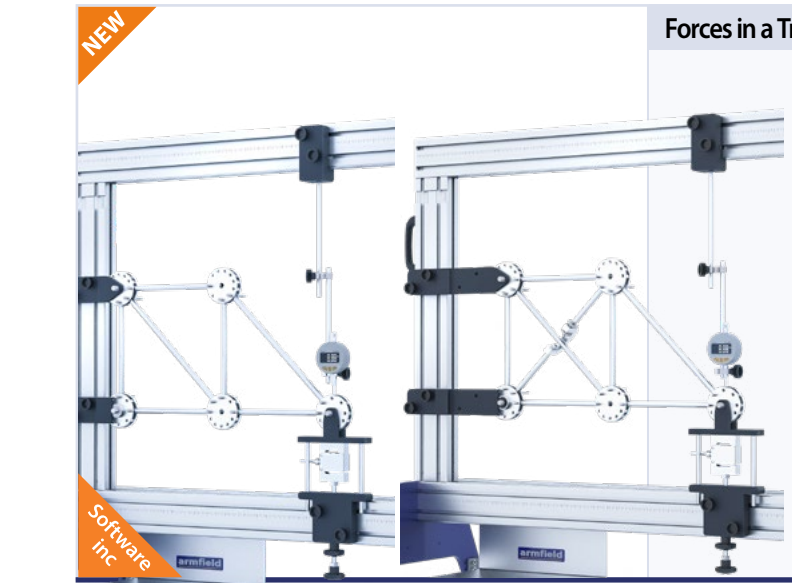
Pin-Jointed Frameworks (Roof and Warren Truss) – SV200

Requirements: 1Ph | SV 100 | SV101 Interface

The Pin-Jointed Frameworks experiment is intended for use with the Armfield Universal Frame and allows the experimental investigation of deflection of trusses under load. This then allows Castigliano theorems to be proven.

This experimental content has the following properties:

- Assembly of both a basic roof and Warren Truss via various length members, detent pins and joint hubs
- Up to 10 members possible in one joint hub
- Members suitable for use with both trusses



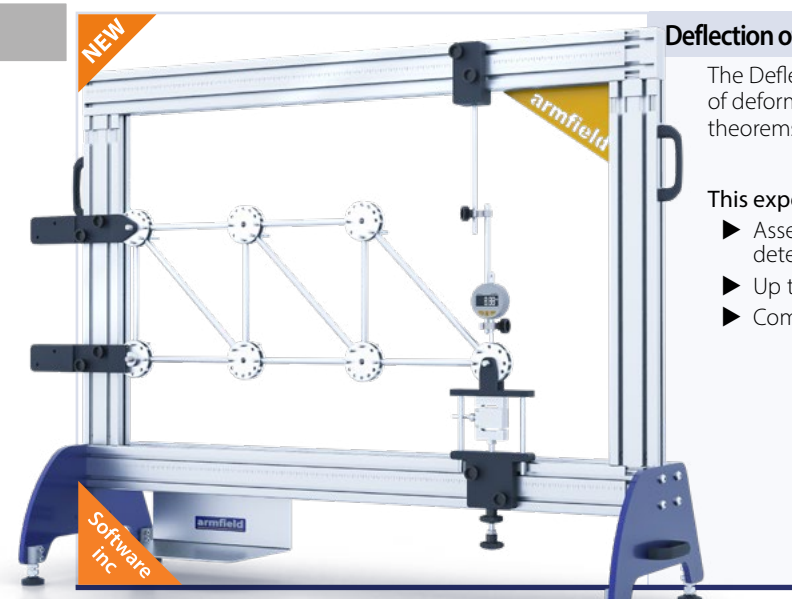
Forces in a Truss and Redundant Truss – SV201

Requirements: 1Ph | SV 100 | SV101 Interface

The Forces in a Truss/Redundant Truss experiment is intended for use with the Armfield Universal Frame and enables the experimental investigation of deflection of trusses under load. This then allows Castigliano theorems to be proven.

This experimental content has the following properties:

- Assembly of both a basic roof and Warren truss via various length members, detent pins and joint hubs
- Quick and easy assembly of members via special detent pins and joint hubs
- Up to 10 members possible in one joint hub
- Loading unit with spindle drive and universal load cell for force measurement
- Members suitable for use with both trusses



Deflection of Trusses – SV202

Requirements: 1Ph | SV 100 | SV101 Interface

The Deflection of Trusses allows the experimental investigation of deformation in trusses under load. This then allows Castigliano theorems to be proven.

This experimental content has the following properties:

- Assembly of three 3-bay trusses via various length members, detent pins and joint hubs
- Up to 10 members possible in one joint hub
- Common members between all three trusses

Strength of Materials

Requirements

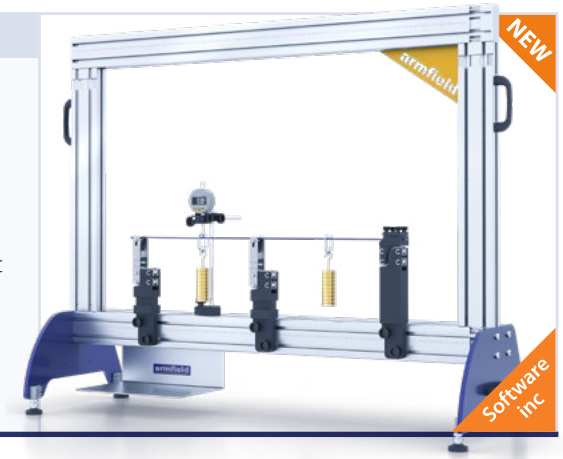
1Ph
SV 100
SV101 Interface

Continuous and Indeterminate Beams – SV500

The Continuous and Indeterminate Beams allows the experimental investigation of the deflection of beams and the resulting reaction forces at the supports for multiple different continuous and indeterminate setups.

This experimental content has the following properties:

- Assembly of multiple different beam experiments via two sinking and one fixed support capable of measuring reaction loads, a fixed support capable of measuring fixing moment, point load weight hangers and UDL weight sleeves
- 3 different beam specimens of different section sizes and material
- Measurement of beam deflection using a digital indicator



Requirements

1Ph
SV 100
SV101 Interface

Plastic Bending of Beams – SV501

The Plastic Bending of Beams allows the experimental investigation of how beams behave when placed under a vertical load that causes plastic bending.

This experimental content has the following properties:

- Assembly of a simply supported, propped cantilever or encastre beam set-up
- 3 different beam specimens with additional spare beam kits available
- Load cell assembly for applying vertical loading
- Linear scale to measure the deflection of the beam at the point of loading

Requirements

1Ph
SV 100
SV101 Interface

Plastic Bending of Portals – SV502

The Plastic Bending of Portals experiment allows the experimental investigation of portal frames placed under horizontal and/or vertical loads to cause plastic bending.

This experimental content has the following properties:

- Two load cell assemblies for independent vertical and horizontal loading
- Adjustable pulley assembly to maintain true vertical and horizontal loading
- Two different portal types, rectangular and pitched portals, 3 of each type supplied with each kit and additional portal kits available
- Linear scales to measure the deflection of the portal at each load point

Requirements

1Ph
SV 100
SV101 Interface

Deflection of Curved Bars – SV503

The Deflection of Curved Bars allows the experimental investigation of the deflection observed when a load is applied to different shaped curved beams or bars as well as being able to validate calculated deflections found using Castigliano's Theorem.

This experimental content has the following properties:

- Six different curved bar specimens
- Up to 15kg of weight hangers to apply load to the specimens
- Two digital indicators to measure vertical and horizontal deflection

Forces and Moments

Combined Shear Force and Bending Moment Apparatus – SV300

The Shear Force and Bending Moment in a beam allows the experimental investigation of the internal shear force and bending moment of a simply supported beam under different point loads.

This experimental content has the following properties:

- Split beam allows the internal shear force and bending moment at the split to be measured
- Up to 3kg of point loads can be applied to the beam across three movable weight hangers
- Adjustable simple supports

Requirements

1Ph
SV 100
SV101 Interface

Shear Force in a Beam – SV301

The Shear Force in a Beam allows the experimental investigation of the internal shear force of a simply supported beam under different point loads.

This experimental content has the following properties:

- Split beam allows the internal shear force at the split to be measured
- Up to 3kg of point loads can be applied to the beam across three movable weight hangers
- Adjustable simple supports

Requirements

1Ph
SV 100
SV101 Interface

Bending Moments in a Beam – SV302

The Bending Moment in a Beam allows the experimental investigation of the internal bending moment of a simply supported beam under different point loads.

This experimental content has the following properties:

- Split beam allows the internal bending moment at the split to be measured
- Up to 3kg of point loads can be applied to the beam across three movable weight hangers
- Adjustable simple supports

Requirements

1Ph
SV 100
SV101 Interface

Forces and Moments

Requirements

SV 100

Deflection of Beams and Cantilevers – SV303

The Deflection of Beams and Cantilevers allows the experimental investigation of the deflection of beams of different section sizes under different loads and types of support.

This experimental content has the following properties:

- Assembly of multiple different beam experiments via 2 adjustable supports, point load weight hangers and UDL weight sleeves
- 3 different beam specimens of different section sizes and material

Requirements

SV 100

Equilibrium of Forces – SV304

The Equilibrium of Forces allows the experimental investigation of non-concurrent forces creating equilibrium in a system.

This experimental content has the following properties:

- Ability to show non-concurrent equilibrium in a system using an equilibrium beam
- Ladder type beam with multiple locations to add additional weight up to a total beam weight of 470g
- Adjustable simple supports allowing the angle of the ladder beam to be adjusted
- Up to 1500g of reaction weights to measure the vertical and horizontal reaction forces at each end of the beam

Requirements

SV 100

Suspension Cable – SV305

This Suspension Cable allows the experimental investigation of a cable free-hanging between 2 supports under its own dead-weight.

This experimental content has the following properties:

- Roller chain to simulate flexible cable
- Up to 4kg of additional weight to simulate increased dead-weight of chain
- Adjustable roller supports
- Moveable vertical scale

Requirements

1Ph

SV 100

SV101 Interface

Bending Stress in a Beam – SV306

The Bending Stress in a Beam allows the experimental investigation of the internal stresses of a simply supported beam placed into four-point bending.

This experimental content has the following properties:

- T section beam fitted with nine strain gauges to measure the strain at various points on the section
- Load cell assembly to apply any load up to 500N via a load application bracket, evenly distributing the load over two points
- Adjustable simple supports

Bridges, Beams, Arches, Cables

Simple Suspension Bridge – SV400

The Simple Suspension Bridge allows the experimental investigation of the tension in the main cable of a suspension bridge under different load conditions.

This experimental content has the following properties:

- Suspension bridge hung between 2 pulley supports with a rigid bridge deck
- Up to 1.35kg of additional weight to simulate UDLs (uniformly distributed loads) and point loads
- Load cell to measure tension in the main cable at the support

Requirements

⚡ 1Ph

SV 100

SV101 Interface

Deflection of a Frame – SV401

The Deflection of Frames allows the experimental investigation of the horizontal thrust and deflection observed when loads are applied to different shaped frames.

The measurements taken can then also be used to validate calculated values for the horizontal thrust and deflections found using Castigliano's Theorem.

This experimental content has the following properties:

- Two different shaped frame specimens
- Up to 1kg of weight hangers to apply loads to the specimens
- Digital indicators to measure deflection at different points on the frames
- Pivoting support capable of measuring horizontal thrust

Requirements

⚡ 1Ph

SV 100

SV101 Interface

Suspended Centre Span Bridge – SV402

The Suspended centre Span Bridge allows the experimental investigation of different forces acting on a bridge with a central section suspended by the two outer cantilever sections of the bridge.

This experimental content has the following properties:

- Ability to show mechanical principles of a centre span bridge
- Ability to show reaction forces at the supports via three load cells covering half of the bridges span
- Point loads, UDLs (uniformly distributed loads) and rolling loads can be applied to the bridge

Requirements

⚡ 1Ph

SV 100

SV101 Interface

Bridges, Beams, Arches, Cables

Requirements

1Ph
SV 100
SV101 Interface

Three-Pinned Arch – SV403

The Three Pinned Arch allows the experimental investigation of the horizontal thrust observed when loads are applied to an arch with hinges at each end as well as at the peak of the arch.

The measurements taken can then also be used to validate calculated values for the horizontal thrust found using the static equilibrium equations.

This experimental content has the following properties:

- Ability to show mechanical principles of three hinged arches
- Point loads, UDLs (uniformly distributed loads) and rolling loads can be applied to the arch
- Pivoting support capable of measuring horizontal thrust

Requirements

1Ph
SV 100
SV101 Interface

Two-Pinned Arch – SV404

The Two Pinned Arch allows the experimental investigation of the horizontal thrust observed when loads are applied to an arch with hinges at each end of the arch.

The measurements taken can then also be used to validate calculated values for the horizontal thrust and deflections found using Castigliano's Theorem.

This experimental content has the following properties:

- Ability to show mechanical principles of two hinged arches
- Both point loads and UDLs can be simulated
- Pivoting support capable of measuring horizontal thrust

Requirements

1Ph
SV 100
SV101 Interface

Semi-Circular Arch – SV405

The Semi-Circular Arch allows the experimental investigation of the horizontal thrust observed when loads are applied to a semi-circular arch with hinges at each end of the arch.

The measurements taken can then also be used to validate calculated values for the horizontal thrust and deflections found using Castigliano's Theorem.

This experimental content has the following properties:

- Ability to show mechanical principles of Semi-circular arches
- Both point loads and UDLs can be simulated
- Pivoting support capable of measuring horizontal thrust

Link to SV Series

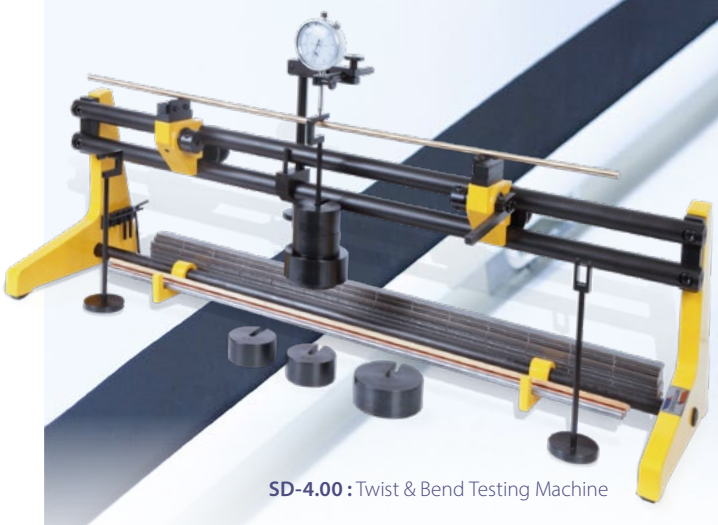
SV SERIES

Statics & Vibrations

Statics & Vibrations from Armfield Didactec Sanderson introduces students to statics, structures, vibration, balancing and materials testing theories within Mechanical, Automotive and Civil Engineering.

The Armfield Statics and Vibrations range of engineering teaching equipment is renowned for excellent quality of build, ease of use and set-up for staff and student.

The Armfield ADS range has provided the fundamentals for Mechanical and Civil Engineering students the world over.



SD-4.00 : Twist & Bend Testing Machine

SD-3.11 Unsymmetrical Cantilever Apparatus

Weight Sets - SD-1.01/SD-1.02/ SD-1.03

The Armfield weight sets are important accessories for many of our Statics & Vibrations units. These sets are essential tools for many mechanical and civil engineering experiments, and can increase the range of tests performed with many of the SV series equipment.

Requirements

Unsymmetrical Cantilever Apparatus - SD-3.11

The Unsymmetrical Cantilever Apparatus is intended to demonstrate the unsymmetrical bending of beams. Simple experiments may be carried out to determine the deflections Δu and Δv at the free end of cantilevers of various sections for varying angles of applied load from which the relationship between Δu/W and Δv/W may be determined graphically.

Shear Centre Attachment - SD-3.11C (Optional)

Requirements

SD-1.02 x1

Requirements

Universal Bench Mounted Frame - SD-1.10

The Armfield Universal Bench mounted frame provides a very sensible alternative to wall mounting, particularly since many new buildings are predominantly glass, with very flimsy dividing walls.

The frame is designed to accommodate two items of equipment, allowing adequate space for students to work on each piece of equipment simultaneously.

Requirements

SD-1.02 x2

Friction Apparatus - SD-1.26

The Friction Apparatus is intended for use in either the classroom or laboratory and may be used for simple demonstrations to illustrate the force of friction.

This equipment can be wall mounted or quickly and easily mounted on the optional Universal Bench Mounted Frame - SD-1.10

Requirements

Torsion of Bars Apparatus - DT-8.00

This simple piece of apparatus has been designed for student laboratory exercises to investigate the elastic torsion characteristics of circular bars.

The range of experiments includes:

- The verification of the elastic torsion equation
- The determination of the modulus of rigidity for different materials

Requirements

Strut Buckling Apparatus - DT-8.01

This apparatus enables the student to determine experimentally the buckling load for struts of varying slenderness ratios and end fixing conditions.

Varying lengths of struts can be subjected to direct axial loading and the critical load determined accurately.

Universal Strut Apparatus - SD-3.12

Requirements

The Universal Strut Apparatus has been developed to enable students to carry out a series of tests to determine the crippling load for struts of varying slenderness ratios and end fixing conditions.

The apparatus has been designed to accommodate struts of suitable lengths within the range 400 to 800mm.

The struts are rectangular in cross section, thus ensuring that the deflection occurs in a predetermined plane.

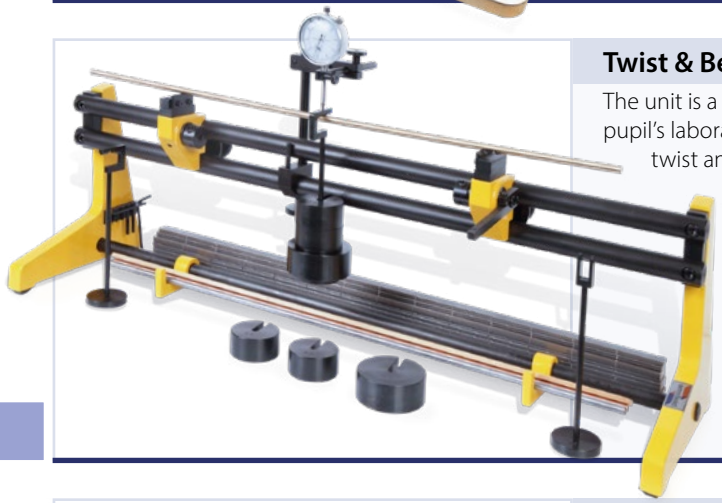
Round Specimen Kit - SD-3.12A (Optional)

Thin Cylinder Apparatus - SD-3.50A

Requirements

The Thin Cylinder Apparatus permits the investigation of stresses and strains in a thin cylinder under internal pressure.

The thin-walled alloy cylinder, supported by a cradle, is mounted on a base board together with the hydraulic hand pump for pressurising the system.

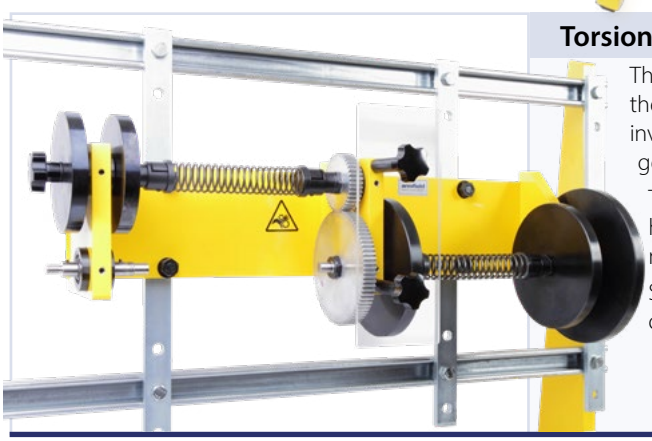


Twist & Bend Testing Machine - SD-4.00

Requirements

The unit is a combined twist and bend testing machine for use both in pupil's laboratory exercises and in conjunction with theoretical work on twist and bending.

Its size and weight make it easy to carry between the different classrooms.



Torsional Oscillations Apparatus - SD-4.14

Requirements

The torsional oscillations apparatus is intended for use in either the classroom or the laboratory and may be used to illustrate and investigate the torsional oscillations of single rotor, multi-rotor and geared systems.

The apparatus consists of a rigid frame carrying bearing cells, helical springs to simulate long flexible shafts and discs of varying mass moment of inertias.

Suitable gears of various sizes are also provided. Shown mounted on the optional Universal Bench Mounted Frame - SD-1.10

Requirements

1Ph

Simple Vibration Apparatus - SD-4.13

The Simple Vibration apparatus illustrated is intended for use in either the lecture room or the laboratory.

Demonstrations may be carried out to illustrate free and damped vibrations of a simple spring-mass system having one degree of freedom and the response of a second-order mechanical system to a step input.

Requirements

1Ph

Free & Forced Vibration Apparatus - SD-4.13A

The Free and Forced Vibration Apparatus has been developed to extend the range of demonstrations and experiments which may be carried out to include the free and forced vibrations of a single degree of freedom with viscous damping.

Simple adjustments can be made to the apparatus and the motion of the mass can be readily observed and recorded on the two pen recorders provided.

The use of so called "Black Boxes" has been avoided, a feature welcomed by most teachers.

Requirements

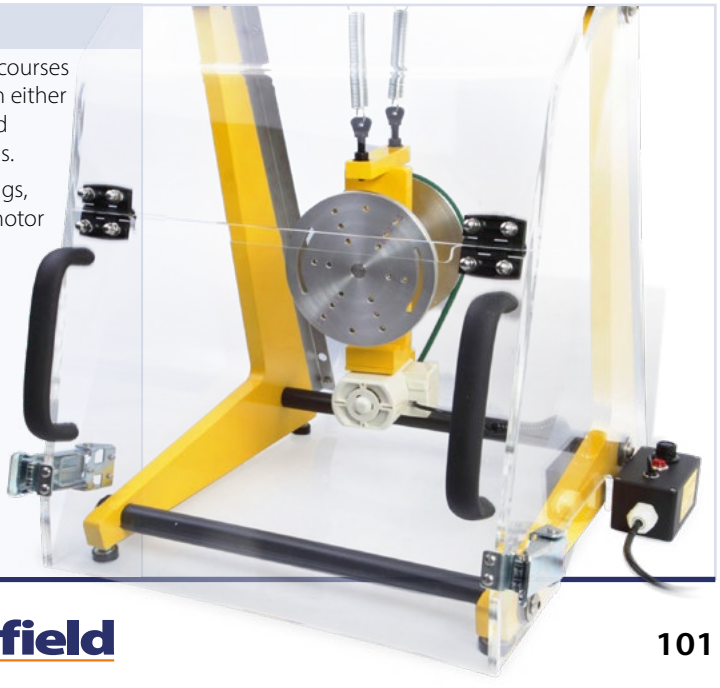
1Ph

Simple Balancing Apparatus - SD-5.12

The Simple Balancing Apparatus has been designed with courses in Mechanical Engineering in mind. It is intended for use in either the classroom or laboratory for simple demonstrations and experiments in the balancing of co-planar rotating systems.

The rotating system is basically a shaft mounted on bearings, supported in a rigid frame and driven by a small electric motor attached to the frame.

A disc to which masses may be attached is rigidly secured to the shaft.



FS SERIES

Fluid Science

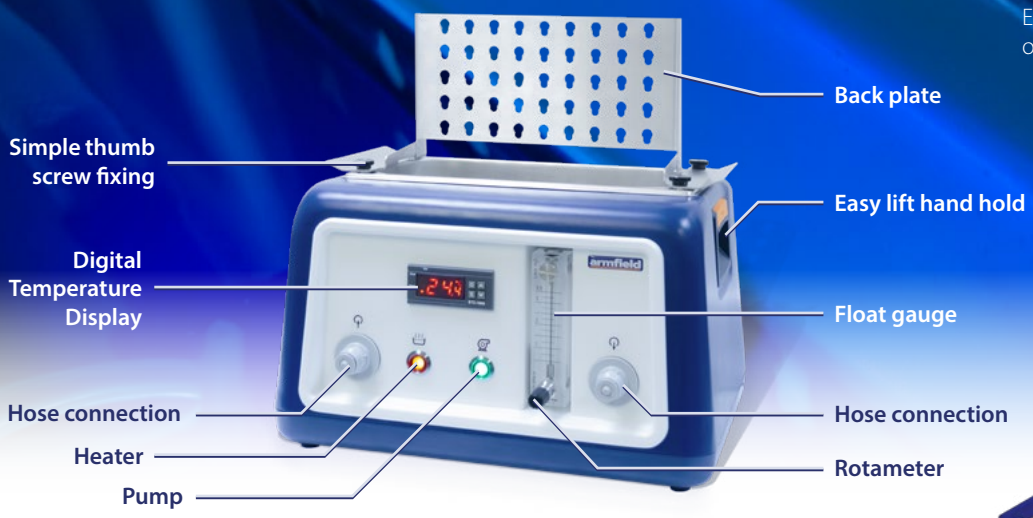
Link to FS Series

Introduce students to the world of engineering, at the earliest opportunity with Armfield's new Fluid Science range.

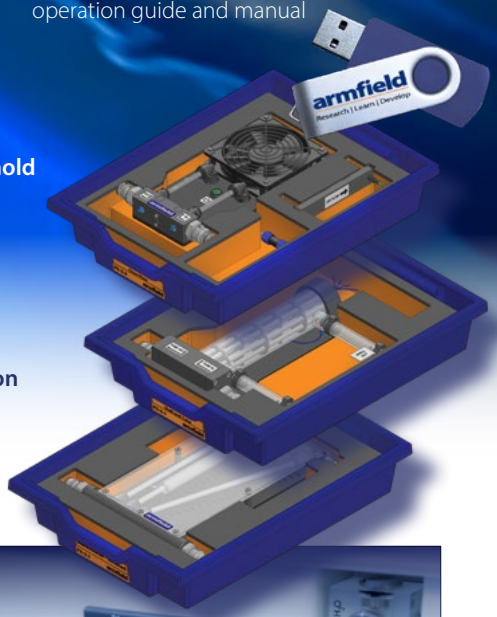
Built on a proven track record of developing innovative hands-on teaching equipment the Fluid Science range enables students to gain an understanding of the fundamentals of Fluid Mechanics and Thermo Fluids via hands-on experimentation.

Students can conduct individual or group experiments ranging from simple flow measurements and losses in hydraulic circuits through to more complex heat exchanger processes using the Fluid Science service unit in conjunction with the multi-functional work panel and instrumentation. A user friendly operational guide provides highly visual illustrations allowing the students to further their knowledge by applying the theories themselves to practical experimentation.

The high precision elements are presented in a modular tray based system providing both ease of access and storage.



Experiments are supplied in trays with USB operation guide and manual



Suitable for student home learning

User friendly quality experiments

Acurate temperature and flow guages

Fluid Science Service Unit - FS-SU

The Fluid Science Service Unit FS-SU is designed to be used in conjunction with the fluid science experiments offered by Armfield. The unit incorporates a pump and rotameter to vary the water flow rate and a heating system. The built-in safety features of the unit include a thermal cut out that prevents the hot water circuit exceeding 55°C and a low voltage water resistant power supply unit.

The high precision elements are supplied as modular tray-based systems which operate in conjunction with the Fluid Science Service Unit, multifunctional work panel and instrumentation enabling the student to conduct their individual or group experiments

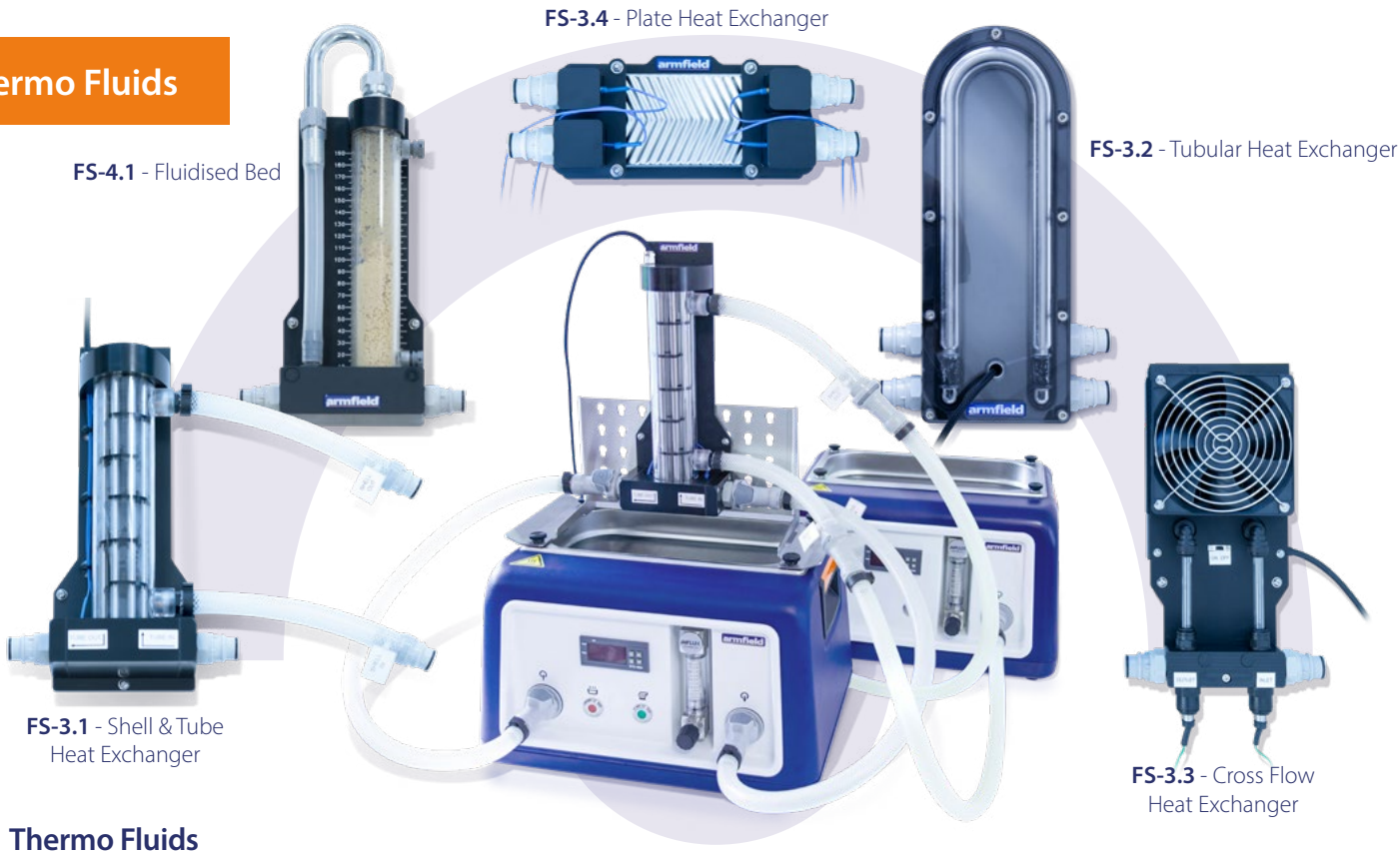
Requirements

Fluid Mechanics

Fluid Mechanics

Explore energy losses in pipes with three experiments trays covering the curriculum as well as studing flow using manometers

Thermo Fluids



Thermo Fluids

Using two base units to provide a hot and cold system to study entry level heat transfer, this series includes a fluidised bed tray

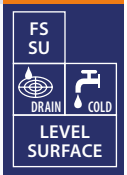
NEW

Fluid Science Flow Measurement - FS-1.1

Combined with the Fluid Science Service Unit (FS-SU), the Fluid Science Flow Measurment Tray, (FS-1.1), provides hands on experimentation designed to demonstrate flow measurement and the relationship between velocity and pressure drop.

Utilising the FS-SU service unit the flow meters experiment rapidly mounts onto the multifunctional work panel and is connected to the built-in water supply via quick connect couplings. Differential pressure reading is taken using a digital manometer against varying flow rates.

Requirements



NEW

Energy Losses - Straight Pipes - FS-1.2

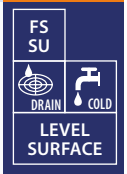
The Fluid Science Energy Losses in Straight Pipes Tray provides hands on experimentation designed to demonstrate energy losses due to the geometry of the flow path at different flow rates.

Utilising the FS-SU service unit the experiments rapidly mount onto the multifunctional work panel and is connected to the built-in water supply via quick connect couplings. Differential pressure reading is taken using a digital manometer against varying flow rates.

The tray includes the following Hydraulic Circuits:

- Smooth and Roughened pipe 6mm diameter
- Contraction and expansion 8mm – 4mm – 8mm diameters

Requirements



NEW

Energy Losses - Bends - FS-1.3

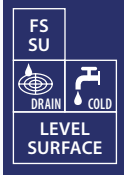
The Fluid Science Energy Losses in Bends Tray provides hands on experimentation designed to demonstrate energy losses due to the geometry of the flow path at different flow rates.

Utilising the FS-SU service unit the experiments rapidly mount onto the multifunctional work panel and is connected to the built-in water supply via quick connect couplings. Differential pressure reading is taken using a digital manometer against varying flow rates.

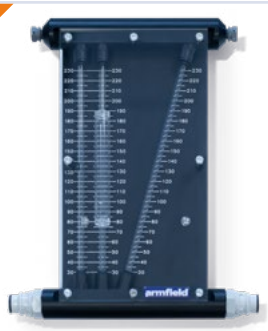
The tray includes the following Hydraulic Circuits:

Energy losses in bends - Shallow bend radii 75mm, 6mm bore
- Tight bend radii 25mm, 6mm bore
- Mitre bend, 6mm bore

Requirements



NEW

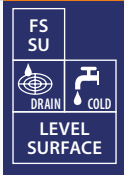


Fluid Science Manometer - Inclined - FS-2.1

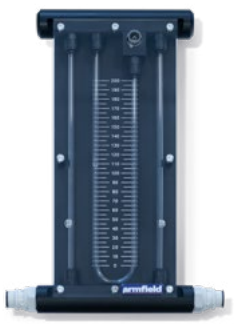
The Fluid Science Inclined Manometer tray includes experiments to measure small pressure differences and the effect of change in manometer inclination.

The tray additionally includes a stepped manometer that incorporates changes in cross section to demonstrate that the level of a free surface is not affected by the size or the shape of the tube.

Requirements



NEW

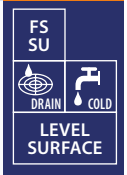


Fluid Science Manometer - U Tube - FS-2.2

The Fluid Science U-Tube Manometer tray includes experiments to compare the pressure created with varying flow rates against atmospheric pressure for both ends of a straight pipe.

It also demonstrates how the differential pressure changes as flow rate changes across a straight pipe.

Requirements



Requirements

FS SU

DRAIN COLD

LEVEL SURFACE

Fluid Science Shell and Tube Heat Exchanger - FS-3.1

The Fluid Science Shell and Tube Heat Exchanger tray includes experimentation to demonstrate indirect heating or cooling by transfer of heat from one fluid stream to another when separated by a solid wall (fluid to fluid heat transfer) in a shell and tube heat exchanger.

The tray introduces students to concepts such as heat transfer coefficients, thermal resistances, controlling resistance and heat transfer driving forces. The heat exchanger can be used in a co-current or countercurrent configuration.

Requirements

FS SU

DRAIN COLD

LEVEL SURFACE

Fluid Science Tubular Heat Exchanger - FS-3.2

The Fluid Science Tubular Exchanger tray includes experimentation to demonstrate indirect heating or cooling by transfer of heat from one fluid stream to another when separated by a solid wall (fluid to fluid heat transfer) in a tubular heat exchanger.

The tray introduces students to concepts such as heat transfer coefficients, thermal resistances, controlling resistance and heat transfer driving forces. The heat exchanger can be used in a co-current or countercurrent configuration

Requirements

FS SU

DRAIN COLD

LEVEL SURFACE

Fluid Science Cross Flow Heat Exchanger - FS-3.3

The Fluid Science Cross Flow Heat Exchanger tray includes experimentation to demonstrate indirect heating or cooling by transfer of heat from hot water to air (fluid to air heat transfer) in a cross flow heat exchanger.

The tray introduces students to concepts such as heat transfer coefficients, thermal resistances, controlling resistance and heat transfer driving forces. The heat exchanger can be used in a co-current or countercurrent configuration.

Requirements

FS SU

DRAIN COLD

LEVEL SURFACE

Fluid Science - Plate Heat Exchanger - FS-3.4

The FS-3.4 Fluid Science Plate Heat Exchanger tray includes experimentation to demonstrate indirect heating or cooling by transfer of heat from one fluid stream to another when separated by a solid wall (fluid to fluid heat transfer) in a plate heat exchanger.

The tray introduces students to concepts such as heat transfer coefficients, thermal resistances, controlling resistance and heat transfer driving forces. The heat exchanger can be used in a co-current or countercurrent configuration.

Requirements

FS SU

DRAIN COLD

LEVEL SURFACE

Fluid Science - Fluidised Bed - FS-4.1

The FS-4.1 Fluidised Bed tray introduces students to the concepts of bed fluidisation commonly encountered both in nature and in industry.

Natural occurrences include the movement of ground water, the movement of crude petroleum or the movement of natural gas through porous media.

Industrial occurrences include operations such as back-washing filters, ion-exchange processes, extraction of soluble components from raw materials and certain types of chemical reactor.

EF SERIES

Engineering Fundamentals

Link to EF Series

Part of a comprehensive range of engineering topic trainers

Provides students with a solid grounding in engineering fundamentals!

The EF series establishes the basis of Armfield's extensive range of engineering teaching and research equipment, for learning and discovery from Key Stage 4 through to undergraduate level.

PERFECT FOR THE FOLLOWING LEVELS

- STEM
- Vocational Training
- High Schools & Technical Colleges
- University Foundation Degrees

Watch video or search EF Series armfield.co.uk

Base Unit shown with sample tray EF-1.1 Statics Forces

Experiments supplied in trays

EF Chapters / Topics / Experiments

The Modular hands-on tray based system is supplied in conjunction with a multifunctional Base Unit enabling the student to conduct their own experiments in subjects such as Statics, Dynamics and Kinematics.

Using easy to follow instructions experiments can be conducted individually or in front of a class.

Choose your topic, build and conduct experiments with our easy instructions and manuals, record the outcome!

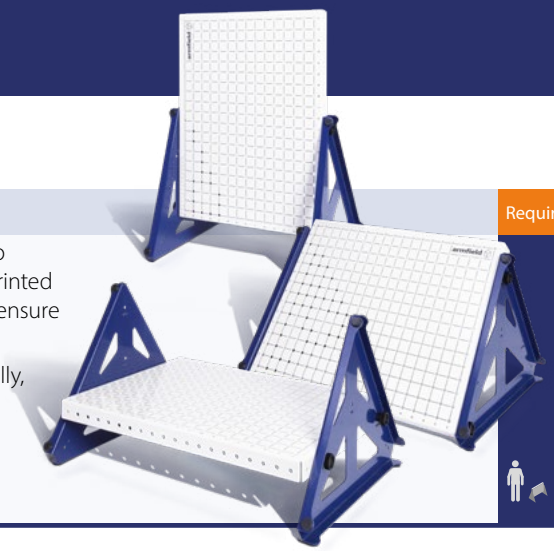
- Simple graphical instructions enable the rapid assembly of all experiments
- Supplied with a detailed instruction manual, covering the theory of beams including multiple practical experiments designed to further develop the students' understanding in this field
- Hands on Learning

Engineering Fundamentals - EF Series

Base Unit - EF-BU

The Base Unit is easy to set up with no assembly tools needed. The screen-printed design includes a measuring scale to ensure repeatable exercises.

The base unit can be set up horizontally, vertically and in inclined positions to suit experiment.



Requirements

Statics / Forces - EF-1.1

The Forces experiment kit enables students to understand the centre of gravity of different shapes and analysis of forces in equilibrium for concurrent and non-concurrent force.

Requirements

EF-BU

Statics / Moments - EF-1.2

The Moments experiment kit enables students to understand the relationship of weights and beam balance.

The different configuration is possible to enhance understanding of the principles of moments, levers, beams and the relationship of distance and forces applied on a beam.

Requirements

EF-BU

Statics / Beams - EF-1.3a

The Beams experiment kit enables students to analyse the behaviour of different types of beams under a variety of load conditions.

Requirements

EF-BU

Statics / Trusses - EF-1.3b

The statics Trusses experiment kit enables students to analyse the behaviour of different types of portal and truss frames.

Requirements

EF-BU

Requirements

EF-BU

Statics / Springs - EF-1.4

The Springs experiment kit enables students to learn about Hooke's law when applied to both extension and compression springs. Students can experiment with a single spring, springs in series or in parallel. A variety of compression springs are included to enable students to learn about spring rates.

Requirements

EF-BU

Statics / Torsion - EF-1.5

The Torsion experiment kit enables students to understand the relationship between torsion and the angle of twist for any given material.

The Engineering Fundamentals range is designed to enable students to gain an understanding of the fundamentals of engineering by the process of learning via hands-on experimentation.

The modular hands-on tray based system is supplied in conjunction with a multifunctional Base Unit enabling the student to conduct their own experiments in subjects such as Statics, Dynamics, Mechanisms and Kinematics.

Requirements

EF-BU

Dynamics / Friction - EF-2.1

The Friction experiments kit enables students to understand that friction can be affected by a number of variables including material surface, mass of the object trying to slide, angle of sliding and what effect external forces acting on the object will have.

The kit is designed to help students understand that friction can be divided into 2 categories, static friction and kinetic (dynamic) friction.

The extent at which friction is reduced by using wheels and rollers, the angle at which the object slides and the angle of friction with the movement of an object along a plane is dependent on what external forces are applied and from which direction.

Requirements

EF-BU

Dynamics / Simple Harmonic Motion - EF-2.2

The Simple Harmonic Motion (SHM) experiments kit enables students to understand the effect of mass and length of pendulum on SHM and the period of oscillation.

The relationship between SHM and gravity is evaluated using the Kater's pendulum, as well as understanding SHM in a mass spring system.

Requirements

EF-BU

Dynamics / Rotational Friction - EF-2.3

The Rotational Friction experiments kit enables students to understand how rotational friction affects the efficiency of a screw jack, a wedge and different bearings.

The kit includes experiments that measure the effort required to raise various loads using a simple form of screw jack.

These include determining how the mechanical advantage and efficiency varies with load, the mechanical advantage and efficiency obtained by using two different wedges including investigating the effect of the angle on overhauling and to compare the resistance to rotation due to friction in four cantilevered bearings of different materials.

Engineering Fundamentals - EF Series

Dynamics / Potential and Kinetic Energy - EF-2.4

Requirements

EF-BU

The Potential and Kinetic Energy experiments kit enables students to understand the difference between potential and kinetic energy and how it can transform from one to the other.

The kit contains a flywheel, a pendulum and set of springs.

The kit will allow students to verify Hooke's law, teach them about energy transfer from potential to kinetic energy using a simple pendulum as well as using a flywheel to show the energy transfer from potential to kinetic and that it can be transferred back again via storage and release.

Dynamics / Centrifugal and Centripetal Force - EF-2.5

Requirements

EF-BU

The Centrifugal and Centripetal Forces kit enables students to demonstrate the relationship between centrifugal force, radius and velocity of rotating masses.

Mechanisms / Cam, Crank and Toggle - EF-3.1

Requirements

EF-BU

The Cam, Crank and Toggle experiments kit provides students with an introduction to cams and rollers and additionally crank motion and toggle.

The kit is designed to help students understand how cams are used, to show how the rotational motion of a cam is transmitted to the linear motion of a follower and how different shapes of cam can be used to achieve varying magnitude and duration of linear motion.

Similar to cams, a crank mechanism can transform rotational motion into linear motion although unlike cams, cranks can also work in the opposite direction, transferring linear motion into rotational motion.

Kinematics / Simple Mechanisms - EF-3.2

Requirements

EF-BU

The Simple Mechanisms experiment kit enables students to visualise and understand the different types of mechanical systems and the conversion of linear motion to rotary motion and vice versa.

The Engineering Fundamentals range is designed to enable students to gain an understanding of the fundamentals of engineering by the process of learning via hands-on experimentation.

The modular hands-on tray based system is supplied in conjunction with a multifunctional Base Unit enabling the student to conduct their own experiments in subjects such as Statics, Dynamics, Mechanisms and Kinematics.

Mechanisms / Additional Mechanisms - EF-3.3

Requirements

EF-BU

The Additional Mechanisms experiments kit provides students with an introduction to conversion of motion using a ratchet and Geneva mechanism.

The Geneva mechanism is a gear mechanism that translates a continuous rotational movement into intermittent indexed rotary motion, with accurately locked location of the driving component. Such mechanisms are frequently used in mechanical watches, film movie projectors and movie cameras.

A Ratchet mechanism allows for continuous linear or rotary motion in one direction while preventing movement in the opposing direction. Such mechanisms are widely used in machinery and tooling such as jacks, hoists, and socket wrenches.

Requirements

EF-BU

Mechanisms / Bar Linkages - EF-3.4

The Bar Linkages experiments kit comprises of different perforated bars or links configured into a range of different linkage mechanisms, including four-bar linkages, rotary and linear movement and planar linkages allowing students to trace the relative movements of each linkage and joint.

A linkage is an assembly of links and joints that provide a desired output motion in response to a specified input motion. One such example and one of the simplest moveable closed-chain linkages is the four-bar which consists of four bars or links connected in a loop by four joints and can be used for many mechanical purposes including converting rotational motion to reciprocating motion and converting reciprocation motion to rotational motion.

Requirements

EF-BU

Kinematics / Pulleys - EF-4.1

The Pulleys experiments kit introduces students to various types of pulleys including fixed, movable and compound pulleys. These experiments show the advantages of using different types of pulleys as a way of lifting weights.

The kit also allows students to familiarise themselves with a simple windlass or wheel and axle and how this can allow a large load to be lifted whilst still maintaining a mechanical advantage, a differential windlass, how a capstan device allows high loads to be controlled by a relatively low restraining force and a Weston differential or chain hoist.

The kit introduces students to terms such as mechanical advantage, velocity ratio, work done, efficiency and the laws of a machine.

Requirements

EF-BU

Kinematics / Gears - EF-4.2

The Gears kit includes a selection of gears to enable students to understand their unique advantages and characteristics.

This kit includes the following gears to allow students to test each set of gears and visualise their different characteristics:

- Spur gears
- Worm gears
- Single gears
- Idler gear
- Bevel gears
- Gear systems
- Compound gears
- Rack and pinion

Requirements

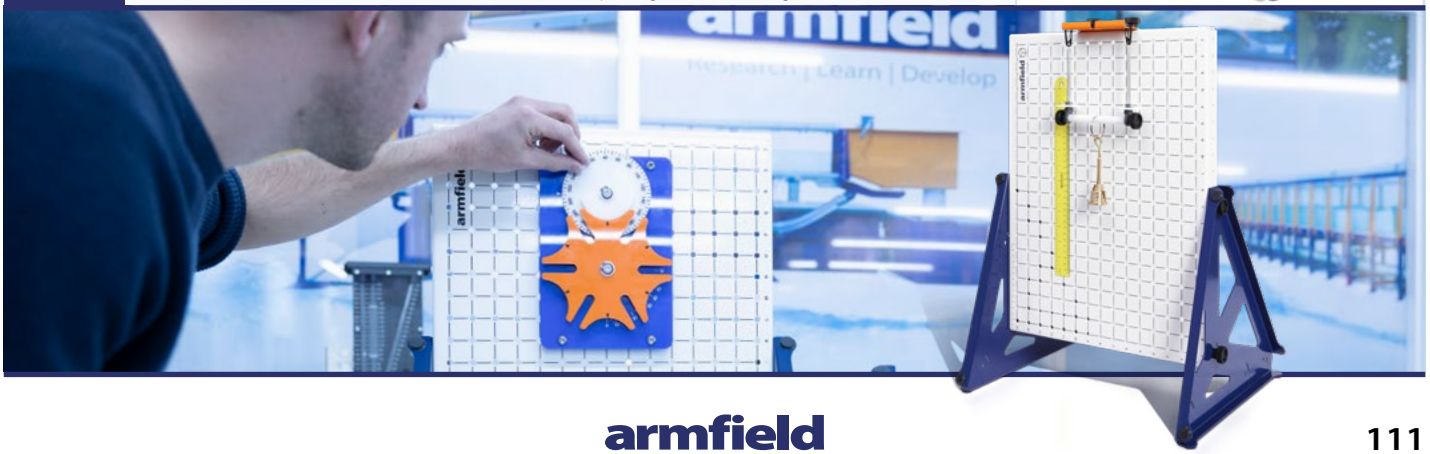
EF-BU

Kinematics / Drive Systems - EF-4.3

The Drive Systems experiments kit introduces students to various types of belt, chain, and shaft drive systems.

Belt and chain drive experiments are included to demonstrate the characteristics of different systems with multiple velocity ratios. The efficiency can be calculated for varying loads for both the different velocity ratios and the different belt and chain systems allowing comparisons between the systems to be observed. Experiments are also included to demonstrate the effect of belt tension and the effect of pulley lap.

Experiments in universal couplings define how they should be set up to ensure that the rotational velocity from the input is seen at the output. The angle of each universal joint and the orientation relative to each other will be tested to see which setup will give uniform angular transmission.

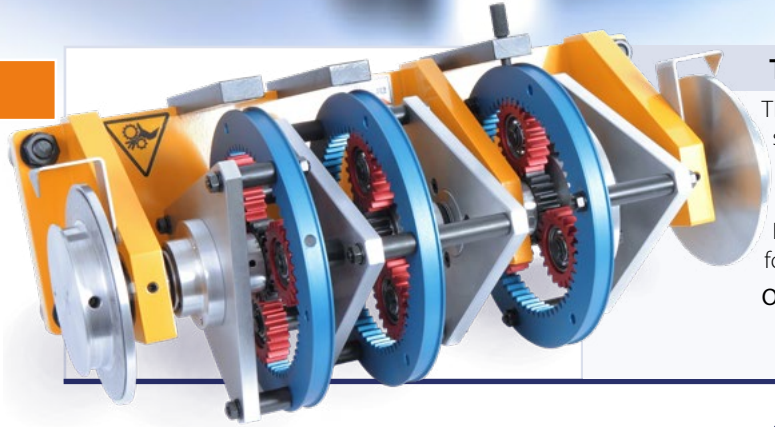


Link to ME Series

ME SERIES

Machine Elements

The Armfield Machine Elements series introduces students to a range of commonly used mechanisms employed in machine design, mechanical engineering and design of machine elements.



Three-Speed Epicyclic Gearbox - SD-4.18

The Epicyclic Gear Units have been developed to enable students to carry out investigations concerning epicyclic gearing in simple and more advanced forms.

A version of this apparatus is the Sanderson Coupled Epicyclic Unit, which uses two standard speed unit or a forward and reverse unit.

Option: Torque re-action kit SD-4.18A

Requirements

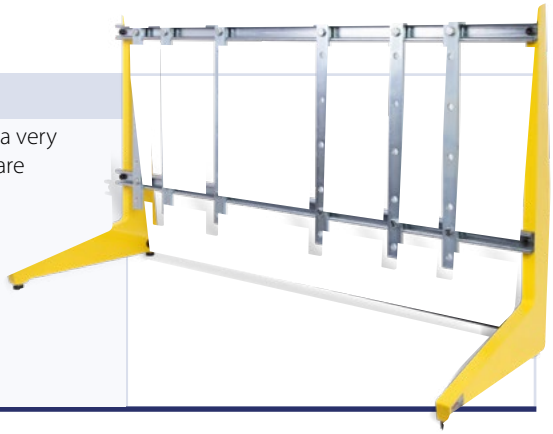
SD-1.02 x2

Requirements

Universal Bench Mounted Frame - SD-1.10

The Armfield Didactec Sanderson Universal Bench Mounted Frame provides a very sensible alternative to wall mounting, particularly since many new buildings are predominantly glass, with very flimsy dividing walls.

The frame is designed to accommodate two items of ADS apparatus, allowing adequate space for students to work on each piece of equipment simultaneously.



Requirements

SD-1.01 x2

SD-1.02 x2

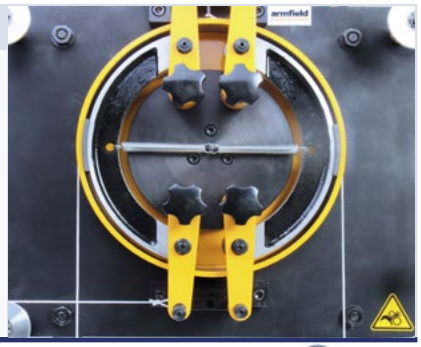
Drum Brake Apparatus - SD-1.12

This apparatus has been developed specifically for motor vehicle mechanics and motor vehicle technicians courses.

It provides a means of demonstrating the difference in braking torque between leading (primary) and trailing (secondary) shoe braking systems and the effect on the braking systems and the effect on the braking torque of the various combinations of leading and trailing shoes.

When the two shoes are linked together, the self-energising action can be demonstrated.

Options: Adjustable lining **SD-1.12A**
Full lining **SD-1.12B**



Requirements

SD-1.02 x2

Gearbox Apparatus - SD-1.15

Most road vehicles are fitted with variable-ratio gearboxes as a means of obtaining the best power application under varying road conditions.

Fundamentally the gearbox consists of gear wheels of different sizes, which may be engaged as required. The sliding mesh box, although it is still used on heavy commercial vehicles, is seldom found on modern cars, but its basic construction and operation are important from the student's point of view as it represents the basic layout from which most modern gearboxes have been developed.

Options: Short coupling **SD-1.15A**
Universal joint coupling **SD-1.15B**

Requirements

SD-1.02 x2

Crown Wheel & Pinion - SD-1.16A

Many students find it difficult to visualise the action of a differential when used as a means of providing a drive from the gearbox to each axle shaft while allowing independent motion between shafts.

The Sanderson Differential Unit has been designed to demonstrate the action of crown wheel and pinion rear axle drive and differential elements.

Options: Short coupling **SD-1.15A**
Universal joint coupling **SD-1.15B**

Requirements

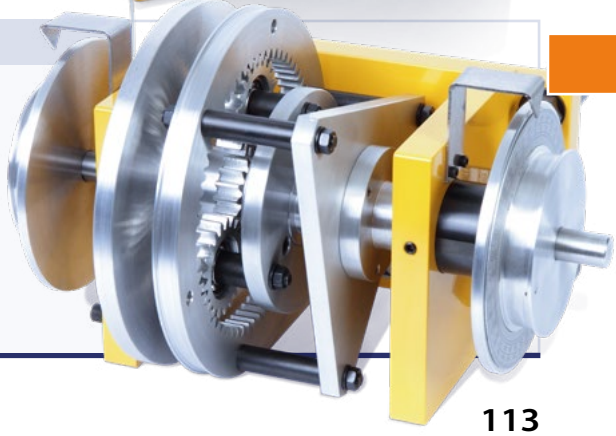
SD-1.02 x2

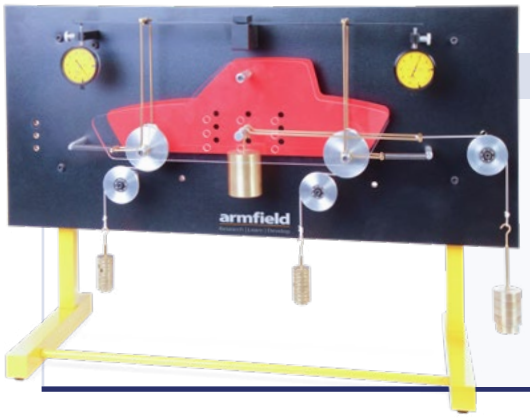
Overdrive Apparatus - SD-1.17

The Sanderson Overdrive Unit has been designed to demonstrate the action of the gear elements in simple epicyclic gear arrangements.

The unit may also be used by students in the laboratory to carry out simple experiments on epicyclic gearing.

Options: Short coupling **SD-1.15A**
Universal joint coupling **SD-1.15B**





Braking & Accelerating Forces Apparatus - SD-1.18

Under conditions of braking or acceleration of a road vehicle, a load transfer between front and rear wheels occurs.

The problem of load transfer arises since the accelerating or braking force is not applied to the centre of gravity of the vehicle but to the point of contact of the wheels with the road.

Requirements

SD-1.01 x2

SD-1.02 x1

Belt Friction Apparatus - SD-1.20

The Belt Friction Apparatus has been designed to allow students to carry out investigations to compare the driving torque for a given degree of overlap of a flat leather belt, a badly fitted 'V' belt and a correctly fitted 'V' belt.

Tension is introduced into the belt by hanging a mass from the ring attached to the end. The slipping torque is determined by the addition of a suitable mass attached to a cord wrapped around the drum.

Note: Either SD1.02 X2 or SD1.03 X2 can be used

Requirements

SD-1.02 x2

or

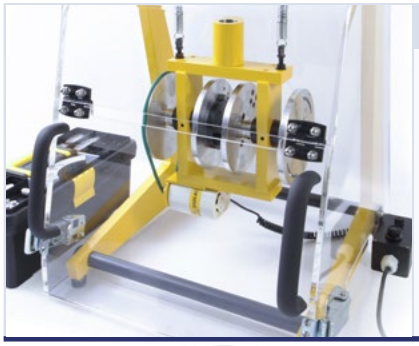
SD-1.02 x2

Borg-Warner Automatic Transmission Simulator - SD-1.22

The simplicity of operation and the ease with which the student may understand the Mechanical Power Flow in the Borg-Warner 35 gearbox has made the Sanderson simulator extremely popular with lecturers and students alike, in Technical Colleges throughout the world.

Requirements

SD-1.02 x2



Static & Dynamic Balancing Apparatus - SD-1.23

The Dynamic Balancing Apparatus may be used effectively in both the classroom and the laboratory for simple demonstrations and experiments in the dynamic balancing of rotating and reciprocating systems.

Requirements

Plate Clutch Apparatus - SD-1.24

The Plate Clutch Apparatus has been designed specifically for motor vehicle technician courses.

It provides a means of demonstrating the effect of the mean radius of the friction surfaces and the spring pressure on the torque transmitted by a plate clutch.

Requirements

SD-1.02 x1

Requirements

SD-1.02 x2

Disc Brake Apparatus - SD-1.25

The Disc Brake Apparatus has been designed specifically for motor vehicle courses and may be used effectively for classroom demonstrations.

It may also be used by the student in the laboratory to carry out simple experiments to investigate the relationship between the normal force acting on the brake pads and the braking torque.

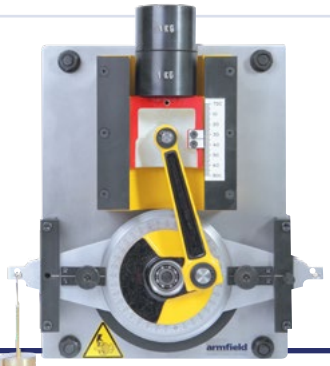
Requirements

SD-1.02 x1

Crank Mechanism - SD-1.28

The apparatus is intended to represent a simple engine mechanism and may be used by the students for simple experiments to investigate:

- The relationship between the piston displacement and the crank angle for a given connecting rod/crank radius ratio
- The relationship between the turning moment on the crank shaft and the crank angle for a given force on the piston



Requirements

SD-1.02 x1

Acceleration of Geared Systems - SD-4.15

The Geared System essentially consists of three shafts, each mounted on ball races, supported in a suitable frame and connected by gearing.

Alternative interchangeable gear ratios are supplied.

Requirements

SD-1.02 x2

Coupled Epicyclic Unit - SD-4.17

The Epicyclic Gear Units have been developed to enable students to carry out investigations concerning epicyclic gearing in simple and more advanced forms. A version of this apparatus is the Sanderson Coupled Epicyclic Unit, which uses two standard speed unit or a forward and reverse unit.

Option - Torque re-action kit SD-4.18A

Requirements

SD-1.02 x2

Simple Hydraulic System - SD-1.27

The Hydraulic System is a simple piece of apparatus designed specifically for motor vehicle and mechanical engineering technician courses.

It is intended for use in either the classroom or laboratory and may be used for simple demonstrations to illustrate how liquid can be used to transmit a force.

Link to ME Series

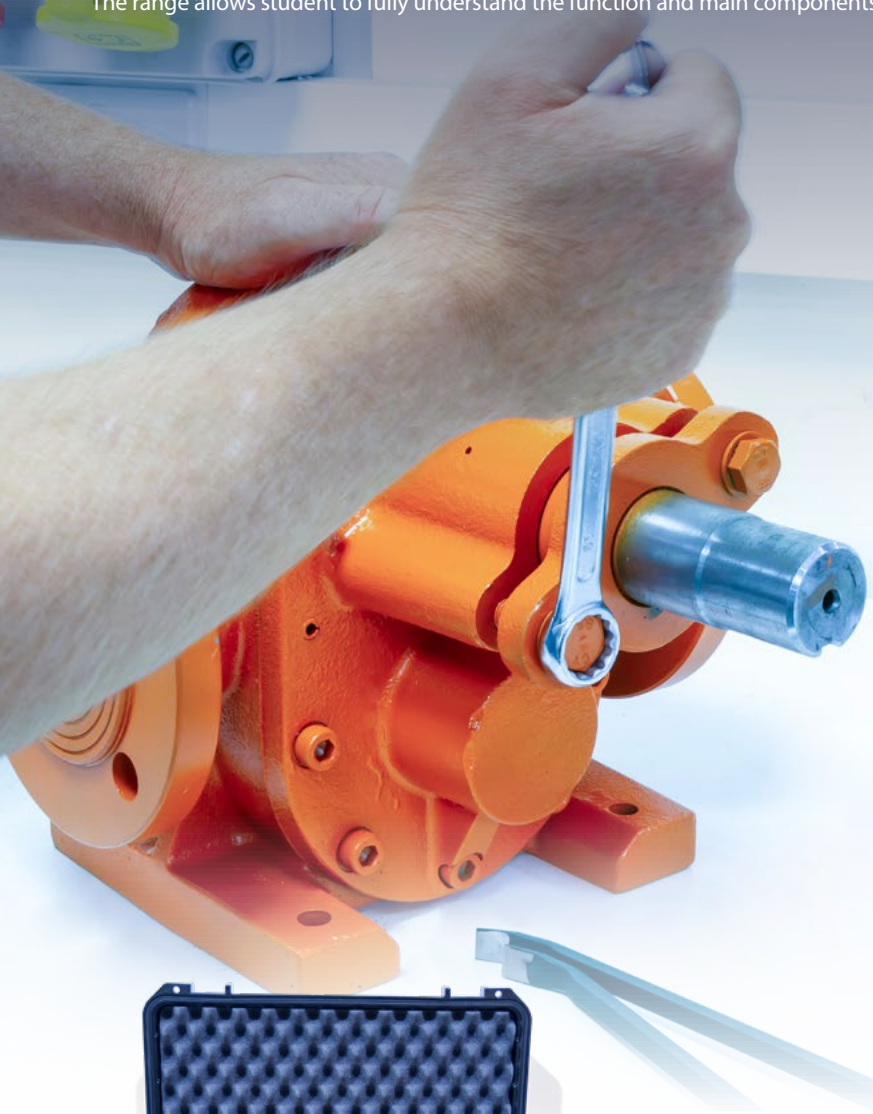
ME SERIES

Dissectible Pumps & Valves

Our dissectible maintenance training kits use new industrial pumps and valves that are commonly used in industrial parts

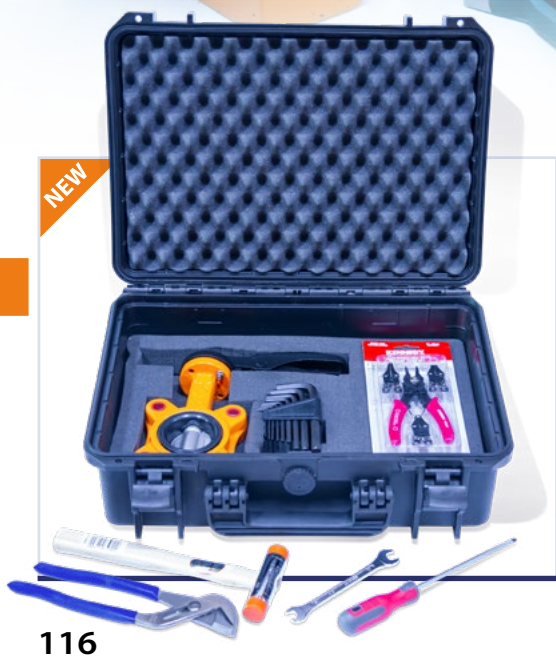
Armfield Intro to Range: The Armfield Machine Elements product range has been designed to teach hands-on industrial skills, to prepare students for work in real industrial jobs. From stripping and repairing real industrial pumps, valves and equipment to understanding the construction and operation of heat exchangers.

The range allows student to fully understand the function and main components of universally used machine elements.



ME61: 2"/DN50 Single Stage Centrifugal Pump
ME62: 2"/DN50 Long Coupled Single-Stage Centrifugal Pump
ME63: 2"/DN50 4 Stage Centrifugal Pump
ME64: 2"/DN50 Internal Gear Pump
ME65: 2"/DN50 External Gear Pump
ME66: 1.5"/DN40 Vane Pump
ME67: 2"/DN50 Multi-Screw Pump
ME68: 2"/DN50 Lobe Pump
ME69: 2"/DN50 Diaphragm Pump
ME70: 2.5"/DN65 Tri-Rotor Rotary Piston Pump
ME81: 2"/DN50 Ball Valve
ME82: 2"/DN50 3-Way Ball Valve
ME83: 2"/DN50 Gate Valve
ME84: 2"/DN50 Globe Valve
ME85: 2"/DN50 Right-Angled Globe Valve
ME86: 2"/DN50 Diaphragm Valve
ME87: 2"/DN50 Butterfly Valve
ME88: 1"/DN25 Needle Valve
ME89: 2"/DN50 2-Port Plug (Cock) Valve
ME90: 2"/DN50 Ball Check Valve
ME91: 2"/DN50 Swing Check Valve
ME92: 2"/DN50 Disc Check Valve
ME93: 2"/DN50 Lift Check Valve
ME94: 2"/DN50 Electrically Actuated Ball Valve
ME95: 2"/DN50 Pneumatically Actuated Ball Valve
ME96: 2"/DN50 Control Valve without Positioner
ME97: 2"/DN50 Control Valve With Smart Positioner
ME98: 2"/DN50 Dissectible 3-Way Control Valve
ME99: 2"/DN50 Solenoid Valve
ME100: 2"/DN50 Pressure Reducing Valve
ME101: 2"/DN50 Spring Safety Relief Valve

NEW



2" / DN50 Butterfly Vave - ME87

Requirements

A 2" or DN50 inlet and outlet dissectible industrial Butterfly Valve for maintenance and repair training.

Butterfly Valves can be used for isolating and regulating flow. The closing mechanism consists of a disc that operates in a similar way to a ball valve, allowing for quick shut-off. Butterfly valves are lower cost than other valve designs and lighter in weight.

This is a brand new industrial butterfly valve. The set includes a complete tool kit for valve maintenance operations and laminated job worksheets for dis-assembly, checking, repair and re-assembly of a butterfly valve. All components are supplied in a foam lined rugged industrial case for easy storage and handling.

Requirements

Single Stage Centrifugal Pump - ME61

A brand new single stage industrial centrifugal pump with DN50 inlet and DN32 outlet for maintenance and repair training.

The set includes a complete tool kit for pump maintenance operations and laminated job worksheets for disassembly, checking, repair and reassembly of a single-stage centrifugal pump.

All components are supplied in a foam lined rugged industrial case for easy storage and handling.

Requirements

External Gear Pumps - ME65

NEW

A brand new single stage industrial centrifugal pump with DN50 inlet and DN32 outlet for maintenance and repair training.

The set includes a complete tool kit for pump maintenance operations and laminated job worksheets for disassembly, checking, repair and reassembly of a single-stage centrifugal pump.

All components are supplied in a foam lined rugged industrial case for easy storage and handling.

Requirements

Lobe Pump - ME68

NEW

A brand new dissectible Lobe Pump with DN50 inlet and outlet for maintenance and repair training.

The set includes a complete tool kit for pump maintenance operations and laminated job worksheets for dissasembly, checking, repair and reassembly of the pump.

All components are supplied in a foam lined rugged industrial case for easy storage and handling.

Requirements

Globe Valve - ME84

NEW

A brand new 2" or DN50 inlet and outlet dissectible industrial Globe Valve for maintenance and repair training.

Globe valves use a disc and seat arrangement to control fluid flow. An internal baffle splits the inlet and outlet at the seat and the disc moves up and down into the seat to control flow. Globe valves are typically used for applications that are normally closed, because the internal baffles and valve shape prevents fully unrestricted flow.

The globe valve is a brand new industrial globe valve. The set includes a complete tool kit for valve maintenance operations and laminated job worksheets for dis-assembly, checking, repair and re-assembly of a globe valve. All components are supplied in a foam lined rugged industrial case for easy storage and handling.

Cutaway Close-Coupled Centrifugal Pump 2"/DN50 - ME1

Requirements

The ME1, ME2, ME3 series of cutaway centrifugal pumps uses brand new industrial close-couple, long coupled and multi-stage centrifugal pumps.

They are cutaway to clearly show the inlet, outlet, impeller, bearings and seals, allowing students to easily visualise pump operation and identify the main pump components.

Cutaway Long-Coupled Centrifugal Pump 2.5" - ME2

Requirements

A 2.5" or DN65 inlet cutaway Long-Coupled Centrifugal Pump for studying the internal construction and operation of a long-coupled industrial centrifugal pump.

Cutaway Multi-Stage Centrifugal Pump 2"/DN50 - ME3
Study the internal construction and operation.

Cutaway Internal Gear Pump 2"/DN50 - ME4

Requirements

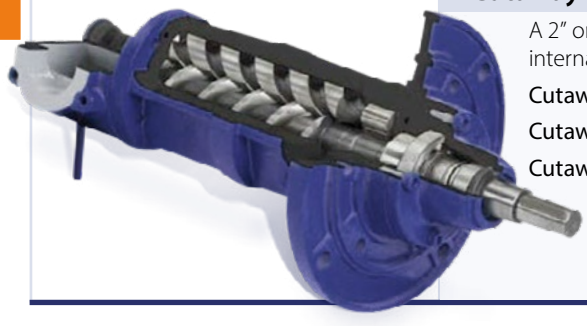
The 2" ME4, ME5 series of cutaway internal and external gear pumps uses brand new industrial gear pumps that are cut away to clearly show the inlet, outlet, gears and seals, allowing students to easily visualise pump operation and identify the main pump components.

Cutaway External Gear Pump 2"/DN50 - ME5
Study the internal construction and operation.

Cutaway Vane Pump 2"/DN65 - ME6

Requirements

A 2.5" or 2" DN65 inlet and outlet cutaway vane pump for studying the internal construction and operation of an industrial vane pump.



Cutaway Triple Screw Pump - ME7

Requirements

A 2" or DN50 inlet and outlet cutaway Triple- Screw Pump for studying the internal construction and operation of an industrial multi-screw pump.

Cutaway Triple Lobe Pump - ME8 (2" or DN50)

Cutaway Triple Diaphragm Pump - ME9 (2" or DN40)

Cutaway Triple Diaphragm Metering/Dosing Pump - ME10 (3/8" or DN10)

Requirements

Cutaway Ball Valve 2"/DN50 - ME21

A 2" or DN50 inlet and outlet cutaway ball valve for studying the internal construction and operation of an industrial Ball Valve.

Cutaway Gate Valve 2"/DN50 - ME23
A 2" or DN50 inlet and outlet cutaway gate valve for studying the internal construction and operation of an industrial gate valve.

Requirements

Cutaway Globe Valve 2"/DN50 - ME24

A 2" or DN50 inlet and outlet cutaway globe valve for studying the internal construction and operation of an industrial globe valve.

Requirements

Cutaway Butterfly Valve 2"/DN50 - ME27

A cutaway 2"/DN50 inlet and outlet butterfly valve for studying the internal construction and operation of an industrial butterfly valve.

Requirements

Cutaway Ball Check Valve 2"/DN50 - ME30

A 2" or DN50 inlet and outlet cutaway unsprung ball check valve for studying the internal construction and operation of an industrial ball check valve.
Cutaway Swing Check Valve 2"/DN50 - ME31
A cutaway 2"/DN50 inlet and outlet swing check valve for studying the internal construction and operation of an industrial swing check valve.
Cutaway Disk Check Valve 2"/DN50 - ME32
A 2" or DN50 inlet and outlet cutaway Disc Check Valve for studying the internal construction and operation of an industrial Disc Check Valve.

Requirements

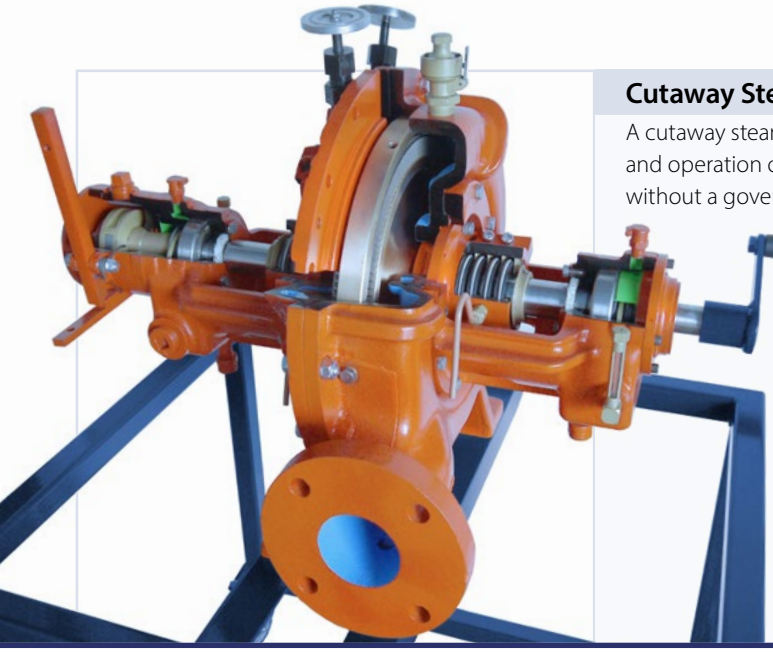
Cutaway Lift Check Valve 2"/DN50 - ME33

A 2" or DN50 inlet and outlet cutaway lift check valve for studying the internal construction and operation of an industrial lift check valve.

Requirements

Cutaway Spring Safety Valve 2"/DN50 - ME40

A cutaway 2"/DN50 inlet and outlet spring safety relief valve for studying the internal construction and operation of an industrial spring safety relief valve.



Cutaway Steam Turbine Without Governor - ME51

Requirements

A cutaway steam turbine for studying the internal construction and operation of a single stage ball bearing type steam turbine without a governor.

Cutaway Steam Turbine With Governor - ME52

A cutaway steam turbine for studying the internal construction and operation of a single stage ball bearing type steam turbine with a governor.

Transparent Process Demonstrators / Dissectible Pumps & Valves - Machine Elements - ME series

Fixed Tube Sheet Single Pass Heat Exchanger - ME301

Requirements

A Fixed Tube Sheet, Single Pass Acrylic Heat Exchanger Demonstration Unit for studying the internal construction and assembly of an industrial standard AEL heat exchanger.

U Tube Heat Exchanger - ME302

A U-Tube Heat Exchanger with single pass shell for studying the internal construction and assembly of an industrial standard AEU heat exchanger.

Vertical Thermosyphon Reboiler - ME303

Requirements

A Vertical Acrylic Thermosyphon Reboiler Demonstration Unit for studying the internal construction and assembly of a typical industrial Thermosyphon Reboiler.

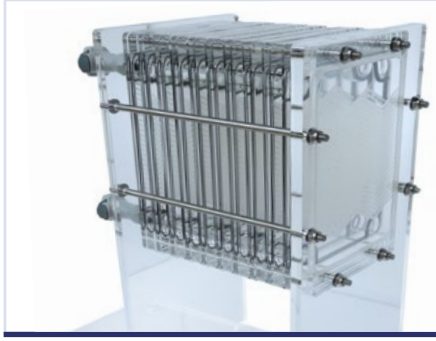


Plate Heat Exhchanger - ME304

Requirements

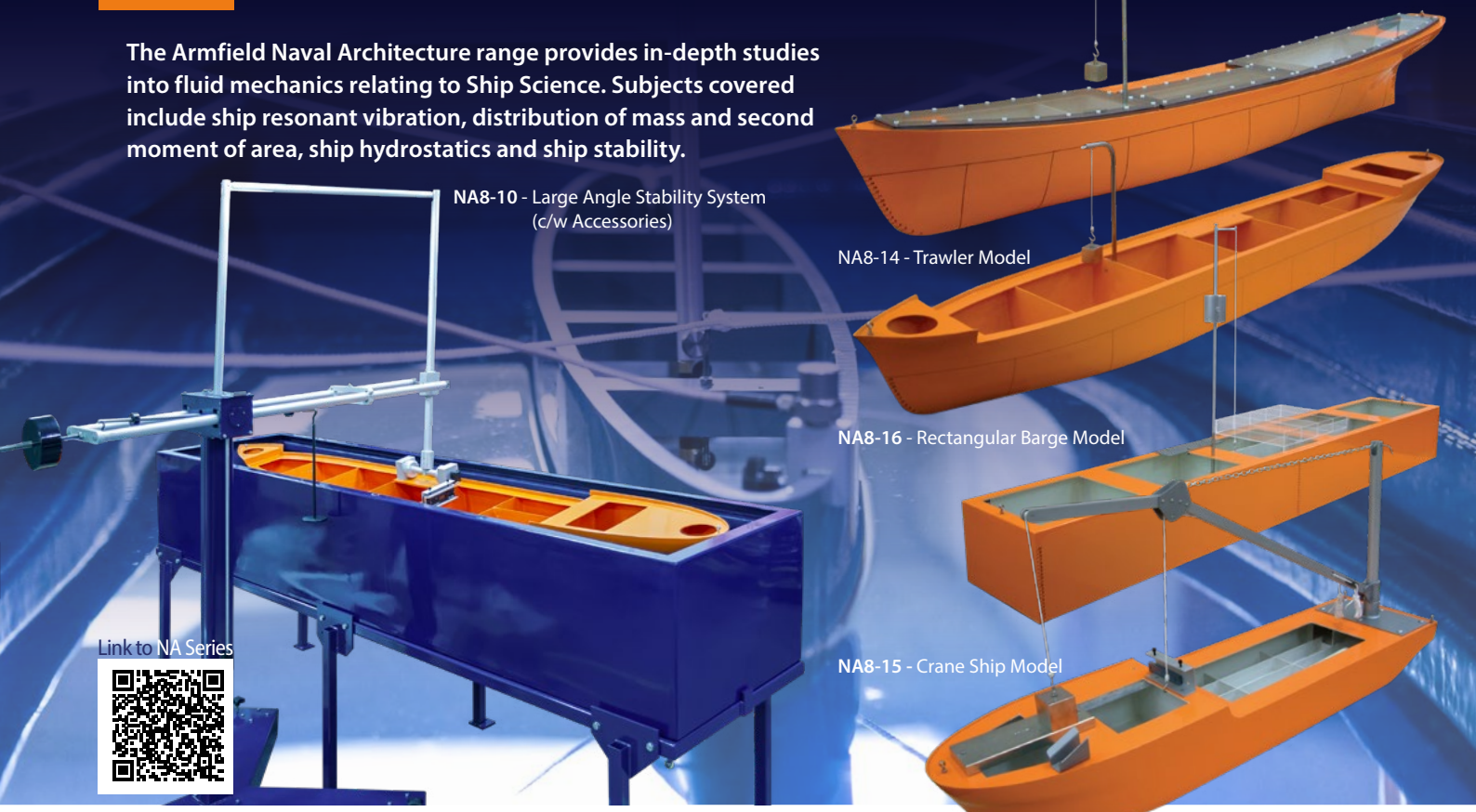
A demonstration unit for studying the internal construction and assembly of an industrial standard 13-plate heat exchanger.

NA SERIES

Naval Architecture

Supplied - 1/70 scale model of a 28000 tonne general cargo vessel

The Armfield Naval Architecture range provides in-depth studies into fluid mechanics relating to Ship Science. Subjects covered include ship resonant vibration, distribution of mass and second moment of area, ship hydrostatics and ship stability.



Link to NA Series

Requirements

1Ph

NA 4-11

Ships Vibration Apparatus - NA4

The apparatus is designed to enable an investigation of a simple model hull form enabling many of the principal phenomena connected with ship resonant vibration to be clearly demonstrated.

At a more advanced level, the distribution of mass and second moment of area may be calculated and natural frequencies estimated/compared with measured values.

Flotation Tank - NA4-11 (Recommended option shown in product picture)

Requirements

1Ph

NA 4-11

Ships Stability Apparatus - NA8

Developed for the laboratory study of ship hydrostatics and stability.

The complete apparatus comprises four different types of vessel models with ballast weights, clinometer and a water tank in which to float them. Righting moment is measured by a free-standing dynamometer.

NA4-10 Ships Vibrations Test Model

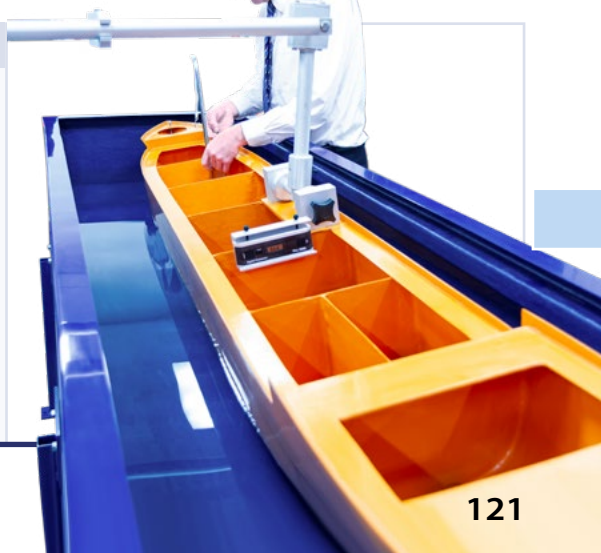
NA4-11 Flotation Tank for NA4-10

NA8-10 Large Angle Stability System (c/w Accessories)

NA8-14 Trawler Model

NA8-15 Crane Ship Model

NA8-16 Rectangular Barge Model



CA SERIES

Control & Acquisition Systems

Link to armSOFT

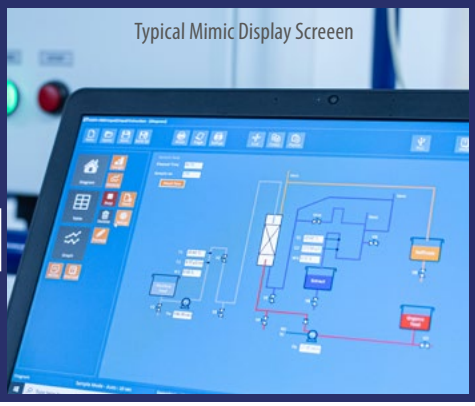
armSOFT

armSOFT data entry, data logging, acquisition and control software

Typical armSOFT aSUITE Controller Screen

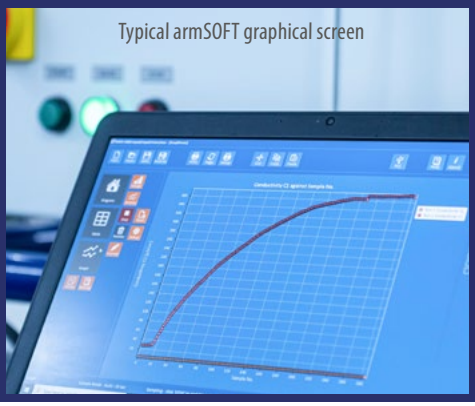
Available for many Armfield products, with a wide range of features

- Remote access
- Remote control
- Data logginig
- Realtime display
- Graph plotting
- Process results
- Export results to Excel
- Manual & automatic data entry
- Spreadsheet format
- Mimic diagrams
- Graphs
- Controller screen
- Intuitive interface
- Online help available
- Comes standard with many items



Typical Mimic Display Screeen

Typical Tabular Display



Typical armSOFT graphical screen

The armSOFT™ suite of software from Armfield delivers an intuitive and simple to use range of computer applications. The user interface is generic across the range providing powerful data entry, data logging, acquisition and control software with a wide range of features which is available for many Armfield products.

Requirements

PC

USB

Manual Data Entry - aBASIC

Some products are not suitable for data logging, and require the results to be input manually from primary instrumentation such as manometers or thermometers.

For these products the armSOFT aBASIC software offers a powerful tool for displaying and processing the results.

Requirements

PC

USB

Data logging Facilities - aLITE

Powerful data logging software with automatic or manual sampling.

The data is stored in spreadsheet format, which also contains any calculated values.

The software includes powerful graph plotting tools enabling numerous display options, including dual y axes, points or lines.

Requirements

PC

USB

Acquisition and Control - aSUITE

This package has all the data logging and general features of the armSOFT aLITE package, but also includes computer control.

A mimic diagram is used where set points and output values can be specified, PID loops can be tuned, and on-off switches can be controlled.

Hardware

armSOFT data logging products connect to the computer using USB interfaces. The USB interface is either built into the main equipment or via a separate control unit such as the IFD7.

The interface details can be seen in the requirements section for each individual product, to utilise the USB interface a computer is essential.

CA SERIES

Hardware/Software Control & Acquisition Systems

Link to armBUS

armBUS

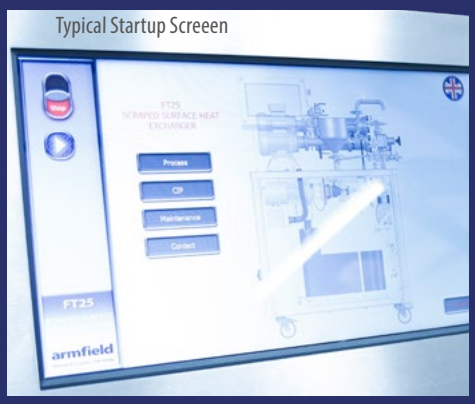
A revolutionary integrated hardware/software ecosystem, enabling the connection of teaching and research equipment to the modern world

The armBUS standardised interface makes operating Armfield products easy for teaching and research, producing reliable data or product across multiple area's of industry.

armBUS a radical system for integrating electronic measurement sensors and control devices onto teaching and research equipment. armBUS is a universal, single-wire interface which enables all peripheral sensors and control mechanisms to be connected to a digital bus with common ports. Connectivity is completely port independent, eliminating errors in the configuration of the system as well as enabling seamless integration of new sensors at any point in time.

armBUS can be interfaced to a variety of devices via a USB port, network port or wireless connection enabling the equipment to be operated with a PC, PC with touchscreen, optional LCD touchscreen or a mobile device such as a tablet.

Advantages of the armBUS system include improved reliability, improved interchangeability and improved accuracy. All sensors are pre-calibrated, eliminating the need for further calibration after installation or if a sensor is replaced.



Typical Startup Screeen

Typical Control Display


Graphing screen

Standard controls for all basic functions such as start-up & shut down

Data logging as standard, results can be analysed in armBUS or exported to a spreadsheet

Multiple languages are available

** Language options are product dependant*

Requirements

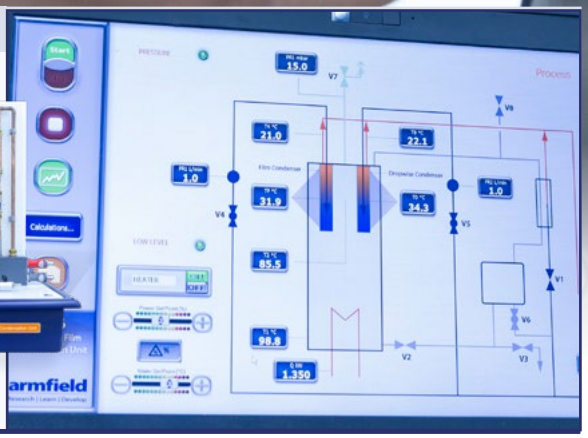
PC

USB

Hardware Acquisition and Control - armBUS TH6

TH6 Film and Dropwise Condensation Demonstration Unit

- Total control and monitoring of process parameters
- Can view trends in current parameters
- Comparison of current data to previous process runs possible in real time
- Quick save feature for data recovery



Requirements

PC

USB

Hardware Acquisition and Control - armBUS FT74XA

FT74XA Miniature-scale HTST/UHT processing system

- Total control and monitoring of process parameters
- Can view trends in current parameters
- Comparison of current data to previous process runs possible in real time
- Quick save feature for data recovery

Requirements

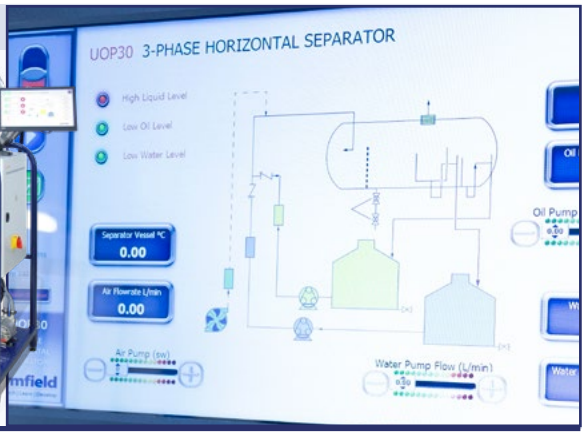
PC

USB

Hardware Acquisition and Control - armBUS UOP30

UOP30 3-Phase Horizontal Separator

- 3-Phase horizontal separator
- Visual demonstration of the entire separation process
- Software Control, PID and data logging via PC



armfield

Industrial Processing & Food Technology

Link to IFT Series

Research | Development | Production | Industry

Armfield can provide a complete solution to your requirements, offering not just the equipment but processing line advice, planning, installation, commissioning and training.

This range includes industry rated equipment for vocational training, research and development, small scale pilot and batch production for applications in the following fields:

- ▶ Dairy
- ▶ Ingredients
- ▶ Flavours & fragrances
- ▶ Edible & essential oils
- ▶ Liquid foods
- ▶ Beverages
- ▶ Cosmetics
- ▶ Pharmaceuticals
- ▶ Nutraceuticals

Products listed by process

Batch Heat Treatment/Pasteurisation

- FT19
- FT140
- FT141
- FT142

HTST/UHT Thermal Processing

- FT43
- FT75
- FT84
- FT94X
- FT94LT
- FT174X
- FT74XA

Homogenisation

- FT90
- FT91

Filling + Storage

- FT83
- FT85

Carbonation/Filling/Capping

- FT102X
- FT102LT
- FT104X

Deaeration

- FT51

Drying

- FT30
- FT31
- FT32
- FT33
- FT80/81 (Also has chilling capability)

Margarine Crystallisation

- FT21
- FT25 (20 & 40 bar Units)

Ice Cream Processing

- FT25X
- FT140X

CIP (clean in place)

- FT52

Mixing

- FT140X
- FT141
- FT142 (UHT capability)

Filtration - Microfiltration/Ultrafiltration/Nanonfiltration & Reverse Osmosis

- FT18-MKII - Different membranes available
- FT17 - Different membranes available

Chilling

- FT63 or FT64

Pressure Extraction

- FT2
- FT14
- FT28
- FT110X - 1 litre
- FT111X - 5, 10 & 20 litres available

Solvent Extraction

- FT29

Oil Neutralisation, Washing, Bleaching and Refining

- FT27
- FT66

Oil Deodorisation

- FT68

Hydrogenation

- FT67

Cheese Making

- FT20

Freezing

- FT34
- FT36

STERILE PROCESSING LINES

HTST/UHT System Options

- FT74XA - Plate + Tubular heat exchanger
- FT174X - Plate, Tube, Scraped surface H.E. + DSI
- FT94X - Up to 200l/h (option)
- FT94LT - Up to 100l/h

Homogeniser Options

- FT90 or FT91

Mixing Tanks

- FT140X - Various sizes and configurations available

Sterile Filling Station/Storage

- FT83 - Optional UV
- FT85

Chiller Options

- FT63 or FT64

Steam Generator

- UOP10

Industrial Processing & Food Technology

IFT SERIES

Laboratory Pasteurisation

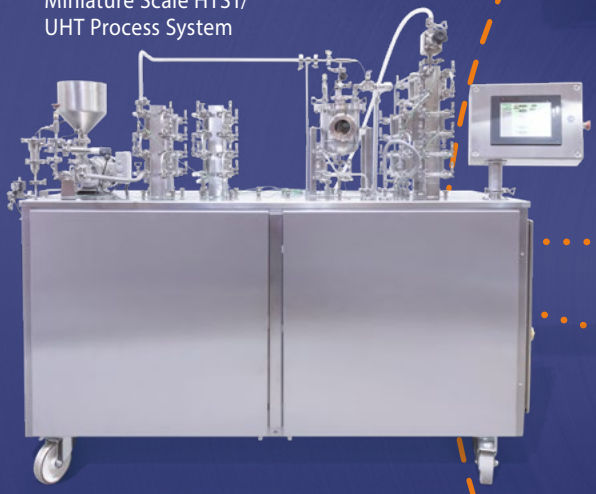
Link to IFT Dairy

The HTST/UHT processing equipment from Armfield allows you to create a modular heat treatment process line that can be reconfigured at any time.

From mixing and preparing the ingredients, through heat treating the product, storing it safely and filling it in a sterile environment, our equipment can safely simulate your processing needs.

FT140X Mixing Vessel

FT174X Modular Miniature Scale HTST/ UHT Process System



FT63 Laboratory Process Chiller

UOP10 Laboratory Steam Generator

FT85 Sterile Vessel

FT83 Sterile Filling System

The FT174X is a modular HTST/UHT processing system designed to treat products at flow rates of 10-40 l/h or up to 60 l/h for water (or similar low viscosity products)

Standard modules for direct heating (steam injection) or indirect heating (using tubular and/or plate heat exchangers), SSHE, aseptic processing, upstream or downstream homogenisation and additional chilling are available.

The touch-screen control panel makes it extremely user friendly and easy to configure and monitor processing parameters.

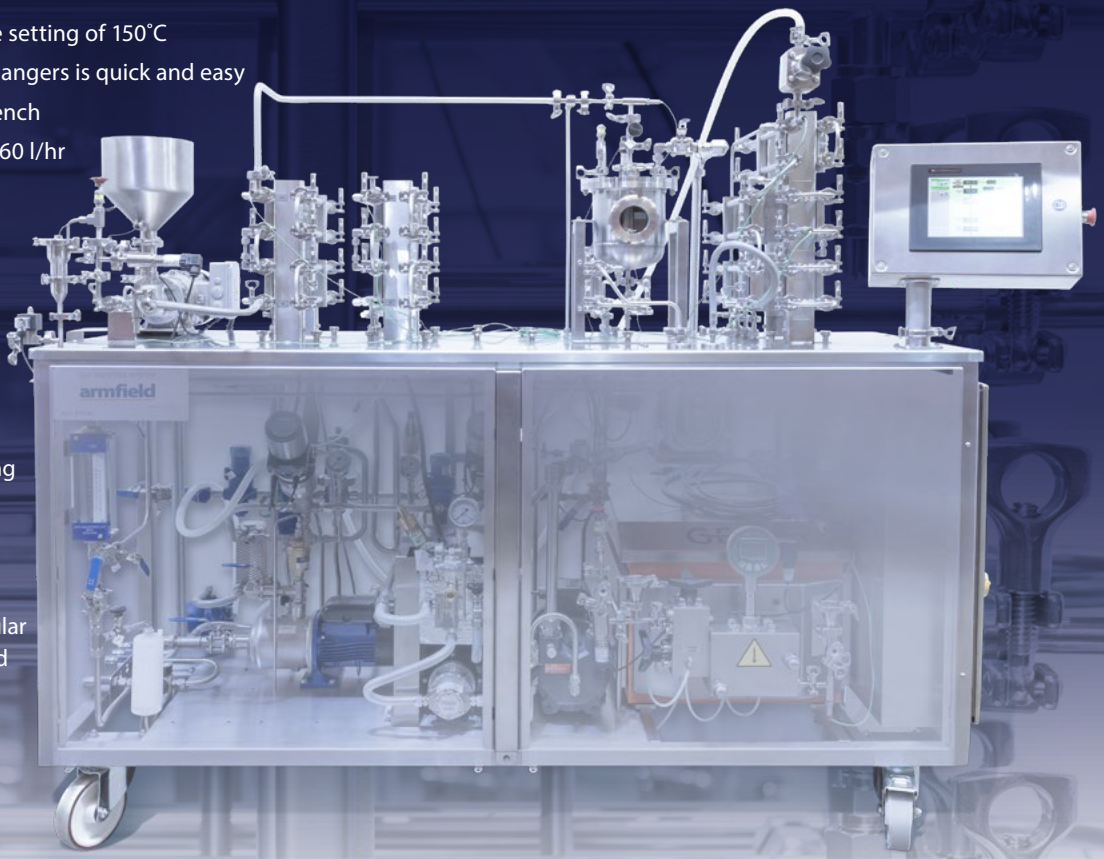
The operator is prompted at every stage whenever intervention is required.

These, along with many other options, enable multiple modules to be included in the same system, giving high process adaptability by reconfiguration of flexible product hoses, using quick-release connections.

The sterilisation options enable it to be linked to an Armfield sterile filling bench to produce sterile product, even when using long holding tubes and/or downstream homogenisation.

Options for increasing the automation of different sections are available.

- High degree of user configuration
- Rapid start-up and shut down
- Maximum product temperature setting of 150˚C
- Switch-over between heat exchangers is quick and easy
- Links directly to sterile filling bench
- Standard throughputs from 10-60 l/hr
- Direct and/or indirect heating
- Low product hold-up
- Totally modular system
- Full sterile capability options
- Touchscreen control panel
- Hygienic fittings as standard
- Integral homogeniser option
- Controllable preheat and cooling
- Built-in CIP facility
- USB data logging option
- Electronic flow meter option
- Small footprint can contain tubular & plate heat exchangers, scraped surface heat exchangers (SSHE), DSI module & homogeniser



Link to FT174X

Requirements

1Ph | 3Ph | COLD | COMP. AIR | DRAIN | STEAM

Modular Miniature-Scale HTST/UHT Process System - FT174X

Indirect and direct processing using plate, tubular and scraped surface heat exchangers as well as DSI (or any combination).

The system is capable of SIP and CIP and optional in line homogenisation for use upstream or downstream.

- Flow rates between 12-60 l/h
- Multiple option are available to enhance your processing requirements

Can be linked to **FT83 Sterile Filler** for ESL products

Industrial Processing & Food Technology

Link to FT74XA

The FT74XA is compact, mobile and easy to install. It has an integral pressurised hot water generator and requires only electricity and cooling water to operate making it ideal for confined spaces with limited services available.

Operation with either plate or tubular heat exchangers means a wide range of product viscosities can be handled.

A progressive cavity feed pump ensures that flow rates are independent of viscosity/backpressure changes and allow a maximum operating pressure of 10 bar.

Typical processing flow rates are 10-20 L/h with holding temperatures up to 150°C.

At pasteurisation temperatures flow rates of up to 60 L/h are achievable.

Cleaning is in place (CIP) utilises the feed pump in high flow rate mode and there is a centrifugal pump CIP option FT74XA-52 which generates very high cleaning velocities to deal with products that are particularly difficult to clean.

- Platinum resistance (PT100) temperature sensors for high accuracy
- Variable holding tube options
- Fully instrumented: product pressure and flowrate
- Two-stage cooling capability for plate and tubular heat exchangers
- Rapid switch-over between heat exchanger types
- Tests can be made with a few litres of product
- Suction feed capability to operate in conjunction with an external feed tank
- Independent operation or within a continuous process in both aseptic and non-aseptic modes
- Automated SIP capability
- Touchscreen control of all operations
- Independent pre-heat hot water loop and product temperature control
- Seamless homogenisation integration upstream or downstream with automatic speed control through the touchscreen
- Recipes saved in the system for instant set-up of operating parameters for particular products
- Backpressure control using a sprung diaphragm valve or pinch valve for products containing particals
- Controlled cooling
- On-screen calculation of holding times from flow meter reading and display of Fo value based on holding time and temperature

HTST/UHT System - FT74XA

The FT74XA is a highly flexible, miniature-scale HTST/UHT processing system which makes it ideal for new liquid product development.

It has a wide range of options to suit all needs and can be operated independently or as part of a continuous-operation process with other Armfield equipment.

- Platinum resistance temperature sensors for high accuracy
- Touchscreen control of all operations
- Two-stage cooling capability for plate and tubular heat exchangers
- armBUS control/instrumentation system increases reliability

Requirements

1Ph

3Ph

COLD

Requirements

1Ph
COMP. AIR
COLD
STEAM GENERATOR

HTST/UHT Mini Pilot System - FT94X

The Armfield FT94X HTST/UHT Mini Pilot system extends the range of continuous operation scaled-down units offered by Armfield to 30-100 l/hr.

The unit combines full flexibility – plate and tubular heat exchanger options - with comprehensive instrumentation demanded of research and development equipment.

Options up to 200 l/h can be provided on special request.

See **FT64** for suitable chiller

Requirements

1Ph
COMP. AIR
COLD
STEAM GENERATOR

HTST/UHT Mini Pilot System - FT94LT

FT94LT is a cost effective HTST/UHT processing system, capable of throughputs of 30-100 l/hr and process temperatures up to 150°C with a range of options, to tailor the product to your requirements.

Designed with flexibility in mind, the FT94LT Mini Pilot System is suitable for a wide range of applications, from fruit juices to ice cream, and pet food to pharmaceuticals.

See **FT64** for suitable chiller

Requirements

1Ph
COMP. AIR
COLD
STEAM GENERATOR

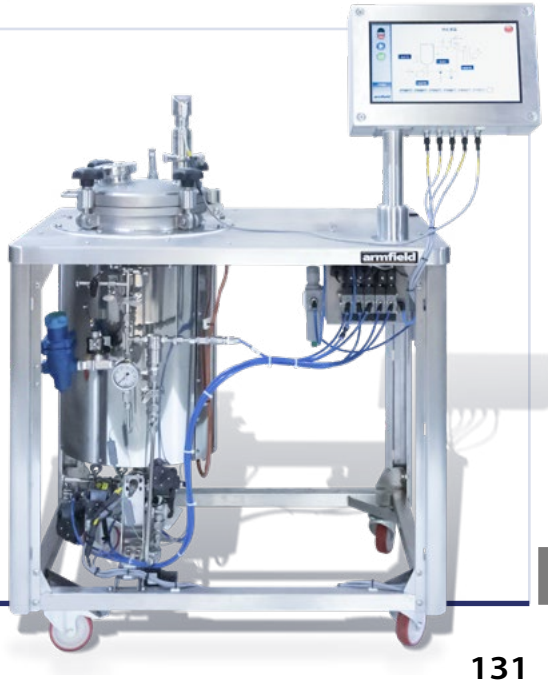
Sterile Vessel - FT85

The Armfield FT85 Sterile Vessel can store UHT processed product for sterile filling at a later point. It eliminates product wastage associated with pilot-scale continuous operation filling systems that lack buffering capacity.

The vessel is sited between Armfield's UHT processing units and the FT83 Sterile Filling System and is available with vessel sizes from 10 to 30 litres (other sizes on request).

It is designed for operation with Armfield systems, but can be operated with other equipment.

Optional Steam Generator **FT85-10** removes the need for a steam supply for sterilisation.



Microwave UHT Add-On - FT84

The Armfield Microwave UHT /HTST unit has been developed for the rapid heating of various types of viscous, nonviscous and even nonhomogeneous products.

Product temperatures up to 160°C can be reached. The product is heated in a short product tube enabling extremely rapid heating rates to be achieved.

The add-on unit is designed to be used in conjunction with the FT74XA, FT174X or FT94X, FT94LT UHT systems.

Requirements

- 3Ph

Sterile Filling System - FT83

The Armfield FT83 is the most cost-effective solution for R&D departments to produce sterile packaged samples with an excellent shelf life.

As well as a working chamber with a controlled, clean environment, the unit includes the facilities to enable all the product paths to be sterilised and for the filling to be controlled in a simple manner.

A nitrogen nozzle is included, which can be directed over the container while filling, to give low oxygen content in the packaged product. N_2 is supplied via a sterile filter.

- Integrated UV lamp option is available for increased environment sterility

Requirements

- 1Ph
- COMP. AIR
- UHT SYSTEM
- COLD
- N_2

Continuous In-line Deaerator - FT51

The Armfield FT51 deaerator unit has been designed to mirror the industrial processes of vacuum deaeration.

This unit enables small quantities of food and other liquid products to be processed conveniently in the laboratory it can be used in batch mode or in series with Armfield Thermal Processing Systems.

- N_2 gas can be introduced into the product in order to reach lower DO_2 levels (down to 0.5ppm)

Requirements

- 1Ph

Requirements

1Ph
3Ph
COLD

Homogenisation Sub-Systems - FT90/91

The FT90 and FT91 are complete in-line homogenisation sub-systems for use with Armfield miniature-scale food processing equipment.

The **FT90** is based on an APV LAB 1000 homogeniser and the **FT91** is based on a Niro Twin Panda.

Both homogenisers have been specifically optimised for this application.

▶ Can be operated upstream or downstream of HTST/UHT process or stand alone

Requirements

3Ph
COLD
COMP. AIR
STEAM GENERATOR

Multifunction Laboratory Mixer - FT141
Multifunction Laboratory Mixer UHT - FT142

The FT141 & FT142 offer flexible solutions to batch processing in the food laboratory. Requiring only small quantities of product, the systems provide results representative of large-scale industrial processes available in 10 or 20 liter sizes.

Ideal for R&D, the systems are suitable for high shear mixing, dispersing, homogenising, emulsifying, evaporation and vacuum deaerating.

The FT141 is capable of processing at 95% vacuum and up to 100°C, with the FT142 extending performance into UHT processing at up to 140°C and three bar pressure.

Requirements

1Ph
3Ph
COLD
DRAIN

Mixing Vessels- FT140X

Armfield FT140 Multipurpose Mixing Vessels are designed and constructed using high quality hygienic industry standard materials. These tanks are available in three models in varying configurations (see table) and are available in 50l and 100l volumes.

All three models have an internal surface made of AISI 316 stainless steel. Available with or without heating / high shear emulsifier.

Options are available with Colour Touch Screen and PLC control enables easy operation of stored recipes.

Requirements

1Ph

Cheese Vat - FT20

A stainless steel jacketed vat for the production of cheese by the traditional method. A separate electrical console provides control of paddle agitator speed, temperature and pH indication.

Now offered in 10 litre or 20 litre variants: **FT20-10 / FT20-20**

▶ FT20A Cheese Making Accessories

Industrial Processing & Food Technology

Link to Oils

Oil Preparation & Processing

Armfield is proud of its unique oils preparation and refining line of processing equipment. Using this equipment, you can take a raw seed from the plant, extract the oil and refine it to the purity you desire.

These units can create oils that are ready for sale or further downstream processing in various forms depending on your requirement.

FT29 Batch Solvent Extraction & Desolventising Unit

UOP10 Laboratory Steam Generator

FT66 Neutraliser/Washer/ Bleacher

FT68 Deodorising Unit

FT67 Hydrogenation Unit

FT25 Margarine Crystaliser

Edible oils have such a wide variety of forms and functions and are used in such a range of consumer products that constant redeveloping of new products and refining of the manufacturing process is becoming more of a necessity in modern manufacturing environment.

Link to FT25

The FT25 range of miniature-scale scraped surface heat exchangers has built-in control and flexibility with a graphic representation of the process on the touch screen control panel.

The operator can choose the parameters required for any particular formulation, these include margarine/ice cream/crystalisation processes.

The FT25 has a number of configurations according to the required use. Armfield miniature-scale technology is well established at offering developers the opportunity to run small trials, which provide enough information to enable scale-up to larger plant with confidence.

The formulations go through similar physico-chemical changes as they would in production plant and real time data logging permits results to be recorded and repeated.

FT25 - 40 bar

FEATURES & BENEFITS

- Duplicates full-scale process
- Fast, accurate new product development
- All process parameters under operator control for maximum flexibility
- Rugged and reliable units
- Only requires electricity and water to function
- Full control of barrel speeds to over 1400rpm
- Temperature control system incorporated
- Integral control panel enabling simple control and monitoring of all major variables
- Enclosed self-contained, mobile, stainless steel service cabinet for easy cleaning and wash down with removable panels
- Stainless steel barrel with PEEK scrapers
- Hygienic design
- Made from 316 stainless steel
- In cabinet refrigeration

FT25 - 20 bar

Requirements

Scraped Surface Heat Exchanger Systems - FT25

Various configurations of heat exchangers, pin workers and air incorporation are available to fulfil a wide range of process requirements. All options provide variable control of the process throughput. With controllable process speed and up to two independent controls for rotational speed, a wide range of process variations can be explored.

Typical configurations:

- Margarine Crystalliser
- Continuous Ice Cream Freezer
- Combined Margarine Crystalliser & Ice Cream Freezer
- Margarine / Spreads / Shortening Crystallizer

Neutraliser/Washer/Bleacher - FT66

A floor-standing 25 litre batch processing vessel capable of carrying out the important pre and post refining stages of crude edible oils.

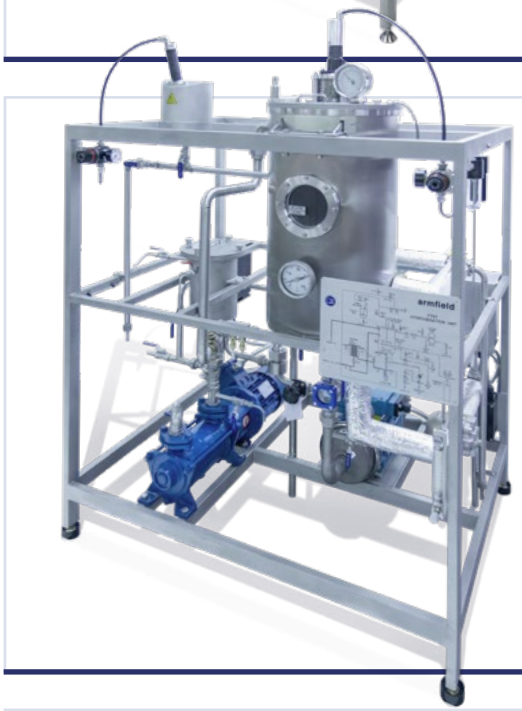
The three stages (neutralising, washing and bleaching) will:

- Turn the free fatty acids (FFA) into salt and water
- Remove any salt water and soaps generated during this process
- Filter the remaining material through a pressure leaf filter using diatomaceous earth as catalysts and filter aids

This will leave a clean oil of increased clarity and shelf stability.

Requirements

3Ph
COLD
COMP. AIR



Hydrogenation Unit - FT67

This floor-standing unit enables efficient gas/liquid mixing under controlled conditions for the study of 'hardening' of edible oils.

Hydrogen is added under temperature controlled conditions with a Nickel Raney Catalyst.

By breaking the double bonds in the unsaturated oils, they become less reactive and therefore more shelf-stable. The trade-off in product shelf-life and ease of manipulation can then be explored.

The FT67 is a floor-standing batch processing vessel, used to adjust the degree of saturation of 25-litre batches of edible oils. An integral part of the edible oil processing line, for use in teaching/training and research and development.

Requirements

3Ph
COLD
COMP. AIR
STEAM GENERATOR
DRAIN

Deodorising Unit - FT68

A vacuum steam distillation unit, suitable for demonstrating the removal of aromatic compounds from edible oils.

Using a combination of vacuum evaporation and steam stripping, extremely low pressures can be reached. This rapidly encourages the removal of volatile compounds, leaving an aroma-free oil.

The deodorising process vessel has a batch size of 25 litres and is mounted in a floor-standing stainless steel framework, which also houses the high-vacuum equipment, control console, discharge pump and polishing filter.

Requirements

3Ph
COLD
STEAM GENERATOR
DRAIN

Requirements

3Ph
COLD
STEAM GENERATOR
DRAIN

Batch Solvent Extraction & Desolventising Unit - FT29

A floor standing, self-contained 25kg batch process unit demonstrating a variety of solid/liquid extractions.

It is particularly suitable for 'leaching' edible oil from oil-bearing seeds and desolventising both the extracted solids and the miscella.

- Single extraction/desolventiser vessel
- Solvent/water recovery tank
- All flameproof construction
- ATEX approved
- Operation of small-scale version of industrial processes
- A wide variety of solid/liquid extractions may be processed
- Small quantities (25kg) can be processed
- Low waste disposal rate

Requirements

3Ph
COLD
COMP. AIR

Modular Cross Flow Filtration System - FT18-MKII

A small pilot-scale cross-flow filtration system designed to operate with a range of membrane module configurations.

It can be operated with as little as 5-10 litres of material to give data that is useful for process scale-up. It can be used over the full range of cross-flow filtration applications from microfiltration through to reverse osmosis.

- Integral data logging of all parameters
- Capable of Microfiltration / Ultrafiltration / Nanofiltration & Reverse Osmosis
- Ceramic, Spiral Wound, Tubular and Hollow Fibre membrane modules available

Requirements

1Ph
PC
USB

Cross Flow Membrane Filtration - FT17

A lab-scale system for evaluating membranes in a cross flow filtration application enabling rapid determination of cross flow filtration performance using a range of membrane types with small product volumes (1 litre).

It can also be used in teaching applications to demonstrate features of different membrane types and the effect of varying filtration variables.

- Variable retentate cross flow velocity over the filtration membrane
- Data logging of filtration pressure, permeate mass, retentate flow rate, retentate temperature
- Electronic balance to measure filtration performance
- Buffer addition / Diafiltration capabilities
- Optional retentate temperature control (FT17-15) with operating temp range of 5-60 °C

Industrial Processing & Food Technology

Link to IFT Beverages

Carbonation & Filling

Precise calculation of carbonation and consistently accurate filling are the core principles around which the FT102 Carbonator Filler was designed.

These characteristics allow you to assess the precise filling parameters your beverage will behave best under. This in turn allows you to perfect your recipe for boosting the desirable traits, and the filling process for maximising the filling efficiency.

FT140X Mixing Vessel

FT63 Laboratory Process Chiller

FT102X Carbonator/Filler

FT104X Filler/Capper

The FT102X design is highly versatile, boasting a large number of features to replicate a production scale process.

Both premix and postmix operations are available from the standard machine, and an option is available to add the syrup for postmix automatically. Other options enable deaeration of the product and evacuation of the bottles, continuous processing capability, and filling and capping (screw and/or crown) at a single station without removing the bottle.
The FT102X Carbonator Filler is easy to install, set up and use.

Colour touch screen control is used with a new graphical interface, enabling different carbonating and filling scenarios to be set and stored. The improved semi-automated cleaning programme takes the user step by step through the cleaning process and enables the unit to be made ready for another product or formulation.

The FT102X is ideally suited as a general purpose filling and carbonation installation for small laboratory applications. Used in conjunction with one of Armfield's FT74XA UHT/HTST units, a complete drinks line can be created in the laboratory; consisting of heat treatment, carbonation, filling and capping.

FT102 CIP Ball

Link to FT102X

Filling and capping options

PET Screw Cap

Crown Cap

Can

Carbonator/Filler - FT102X (shown with FT63 chiller option)

The Armfield miniature-scale carbonator enables precise and flexible carbonation and filling in the laboratory. This dramatically improves the speed with which new products can be developed.

Features:

- Carbonates in excess of 10g/l
- Deaerates
- Fills & caps PET & glass
- Fills cans
- In bottle pressure measurement

Option: Filling and crown seal capping and/or screw top capping at a single station 30l process vessel, positioned at a convenient height.

Requirements

- 1Ph
- COLD
- CO_2
- N_2

Filler/Capper - FT104X

The FT104X is a counter pressure filling station, which can be used as an add-on filling station for the FT102X.

Features:

- Extends filling & capping capacity of FT102X
- Enables different container types to be filled

Requirements

- 1Ph
- COLD
- CO_2
- N_2

Carbonator/Filler - FT102LT

The Armfield FT102X has a well deserved reputation for being simply the best Carbonator-Filler on the market.

The Armfield FT102LT utilises the same technology and most of the features and benefits, in a smaller, more cost effective package.

Features:

- Carbonates in excess of 10g/l
- Deaerates
- Fills & caps PET & glass
- Fills cans
- In bottle pressure measurement
- 15 litre feed vessel

Requirements

- 1Ph
- COLD
- COMP. AIR
- CO_2
- FT63

Requirements

1Ph
COLD
COMP. AIR
N_2

Bench-Top Rapid Extractor - FT110X

The Armfield unit uses high pressure and a combination of both static and dynamic extraction phases to achieve a rapid extraction of the active materials with minimum degradation to the product.

In the dynamic phases, the solvent is passed through the material providing a forced percolation and agitation.

Requires manual solvent priming.

- Computer Controlled
- Fast response. Results in hours rather than days
- Small scale, only one litre of raw material is required
- Simple cleaning and maintenance procedures
- Uses ethanol, glycerol, water or similar safe polar solvents
- Reproducible results
- Data logging

Requirements

1Ph
COLD
COMP. AIR
N_2

Laboratory-Scale Rapid Extractor - FT111X

The Armfield FT111X uses high pressure and a combination of both static and dynamic extraction phases to achieve a rapid extraction of the active materials with minimum degradation to the product.

In the dynamic phases, the solvent is passed through the material providing a forced percolation and agitation.

Features automatic solvent priming.

- Uses ethanol, glycerol, water or similar safe solvents
- Reproducible results
- Touch screen control
- Built in solvent tank
- Data logging recovery
- Remote control via VPN
- Fast, efficient solid/liquid extraction of active constituents from plants, herbs, fruits and other similar materials
- High pressure, room temperature extraction, excellent for sensitive materials

Requirements

3Ph
COLD
DRAIN

Mixing Vessels- FT140X

Armfield's Multipurpose Mixing Vessels are designed and constructed using high quality hygienic industry standard materials. These tanks are available in three models in varying configurations (see table) and are available in 50l and 100l volumes.

All three models have an internal surface made of AISI 316 stainless steel.

- Available with or without heating / high shear emulsifier.
- Electronic control speed for mixing agitator (20-60 rpm)
- Data logging to record process data
- 50l or 100l tanks available as standard
- CIP spray ball as standard

Options are available with Colour Touch Screen and PLC control enables easy operation of stored recipes.

Link to IFT Ingredients

Ingredient Preparation

Ingredients and constituents of the final products must sometimes travel large distances to where they are fully assembled.

To reduce the cost of this transportation some ingredients can be dehydrated at the source and rehydrated upon arrival at the final assembly site.

Products with a base of a common oil can be filtered to increase the concentration of the required ingredient, then diluted at the destination to the appropriate concentration.

FT32 Laboratory Drum Dryer

UOP10 Laboratory Steam Generator

FT142 Multifunction Laboratory Mixer UHT

FT80 Tall Form Spray Dryer

Requirements

3Ph

COMP. AIR

Tall Form Spray Dryer/Chiller FT80/81

The Armfield Tall Form Spray Dryer has been specifically designed to enable small quantities of product to be processed. The functional properties of the powders produced are comparable to large-scale production dryer capabilities.

The FT80 can be quickly and easily configured as a Spray Chiller (FT81) capable of handling products such as bakery shortening mixes containing high melting point fats to be converted from liquid to powder.

- Temperatures up to 250°C
- Max flow rate 7l/h
- Max evaporation rate 3l/h
- Measures relative humidity and all relevant chamber pressures.

Requirements

3Ph

DRAIN

STEAM GENERATOR

Drum Dryer - FT32

A steam-heated, nip fed twin cylinder roller dryer.

- Simple drying of a material to give moisture content and the drying time (or residence time) required
- Determination of drying curves to assess the feasibility of fluidised bed drying of a material on an industrial-scale. Drying curves are relevant to the mechanism of drying - they may be used as a basis for heat and mass balance, thermal efficiency of drying and dryer design
- Calculation of heat transfer coefficients for different conditions - important in dryer design and comparison of fluidised beds with other drying methods

Requirements

3Ph

COLD

DRAIN

Blast and Fluid Bed Freezer - FT36

A scaled-down insulated freezer cabinet combining two industrial processes for demonstration.

Independent control of the temperature and air flow on both tray and fluid bed sections enables a variety of conditions to be demonstrated.

A data logging accessory to store process data to a PC is available.

- Rapid freezing of food simulating production scale processes
- Investigations of temperature changes within foods and similar items over varying times can be examined on the small batch scale

Large Laboratory Process Chiller - FT64

Requirements

1Ph

The FT64 is a recirculating process chiller, providing a continuous supply of chilled liquid to serve as the cooling fluid when used with an Armfield miniature-scale processing unit.

The FT64 is particularly suitable for larger cooling duties and for use with the Armfield FT174X, FT94LT & FT94X systems.

Features:

- Low refrigerant charge
- Low running costs
- Easily cleaned and maintained

Laboratory Process Chiller - FT63

Requirements

1Ph

The unit is a recirculating process chiller, providing a continuous supply of chilled liquid to serve as the cooling fluid when used with an Armfield miniature-scale processing unit. The FT63 is particularly suitable for use with an Armfield FT74XA UHT and FT174X systems.

Features:

- Low refrigerant charge
- Low running costs
- Easily cleaned and maintained

CIP Unit- FT52

Requirements

1Ph

The Armfield FT52 has been designed to provide additional cleaning performance for Armfield FT units and other equipment.

It consists of a high flow rate stainless steel centrifugal pump mounted on a mobile frame

- Mobile unit with small footprint providing local CIP capability for pilot scale equipment
- Produces cleaning velocities in excess of the industry standard 1.5 m/s in Armfield systems
- Capable of flow rates up to 4.0 m^3/h
- High pressure hygienic flexible hoses and fittings for quick connection to Armfield equipment
- 5l stainless steel hopper for cleaning solutions

.

IFT SERIES

Industrial Food Trials Laboratory

Armfield's purpose built IFT laboratory can be used for testing, trial purposes and training

Trial:

- Mixing and Emulsification
- Homogenisation
- UHT and HTST Processing
- Sterile Filling
- Carbonation, Filling and Capping
- Spray Drying
- Solvent Extraction
- Crystallisation

Trials in the USA

Our subsidiary Armfield Inc In New Jersey, USA, also has a trials facility for UHT/HTST processing and carbonation, filling and capping.

Contact us to find out more about developing your future successes:

sales@armfield.co.uk

Laboratory Pasteuriser - FT75

This is an example of the modern high temperature, short time (HTST) pasteurisers used in commercial food production.

It utilises a three stage plate heat exchanger and provides an excellent classroom example of the 'production line' approach to food manufacturing, complete with the associated systems and control aspects.

Options include:

- CW-17 Chilled water circulator
- Data logging system FT75-DTA-ALITE
- Additional temperature sensor STS5

Requirements: 1Ph, PC, USB, COLD

Fluidised Bed Dryer - FT31

A range of materials from fine powders to food particulates can be used on this versatile laboratory-scale unit.

- High rates of heat and mass transfer
- Less than 15 minutes drying time
- Digital readout display

Requirements: 1Ph

Spray Dryer - FT30-MKIII

A bench top all-glass construction unit enabling continuous observation and measurement of this rapid drying process.

- 0-1.5 l/h product flow rate
- Air inlet temperature 200°C
- Can be used for beverages, heat sensitive material, dairy, plants, cereal and egg products

Requirements: 1Ph, COMP. AIR

CentriPeel Centrifuge - FT27

All stainless steel basket type separator designed to save time.

With an 9 litres per batch capacity and operating at up to 400G it reduces the time taken for gravity setting a liquid from several hours to a few minutes.

Applications:

- Dairy
- Liquid Foods
- Pharmaceuticals
- Nutraceuticals
- Flavours & Fragrances

Requirements: 1Ph

Requirements

3Ph

Oil Extraction Screw Press - FT28

A small capacity continuous press suitable for extracting edible oils from a variety of oil bearing seeds.

- Oil extraction screw press suitable for use in the laboratory
- Complete with feed hopper, manual feed chute and oil discharge
- 4kW electric motor
- Suitable for use with a wide range of seeds or ground meals

Requirements

1Ph

COLD

PC

USB

Laboratory Pasteuriser - FT43

A bench top unit duplicating the industrial HTST process on a practical scale for teaching. Holding times can be varied with throughput and temperature controlled from a separate comprehensive control console.

Low viscosity food samples as small as one litre can be processed in batches, or continuously processed with a throughput of 20 l/hr.

- Tests can be carried out quickly and easily
- Data logging system FT43-DTA-ALITE
- Simulates the conditions used in a production plant
- Small quantities of liquid product can be processed

Requirements

1Ph

USB

PC

COLD

DRAIN

Contact Plate Freezer - FT34-MKII

The Contact Plate Freezer enables previously prepared and packed products to be quick frozen using an industrial freezing process.

Ideal for project work, it illustrates the improvements in taste and texture, which are obtained by a process achieving fast freezing times compared with the slower domestic freezer process times.

Freezing is an ideal application for demonstrating the importance of data logging. The five temperature sensor outputs are available for this.

An optional data logger is available which can be used to display the freezing curves on a computer. This illustrates the freezing characteristics and shows the Thermal Arrest Time, during which ice crystals are formed.

Optional: FT34-DTA-ALITE Data Logging Accessory:

Requirements

1Ph

Vacuum Freeze Dryer - FT33-MKII

A bench-top unit enabling lyophilisation of heat sensitive materials. Fully self-contained including vacuum pump.

- The unit is operated via a colour touchscreen with a graphing facility to show temperatures and vacuum level in real-time
- Products can be frozen in the chamber before drying
- Designed for freeze drying biologically heat-sensitive materials contained in beakers or other vessels
- It can be considered to be a small-scale replica of commercial-scale pharmaceutical and food production machines

IFT SERIES

Food Technology

Link to FT22

Rising Film Evaporator FT22

The Armfield evaporator processes samples as small as 2.0 litres under conditions identical to those in production, sufficient to reveal the effect of heating on any ingredients newly introduced to the recipe.

As well as investigation of the effect on organoleptic and physico-chemical properties, the equipment can be used to prepare product for taste trials on a daily basis to ensure the quality of incoming raw material is consistent.

Only 0.65m² of floor space is required to install the evaporator and it has been designed to fit easily into a room of standard height.

Applications include the concentration of:

- Juices (fruit and vegetable)
- Milk and milk products
- Extracts (non-flammable)
- Effluents
- Nutritional products

Features and Benefits

- Small quantities of liquid products can be concentrated
- Easily cleaned and maintained
- Low product usage eases the disposal of waste
- Nominal throughput only 10 l/hr
- Single tube heat exchanger
- Integral CIP system
- Integral control console
- Integrated data logging and analysis

Rising Film Evaporator - FT22

A floor-standing unit using the steam-heated, climbing film principle to concentrate small quantities of liquid foods either continuously or in batches.
This unit has an integrated data logger. The important process parameters can be varied and monitored.

- Only 2 litres of raw material required to test new products
- Max evaporation rate - 10 l/hr
- Integral CIP system.

Requirements

Requirements

1Ph

Butter Churn - FT21

The Butter Churn provides practical training in the preparation of butter by the traditional method, and allows the investigation of the effect of process temperature and agitation time.

- 'Phase inversion' of the oil/water emulsion which occurs in churning
- Investigation of process temperature and agitation time in the agitation process
- Production of butter by various methods for quality and analytical determinations
- Mass balance quantitative yield of butter from various types of raw milk

Requirements

1Ph

Autoclave - FT19

A batch sterilising unit designed primarily for in-bottle production of sterilised milk.

- Highly portable autoclave requiring no plumbing to operate
- Time/temperature cycles can be defined to suit specific applications
- Sanitary 316 stainless steel construction and easily wiped down
- Lid is removable for full-width access

Requirements

1Ph

Disc Bowl Centrifuge - FT15

A self-contained centrifugal separator, demonstrating all aspects of cream/milk separation. Instrumentation is provided to measure varying bowl speeds and throughput rates.

Ancillary equipment for investigation into this type of separation consists of:

- Optical tachometer
- Product collecting vessels
- Stop clock
- Tools

The backboard includes a sectioned diagram detailing the component parts of the separator bowl and describing its mode of operation.

Requirements

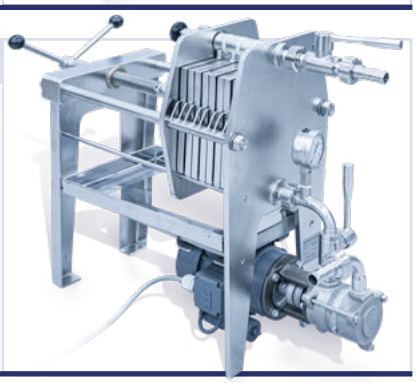
1Ph

Plate and Frame Filter Press - FT14

A small plate pack conveniently mounted on a stainless steel framework, enabling clear demonstration of mode of operation.

This type of filter is widely used in the food, pharmaceutical, brewing and distilling industries.

Several grades of filter media are supplied.



Requirements

1Ph

3Ph

Hammer/Beater Mill - FT2

A hammer mill, that is safe to operate and can be easily dismantled for cleaning. Designed for general laboratory grinding, the bench top unit is supplied with eight perforated plate screens.

Applications

- Seeds
- Nuts
- Other Biomass

Armfield Assist - 24 Hour Support Portal

Link to Support Portal

armfield assist

Armfield Assist is here to help, we have a 24hr online support portal where you can contact us or raise a support ticket, let us know what you need, installation, commissioning, advice, spares or technical back up.

Register or Login into the Armfield Assist Helpdesk Portal this will allow you to view, chase, edit or update your tickets at any time.

Tickets can be created by either:

- Visiting our Help Desk Portal at www.armfieldassist.com
- Emailing helpdesk@armfieldassist.com
- Calling our Support Team on +44 1425 478 781

Trial Facility's

Armfield have trials facilities in both Europe and the United States

Each facility has a selection of our equipment for industrial trials, check for availability or to arrange your trial now.

To book your trial with our experts
Europe : +44 (0)1425 478781
USA: +1 (609) 208-2800

Installation and Commissioning

Armfield offer global installation, commissioning and training by our highly experienced experts.

If you need assistance please contact our professional services team.

Contact us at ict@armfieldassist.com

Customer Training

Depending on your requirements, we can train individuals or groups, either on site or at our training facility.

Contact us at ict@armfieldassist.com

Custom Projects, Design, Software and Aesthetics

Armfield's team of Engineers continue to build on a comprehensive portfolio of original and innovative designs.

We are world leaders in educational products and flume technology for teaching and research and pioneers of the "Pilot Scale System that allows industrial food technologists small-scale simulation of large scale performance".

Our cutting-edge production facilities, talented engineers, software designers and installation team all work to ensure that top quality products are delivered to your facility, every time.

Custom projects

Advancements in technology ensure that Armfield's portfolio continues to develop and evolve.

We are keen to collaborate with universities and specialists to create bespoke production solutions against complex requirements and client concepts.

Our Project Management team are on hand to see your requirement through to completion.

Manufacturing

As an ISO 9001:2015 certified business, Armfield strives for quality.

We work continuously with our suppliers, contractors and production facilities to ensure that your product arrives on time, on budget and to specification.

Design

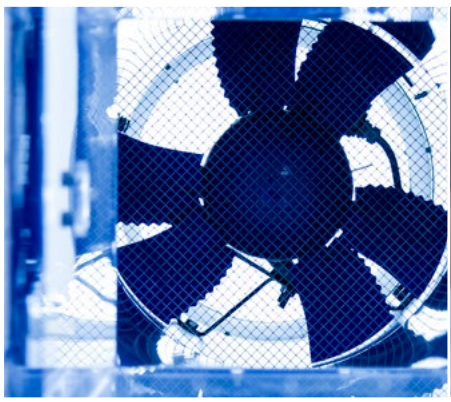
Products are conceptualised, developed and detailed using the latest computer-aided design software.

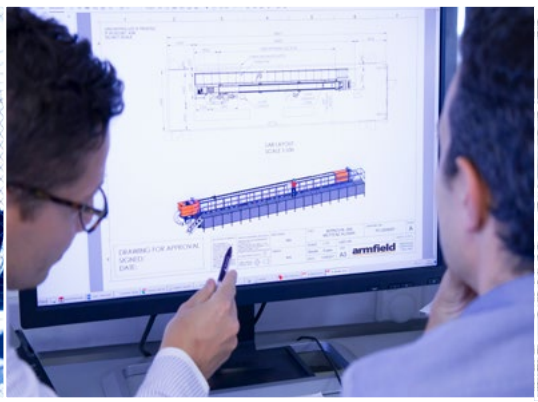
Coupled with computational fluid dynamics (CFD) & Finite Element Analysis (FEA) and 3D-print prototyping, our design process helps to ensure products are right first time.

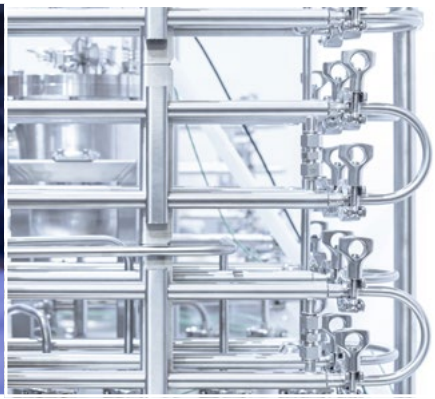
Aesthetics

Armfield is extremely proud of its brand identity: finished in striking blue and orange, each of our products are easily recognisable.

High quality materials including, composites, stainless steels and engineering plastics are used throughout our product range to ensure reliability in the harshest environments.







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Digital Catalogues

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Armfield Agents

Armfield products are distributed throughout the world. It is our policy in most countries to deal direct or through proven and accredited sales agents, who after suitable approval, may become exclusive representatives.

In exchange for this exclusivity they are required to offer a comprehensive service including the highest degree of after sales support.

Customer Demonstration

To arrange a demonstration please contact your local Armfield representative. Details can be found on our website here: **www.armfield.co.uk**, or contact Armfield HQ directly using the information below.

Your local Armfield Agent:

armfield worldwide

To locate a contact in your area visit:
www.armfield.com/contact

U.S. Head Office:

Armfield Inc.
9 Trenton Lakewood Road
Clarksburg NJ 08510
USA

Tel/Fax: +1 (609) 208-2800
E-mail: info@armfieldinc.com
Support: armfieldassist.com

Head Office:

Armfield Limited
10 Headlands Business Park
Ringwood, Hampshire
BH24 3PB England

Telephone: +44 (0)1425 478781
E-mail: sales@armfield.co.uk
Support: armfieldassist.com

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