SERIES

Product List - H1/H12/H30/H33/H40

The Armfield **H series** provides a complete range of hydraulics instruments for both teaching and research purposes.

The collection includes Vernier Hook and Point Gauges to measure the steady state water surface position. A selection of easy to use manometers measuring differential water pressures up to approximately 12.6 metres of water.

Pitot tubes designed for measuring the velocity of water in open channels or closed ducts. Propeller Velocity Meter used to measure very low point velocities in water and other conductive fluids. The range additionally introduces students into Particle image Velocimetry (PIV).

H series product list

Vernier hooks, point gauges & stands

Vernier hooks & point guages
 Electronic hook, point gauges & stands
 H1-1/H1-2/H1-3
 H1-7/H1-8/H1-1

Open water, pressurised, mercury & kerosene manometers

Open water manometers
 Pressurised water manometers
 Kerosene manometers
 H12-2
 H12-5

► Electronic pressure meters H12-8/H12-9

Pitot tubes

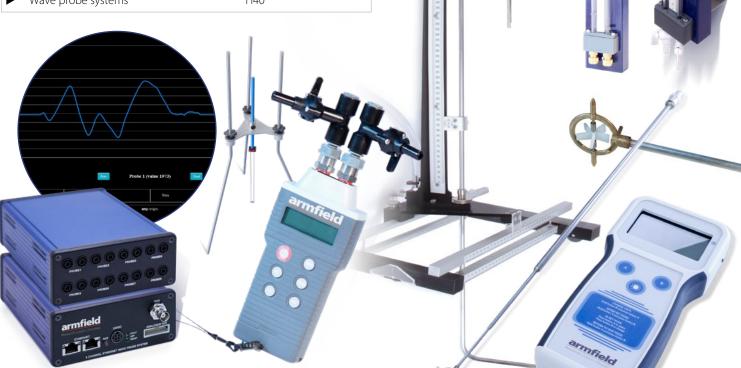
Pitot tubes H30

Propeller velocity flowmeter

► Propeller velocity flowmeter H33

Wave probe systems & Laser PIV system

► Wave probe systems H40



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Vernier Hook & Point Gauges - H1

H1-1: 150mm

H1-2: 300mm H1-3: 450mm

H1-1/H1-3 - Hook & Point Gauges

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.

Description - Vernier Hook & Point Gauges (H1-1, H1-2, H1-3)

A mounting frame is clamped to a suitable support structure and a gauging rod is free to slide up and down over the water surface. A stainless steel hook or point is attached to the bottom end of the rod and is used to locate the water surface.

Gauging is carried out by means of a primary scale attached to the mounting frame and a vernier scale attached to the rod. The scales are in edge contact.

The rod is held in a screwed collar for fine adjustment and can be

Ordering Specification

- A rugged low cost gauge for measurement of water surface position to ±0.20mm
- Mounting frame in enamelled cast aluminium
- Gauging rod and adjusting mechanism in bright plated brass
- Supplied complete with stainless steel hook and point

HT1 Accessories

Ranges:

► **H1-11:** Tripod stand

Technical specifications

Resolution: ±0.10mm released for large, rapid changes of position. Zero can be reset by a locking screw positioned on the vernier scale. Typical accuracy: ±0.20mm Repeatability: +0.10mm **Demonstration Capabilities H1-1:** 150mm **H1-2:** 300mm **H1-3:** 450mm Location of air-water surface boundaries with high resolution Measurement of slowly changing water levels in flumes and hydraulic models Measurement of mechanical deformation **Overall dimensions** H1-1 (150mm): Length 265mm Width 75mm Height 50mm H1-2 (300mm): 160 Length 415mm Width 75mm Height 50mm H1-3 (450mm): 130 Length 565mm Width 75mm 50mm Height Packed and crated shipping specifications Product Gross Weight **Ordering codes** Volume 0.01 m^3 H1-1 (150mm): 1.2kg ► H1-1 0.01 m^3 H1-2 (300mm): 1.5kg ► H1-2 ► H1-3 0.01 m^3 H1-3 (450mm): 1.7kg

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Digital Hook & Point Gauges - H1

H1-7/H1-8 - Digital Hook & Point Gauges

A range of digital hook and point gauges which includes a liquid crystal display which indicates the movement of the gauging rod.

A push button sets the display to zero at any position, allowing the measurement of movement relative to a datum.

Description - Digital Hook & Point Gauges (H1-7, H1-8)

A mounting plate is clamped to a suitable support structure and a flat vertical shaft retained by the gauging unit is free to slide up and down over the water surface.

A steel point or hook is attached to the bottom end of the shaft and is used to locate the water surface.

The gauging unit consists of a liquid crystal electronic display which indicates the movements of the shaft.

A quick-release mechanism permits large changes to be rapidly accommodated, and a screw adjustment is provided for accurate final positioning.

A push button sets the display to zero at any position, so that relative movements compared with a datum can be easily measured.

This gauge is easy to use and minimises potential errors resulting from reading vernier scales.

Ordering Specification

- ► A direct indicating gauge which eliminates observation errors due to vernier and scale reading.
- Can be set to zero anywhere in the operating range to permit easy relative level checking.
- ► The liquid crystal display is easy to read and has a resolution of ±0.01mm.
- A push button gives immediate change to inches from millimetres if required.
- A quick-release mechanism permits rapid changes of position.

Overall dimensions

H1-7 (300mm):

	Length	450mm
Width 75mm	Width	75mm
Height 40mm	Height	40mm

H1-8 (500mm):

Length	650mm
Width	75mm
Height	40mm

Packed and crated shipping specifications

Product	Volume	Gross Weight
H1-7 (300mm):	0.01 m ³	2kg
H1-8 (500mm):	0.02 m ³	2.5kg

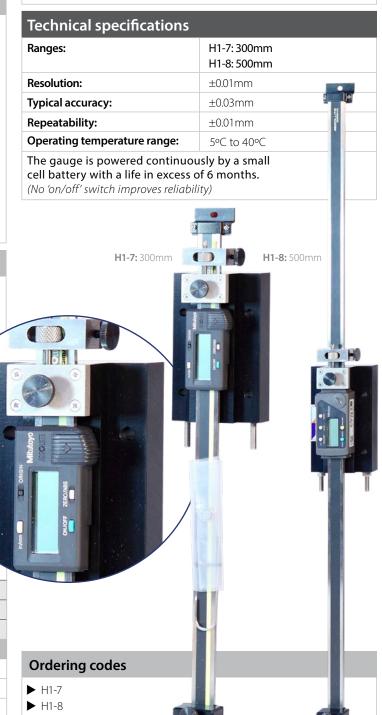
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Demonstration Capabilities

► Measurement of steady state of water with digital display

HT1 Accessories

► H1-11: Adjustable Tripod stand with mountings





Tripod Stands - H1-11

HT1-11 - Tripod Stand

A mounting tripod constructed from aluminium alloy is supported on three stainless steel rods secured by thumbscrews.

The rods are adjustable allowing the stand to be made level.

Description - Tripod Stand (H1-11)

This stand is suitable for use with vernier type Hook & Point gauges (H1-1, H1-2, H1-3) and the Pitot Tubes (H30). It is essential for the convenient use of the gauges in physical models. Also includes mountings and a clamp plate to make it suitable for other instruments, i.e. the Digital Hook and Point gauges (H1-7, H1-8), the micropropeller used on H32 and Propeller Velocity Flowmeter (H33).

Levelling is assisted by use of a 'Bullseye' spirit level mounted on the top plate.

A carrier plate mounted on the tripod supports the gauge. The whole assembly may be adjusted for height on the support rods.



Technical specifications		
Product:	H1-11	
Ranges:	500mm (normal)	
Diameter of base:	340mm	
Overall height:	660mm (without gauge)	

Overall dimensions		
H1-11:		
Length	340mm	
Width	340mm	
Height	660mm	
Packed and crated shipping specifications		
Product	Volume	Gross Weight
H1-11:	0.15 m ³	6kg
		,

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Ordering codes

► H1-11 Adjustable tripod stand with mountings

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H12-1/H12-7 - Liquid Manometers

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

Description - Liquid Manometers (H12-1/H12-7)

A range of manometers measuring differential water pressures up to approximately 12.6m H2O. Scales are graduated in 1mm divisions.

H12-1: 1 metre scale differential open water manometer

H12-2: 1 metre scale differential pressurised water manometer (the air space above the tubes can be pressurised with the pump supplied)

H12-5: 500mm scale differential kerosene over water manometer - Range 0.213m H2O

Accessories

H12-6: Free-standing column with height adjustment to take two manometers

H12-7: Self-sealing and self-bleeding pressure tapping system which allows a pair of pressurised water or mercury manometers to be connected into and disconnected from a number of points around a pumped system.

The equipment consists of ten self-sealing pressure tapping points with 1/4" BSP male threads for fitting into the system and four self-bleeding pressure tapping lines for connection to two differential manometers. Tapping line bleeding is obtained with four in-line vented shut-off valves conveniently mounted on a fixing bracket. The system is supplied complete with a quantity of translucent plastic tubing.

Demonstration Capabilities

- ► Low cost and easy to use instruments
- Wide range of pressures accommodated using different manometer fluids

Ordering Specification

See description:

NOTE: Due to its hazardous nature and severe shipping restrictions, Mercury is not included in Armfield's scope of supply.

Overall dimensions

See description:

Packed and crated shipping specifications

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Product	Volume	Gross Weight	
H12-1/H12-7	0.1 m ³	21.5kg	

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Liquid Manometers & Meters - H12



Ordering codes► H12-1 ► H12-2 ► H12-5







Portable Pressure Meter - H12-8

H12-8 - Liquid Manometers & Meters

A versatile, hand held, battery operated portable pressure meter capable of measuring pressures of water or air from 0 - 2000 mBar (0 - 1500mmHq).

This unit is particularly suitable for use in applications where Mercury manometers have traditionally been used. The use of Mercury is not desirable in a laboratory environment due to its hazardous nature.

Description - Portable Pressure Meter H12-8

A battery operated portable pressure meter suitable for measuring gauge (single input) or differential (dual inputs) pressures of air or water.

Measurement capacity is up to 2 Bar differentially and the unit is capable of withstanding 6 Bar on either port without damage.

Housed in a robust, waterproof case and designed to be hand held. Supplied with connections to suit 6mm flexible hose.

An adjustable zero value eliminates offset and an averaging filter function provides steady readings in situations where the pressure is fluctuating. Readings can be displayed in alternative pressure units.

A calibration certificate referred to National Physical Laboratory (NPL: 5 point calibration) or United Kingdom Accreditation Service (UKAS: 10 point calibration) standards can be supplied if ordered with the meter.

Technical Details		
Measuring range:	0 - 2000mBar (0 - 1500mmHg)	
Units: (selectable)	mBar, mmHg, psi, inH2O, inHg, kPa, cmH2O, kgcm-2	
Resolution:	1mBar (1mmHg)	
Accuracy:	+/-0.2% of full scale	
Maximum overpressure:	6200 mBar (4650 mmHg)	
Temperature range:	0 - 50°C	
Humidity range:	10 - 90% RH non- condensing	
Protection:	Dust and waterproof to IP67	
Fluid compatibility:	Silicon protection for use with water without sensor corrosion	
Connections:	1/8″ BSP parallel female with adaptor to 6mm/9mm flexible tubing	
Battery type:	MN1604	
Battery life:	90 hours	

Overall dimensions			
Length	250mm		
Width	100mm		
Height	40mm		
Packed and crated shipping specifications			
Product	Volume	Gross Weight	
H12-8	0.005m ³	1kg	

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Ordering Specification

H12-8

Basic Portable Pressure Meter



Ordering codes

► H12-8

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Portable Pressure Meter - H12-9

H12-8 - Liquid Manometers & Meters

A versatile, hand held, battery operated portable pressure meter capable of measuring pressures of water or air from 0 - 140 mBar(0 - 99.99mmHg).

Description - Portable Pressure Meter H12-8

A battery operated portable pressure meter suitable for measuring gauge (single input) or differential (dual inputs) pressures of air or water.

Measurement capacity is up to 140 mBar differentially and the unit is capable of withstanding 400 mBar on either port without damage.

Housed in a robust, waterproof case and designed to be hand held. Supplied with connections to suit 6mm flexible hose.

An adjustable zero value eliminates offset and an averaging filter function provides steady readings in situations where the pressure is fluctuating. Readings can be displayed in alternative pressure units.

A calibration certificate referred to National Physical Laboratory (NPL: 5 point calibration) or United Kingdom Accreditation Service (UKAS: 10 point calibration) standards can be supplied if ordered with the meter.

Technical Details	
Measuring range:	0 - 140mBar (0 - 99.99mmHg)
Units: (selectable)	mBar, mmHg, psi, inH2O, inHg, kPa, cmH2O, kgcm-2
Resolution:	0.1mBar (0.01mmHg)
Accuracy:	+/-0.2% of full scale
Repeatability:	+/-0.1% of full scale
Maximum overpressure:	400 mBar
Temperature range:	0 - 50°C
Humidity range:	10 - 90% RH non- condensing
Protection:	Dust and waterproof to IP67
Fluid compatibility:	Silicon protection for use with water without sensor corrosion
Connections:	1/8" BSP parallel female with adaptor to 6mm/9mm flexible tubing
Battery type:	MN1604
Battery life:	90 hours

Overall dimensions			
Length	250mm		
Width	100mm		
Height	40mm		
Packed and crated shipping specifications			
Product	Volume	Gross Weight	
H12-9	0.005m ³	1kg	

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Ordering Specification

► H12-9

Basic Portable Pressure Meter



Ordering codes

► H12-9

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URL: http://www.armfield.co.uk/h1 ChE ME CE IP

Hydraulic Measurement Instruments/H series

H30-1H

130 120

► H30-1H

Pitot Tube - H30



H30-1H/H30-3H - Pitot Tubes

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

Description

Tubes are in stainless steel and mounted on a supporting body with scale. They are supplied with a watertight gland for installation below

In order to measure velocity, the Pitot tubes must be connected to a manometer, such as the Armfield H12-8 or H12-9.

When used with the H12-9, the range is 0 - 5.2m/s. When used with the H12-8 the range is 0 - 19.8m/s

Ordering Specification

H30-1H:

- 150mm Pitot tube
- 150mm traverse Pitot tube supplied with connectors and
- 10m tubing

H30-2H:

- 300mm Pitot tube
- 300mm traverse Pitot tube supplied with connectors and
- 10m tubing

H30-3H:

- 450mm Pitot tube
- 450mm traverse Pitot tube supplied with connectors and
- 10m tubing

Accessories

H1-11: Adjustable Tripod stand **H12-8:** Portable pressure meters **H12-9:** Portable pressure meters



Overall dimensions

See Order Specifications

Packed and crated shipping specifications			
Product	Volume	Gross Weight	
H30-1H/H30-2H/H30-3H	0.1m ³	5kg	

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Propeller Velocity Flowmeter - H33/H33-10

THE H33/H33-10 IS USED TO MEASURE, INDICATE AND RECORD VERY LOW VELOCITIES OF WATER AND OTHER CONDUCTIVE FLUIDS.

H33 - Propeller Probes

The sensor probe has a small impeller at one end, and a BNC connector at the other, joined via a slim, stainless steel tube. The use of two probes allows the range of detectable velocities to be extended up to 300 cm/sec. The indicator is supplied, as standard, with a set of rechargeable batteries. It can also be mains powered via the supplied universal charger.

Description - H33

The measuring head comprises of a 5 bladed PVC rotor mounted on a hardened, stainless steel spindle terminated into burnished conical pivots, resulting in minimal frictional resistance. This is all assembled and enclosed in a brass shrouded frame. An insulated gold wire contained within the tube terminates 0.1 mm from the rotor blade tips. When the rotor is revolved by the movement of a conductive liquid, the passage of the rotor blades past the gold wire tip slightly varies the measurable impedance between the tip and the tube. This variation is used to modulate a 15 kHz carrier signal, generated within the indicating instrument which in turn is applied to the electronic detector circuits. All components have been chosen carefully to give a long reliable life with minimal changes in calibration.

Automatic compensation is made for changes in liquid conductivity. Following amplification and filtering out of the carrier frequency, a square wave signal is obtained. In the digital indicator the pulses are counted over a known time period to obtain a digital reading.

Probes

- ► **H33-1:** Standard low speed velocity probe for the range 5.0 to 150 cm/sec
- ► H33-2: Standard high speed velocity probe for the range 60 to 300 cm/sec
- ► H33-3: 90 Degree angled probe to measure vertical velocities over the range 5.0 to 150 cm/sec

Technical Details H33

Rotor:	11.6 mm diameter, machined plastic (balanced)
Spindle:	Hardened stainless steel with conical ends
Bearings:	Synthetic sapphire vee jewels
Cage:	Heavy Chromium plated brass
Stem:	Stainless steel
Electrical connector:	Co-axial
Weight:	0.20kg
Immersion length:	420mm maximum

Accessories

H1-11: Adjustable Tripod stand with mountings

Packed and crated shipping specifications

Product	Volume	Gross Weight
H33/1/2/3:	0.1m ³	2kg
H33-10:	0.1m ³	5kg

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H33-10 - Digital Indicator

The digital indicator has been developed for use with the miniature propeller probes H33-1/2/3 where laboratory or field measurement of water velocity is required.

Description - H33-10

The H33-10 digital indicator provides all required functions in one compact unit. The power supply/charger is universal and incorporates a range of mains type fittings to enable the unit to be used virtually anywhere in the world at 110 or 230 V a.c. 50 or 60 Hz. The indicator is supplied with a full set of Nickel metal hydride batteries.

The indicator can read frequency over 1 second or 10 second, can be set to count frequency, or can be programmed to read velocity directly in cm/sec using data from the individual probes calibration certificate. A 0 to 5 V DC output is available for driving data loggers and chart recorders and this can be programmed to any frequency range.

Technical Details H33-10

recinical Details (155-10	
Power:	Nickel metal hydride battery or mains power
Battery life:	Typically 300 hrs on full charge
Display:	Dot matrix LCD display
Controls:	On/off and A + B buttons
Input:	BNC
Output Socket	3.5 mm Aux Jack
Output	0.5 V DC - 100 MS update rate
Velocity Range	5 to 150 & 60 to 300 cm/sec using two sensing probes
Accuracy	± 1.5% of true velocity
Scaling	Digital indicators scaled in HZ or cm/sec, Conversion to cm/sec by means of individual calibration curves
Operating Temp.	0 to 50C
Weight:	540g



Issue: 4 Applications
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Wave Probe System - H40-MKII

H40-MKII - Wave Probe System

The H40-MKII is suitable for use in:

2D flume: For this configuration, the wave probes are supplied with a mounting block allowing the calibration stem, that is fixed to the wave probe head, to be attached to any vertical surface.

3D wave basin: For basins, The H40-MKII-7 Twin Wire Wave Probe Tripod is used for mounting the 600 to 1200 mm wave probes. For shallow water up to 1m depth, a smaller stand to fit 300 mm wave probes is available.

Description - H40-MKII

The H40-MKII 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. If more than eight probes are required to be used at the same time in the physical model then multiple cases can be linked together, so that only one computer is required for configuration.

The input connections for the wave probes are provided using 4mm sockets on one face of the case. The opposite face has connections to allow the device to be directly connected to a computer via an Ethernet cable and to an existing data acquisition system using analogue signal outputs. The unit is powered from an external 24Vdc laptop-style power supply.

The wave probe case is set up using a built-in web page which is accessed from the PC using the network connection. Whilst testing is underway the data acquired by the instrument is also transmitted over the network connection for collection by appropriate software(not supplied by Armfield).

The wave probe operates by measuring the current that flows between two stainless steel wires that are immersed in water. This current is converted to an output voltage that is directly proportional to the immersed depth. Each wave probe case contains the energising and sensing circuits for the operation of eight wave probes and provides an output voltage (0-5V) for all eight channels on a 16-way output connector. In order to avoid polarisation effects at the probe, a high frequency square wave is used to energise the probe.

Adjacent probes are set to different frequencies to allow probes to be used close together without causing any interference. Each wave probe channel contains circuitry designed to compensate for the resistance of the cable that connects the probe to the wave probe unit. Without this compensation, the output of the wave probe monitor would be non-linear.

The probe output voltage is converted to a digital reading using an analogue to digital converter and the readings are batched and transmitted over the network in packets of data at a rate of 100 samples per second. The configuration process allows the user to set the output level for a given initial probe immersion. This enables the user to scale the output, from zero (no water over probe) to maximum output for a desired full scale immersion.

The wave probes comprise two parallel stainless steel rods with a plastic head and foot. The head is fixed to the calibration stem and a mounting block is supplied that allows the calibration stem to be fixed to any vertical surface.

Overall dimensions

Length 250mm/Width 100mm/Height 40mm

Packed and crated shipping specifications

H40-MKII 0.1m³ 3kg

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Features/benefits

- Extremely linear output
- No hysterisis
- Reliable, proven design, easily calibrated
- ► Longer distances from the data acquisition PC can be achieved by linking two wave probe cases together
- Suppled with 8 channels as standard
- ▶ Data can be logged directly into a computer via the network link

Technical specification (Wave probe case)		
Case configuration:	8 channels (wave probes)	
Output signals:	EtherNET digital output comms cable network to data acquisition PC 0-5 V via 16-wayIDC connector	
Excitation frequency:	3 kHz to 11 kHz	
Filter band width:	-3 dB at 2 0Hz	
Supply voltage:	220 or 110 V ±10% 40-60 Hz	
Trigger function:	+5 V input signal trigger	

Technical specification (Wave probe)		
Active working range:	300, 600, 900, 1200mm	
Probe diameter (300mm):	1.6mm	
Probe diameter (600, 900, 1200mm):	6.0mm	
Probe cable length:	30m (Supplied)	

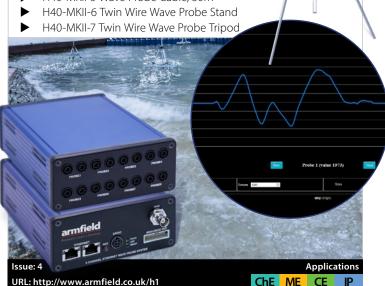
Probe diameter (600, 900, 1200mm): Probe cable length: 30m (Supplied) Requirements Scale

Electrical supply: 110/120V, 60Hz or 220/240V, 50Hz

PC with a USB port, running Windows 7 or above

Ordering codes

- ► 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-5 Wave Probe Cable, 30m



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