

➤ World leading supplier of engineering teaching equipment

H102 Heat Exchange Unit

A professional range of teaching equipment

Heat Transfer



This Fourth-Generation heat exchange unit provides class leading study covering a wide range of heat exchange types, such as:

- Concentric Tube Heat Exchanger
- Plate Heat Exchanger
- Shell & Tube Heat Exchanger
- Jacketed Vessel with Coil and Stirrer
- Extended Concentric Tube Heat Exchanger
- Extended Plate Heat Exchanger
- Water Water Turbulent Flow Heat Exchanger
- Coiled Concentric Tube Heat Exchanger
- Recycle Loops
- Film and Dropwise Condensation
- Water to Air Heat Exchanger Module
- Image is of an H102/230 base unit fitted with optional H102C accessory



Heat Exchange



Heat exchange is central to a student's understanding of thermodynamic principles where there is a transfer of heat between two, or more fluids.

Heat exchange is widely used in commercial applications such as space heating, refrigeration, air conditioning, power stations, chemical plants, petroleum refineries, natural-gas processing and sewage treatment.

The P.A. Hilton heat exchange unit allows students to study the two primary forms of heat exchange these being: co current and counter current flow.



HDL D103 - Data Acquisition

- The H102 service unit (H1102/230/HC & H102/115/HC) where applicable, utilise an industrial standard HDL D103 21 channel data logger for data collection. Output data as per table.

H102/230/HC or H102/115/HC	H102G/HC	H102K/HC
Hot water outlet °C	Hot water outlet °C	Liquid Temp °C
Hot Water return °C	Hot Water return °C	Surface °C
Cold Water outlet °C	Cold Water outlet °C	Water inlet °C
Cold Water return °C	Cold Water return °C	Water outlet °C
Cold water flow	Intermediate °C	Chamber Pressure
Hot water flow	Intermediate °C	Cooling water flow
Supply volts	Intermediate °C	Supply Volts
Module Temp °C	Intermediate °C	
Module Temp °C	Cold water flow	
Module Temp °C	Hot water flow	
Module Temp °C	Intermediate °C	
Module Temp °C	Intermediate °C	
Module Temp °C	Intermediate °C	
Module Temp °C	Intermediate °C	
Module Temp °C	Intermediate °C	
Module Temp °C	Intermediate °C	
Module Temp °C	Supply Volts	
Module Temp °C		
Module Temp °C		
Module Temp °C		

H102 Series

A bench mounted, steel unit with integral electrical console that provides services for any of the optional heat exchangers.

PID Temperature controlled hot water is provided from an electrically heated tank by a continuously rated fixed speed pump. Mains cold water is pressure regulated. Hot and Cold flow is controlled and measured using variable area flowmeters. The optional heat exchangers are connected to the service unit using non-drip, self-sealing couplings.

Electrical safety is provided by double pole overload and earth leakage circuit breakers. The hot water system is equipped with a safety thermostat.



H102A Concentric Tube Heat Exchanger

- Two separate concentric tubes arranged in parallel in a U format to reduce the overall length
- Provide a mid-position measuring point for both fluid streams
- Mounted on the H102 panel fascia and retained by locking pipe clips (can be fitted along with the H102B and C) at same time
- Quick and easy to connect to H102 water hoses quick release connections

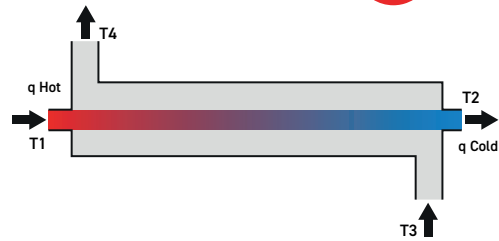
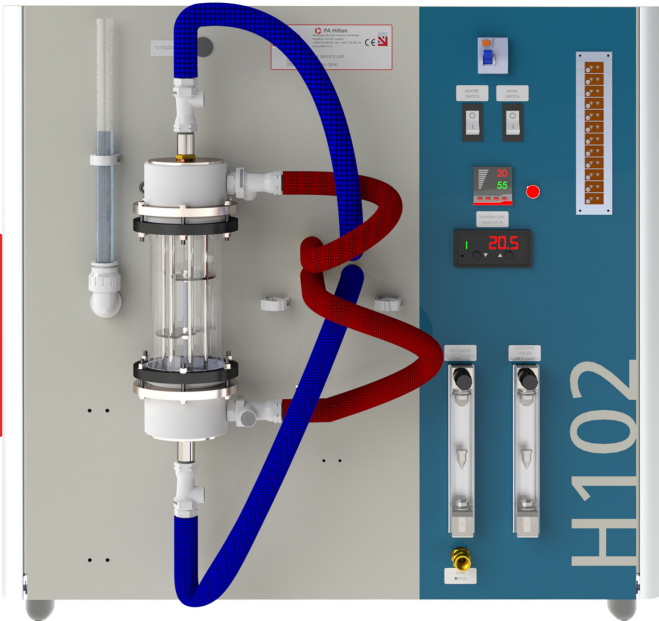
H102B Plate Heat Exchanger

- Multiple brazed stainless steel plates
- Four thermocouples measure hot and cold fluid entry and exit temperatures
- Self-sealing quick release connections
- Mounts onto the H102 fascia panel (can be fitted along with the H102A and C)



H102C Shell and Tube Heat Exchanger

- Thick walled glass shell with 2 baffles and 7 stainless steel tubes
- Four thermocouples measure hot and cold fluid entry and exit temperatures
- Mounted on the H102 panel fascia (can be fitted along with the H102A and B)



H102 Heat Exchanger Service Unit

- Bench mounted panel with integral electric console
- 11 types of Heat Exchangers can be used on the Unit
- Safe and suitable for unsupervised student operation
- Responds rapidly to control changes
- Negligible operating and maintenance costs
- Re-circulating hot water circuit
- Available as either 230v, or 115v
- Optional computerised Data Acquisition Upgrade - HDL® D103 and software
- Image is of an H102/230 base unit fitted with optional H102C accessory

H102D Jacketed Vessel with Coil and Stirrer

- A vessel with a clear top and glass outer jacket
- Vessel contents of up to 2 litres
- Five thermocouples measure hot inlet and exit temperatures and a probe
- Glass coil can be used to emulate an immersion element
- Batch heating experimentation



H102H Coiled Concentric Tube Heat Exchanger

- Demonstration of indirect heating or cooling by transfer of heat from one fluid stream to another when separated by a solid wall
- Conducting an energy balance across a concentric exchanger and calculate the overall efficiency at different fluid flow rates and directions



H102E Extended Concentric Tube Heat Exchanger

- Extended version of the H102A Concentric Tube Heat Exchanger
- Three pairs of intermediate points giving 10 thermocouples in total



H102J Recycle Loops

- Coiled tube section that connects directly to the HOT OUT and HOT RETURN hoses on the H102
- Demonstrates efficiency and process control advantages of recycling



H102F Extended Plate Heat Exchanger

- Extended version of the H102B Plate Heat Exchanger
- Six thermocouples in total



H102K Film and Dropwise Condensation

- Supplies both electrical power and instrumentation for the module via a control console
- Connects to the left side of the fascia panel
- Demonstrates two different types of condensing heat transfer through two separate heat exchanger coatings



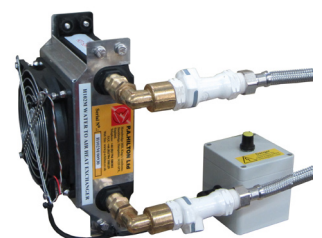
H102G Water Water Turbulent Flow Heat Exchanger

- Determination of surface heat transfer coefficient inside and outside the tube
- Comparison of performance in concurrent and in counter-current flow, measured across 14 thermocouples



H102M Water to Air Heat Transfer Module

- Small water to air heat exchanger, illustrating the use of extended surfaces (fins) as a means of improving the heat transfer to gases from tubes.
- Multi-speed blower fan
- Ships with protective shield





Maximise students per session, so **more efficient use of lab and student time.**

*Image is of an H102/230 base unit fitted with optional H102C accessory

Learning Capabilities	Unit Type
Demonstration of indirect heating or cooling by transfer of heat from one fluid stream to another when separated by a solid wall	H102A H102B H102C H102D H102H H102M
Conducting an energy balance across a heat exchanger and calculate the overall efficiency at different fluid flow rates.	H102A H102B H102C H102D H102H
To demonstrate the differences between counter-current flow and co-current flows and the effect on heat transfer, temperature efficiencies and temperature profiles through a heat exchanger.	H102A H102B H102C H102D H102H
To determine the overall heat transfer coefficient for a heat exchanger using the logarithmic mean temperature difference for counter-current and co-current flows.	H102A H102B H102C H102D H102H H102M
Allows students to make direct comparison of test results on a heat exchanger with a double surface area	H102E H102F
To investigate the effect of changes in hot fluid and cold fluid flow rate on the temperature efficiencies and overall heat transfer coefficient.	H102A H102B H102C H102D H102H
To investigate the effect of driving force (difference between hot stream and cold stream temperature) with counter-current and co-current flow	H102H
Determination of heat transfer rate, logarithmic mean temperature difference, overall heat transfer coefficient and 4 point hot and cold stream temperature profiles.	H102G
Determination of surface heat transfer coefficient inside and outside the tube, and of the effect of fluid velocity.	H102G

Learning Capabilities	Unit Type
Comparison of performance in concurrent and in counter-current flow.	H102G
Investigation of the relationship between Nusselt (Nu), Reynolds (Re) and Prandtl (Pr) numbers for Reynolds Numbers up to 65000 and for Prandtl Numbers between 2.5 and 5.0.	H102G
Determination of the coefficients in $Nu = k Re^a Pr^b$.	H102G
Investigation and understanding of the recycle process.	H102J
Steady state heat and mass balances	H102J
Investigation of responses to changes in bleed flow rate, heat input or recycle rate	H102J
Visual observation of filmwise and dropwise condensation and nucleate boiling.	H102K
Measurement of heat flux and surface heat transfer coefficient in both filmwise and dropwise condensation at pressures up to atmospheric.	H102K
Investigation of the saturation pressure/temperature relationship for water between ambient temperature (20-30°C) and 100°C.	H102K
Demonstration and investigation of the effect of air around condensers.	H102K
Demonstration of Dalton's law.	H102K
Investigation of a water to air heat exchangers characteristics at different water and air flow rates.	H102M
Calculation of the temperature efficiencies of both the hot and cold streams.	H102M
To determine the overall heat transfer coefficient for a water to air heat exchanger using the logarithmic mean temperature difference.	H102M