HT SERIES

Computer Controlled Heat Exchanger Service Module – HT30XC

Description - requires HT30XC base unit

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

It provides controlled cold water flow, hot water direction can easily be reversed using the quick release pipe couplings enabling co-current and counter-current investigations, and the required instrumentation for a series of in-depth investigations into heat exchanger performance.

The individual heat exchangers can be quickly changed over, to enable comparisons between different types of heat exchanger to be made.

The HT30XC requires a user supplied personal computer for the operator interface. The computer connects the HT30XC using a USB interface, providing a simple and straightforward installation and set up procedure.

Once the appropriate heat exchanger has been installed and set up, all other functions can be performed under computer control.

Appropriate measures have been implemented so that in the case of computer failure or communications breakdown, the system shuts itself down in a safe manner.

A wide selection of heat exchanger options are available for use with the HT30XC. Ranging from simple exchangers to demonstrate co-current and counter-current flow, to reconfigurable systems with interim temperature measurements, capable of being used for in-depth heat exchanger analysis.

The heat exchangers are easily interchanged, with quick release fittings on the flexible interconnecting tubes, and a simple location system using thumbscrews to secure the exchangers onto the service unit.

Hardware description

The service unit provides two fluid streams to the heat exchanger, a hot water stream and a cold water stream. The hot water stream is heated in a vessel fitted with an electric heater.

The heater is switched on and off by a solid state relay (SSR), which is under software control. A thermostat limits the maximum water temperature to 75°C for operator safety.

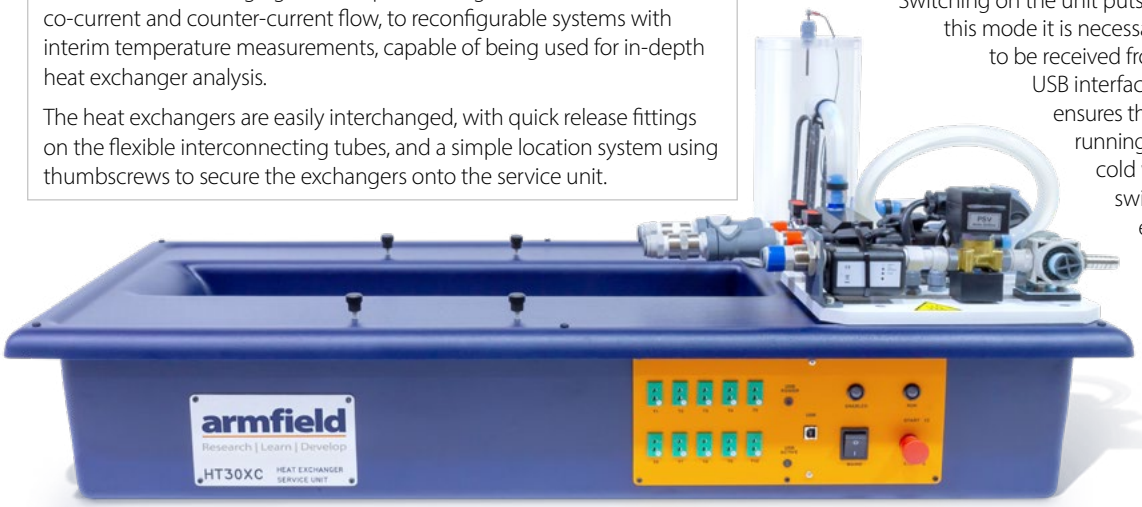
A centrifugal pump circulates water from the vessel, through the heat exchanger and back into the heater vessel. The pump speed is under software control, while the direction can easily be reversed using the quick release pipe couplings enabling co-current and counter-current investigations over a wide range of flow rates.

The cold water stream is generated from a mains water supply. The flow through the heat exchanger is adjusted by a variable flow valve, again under software control. A manually adjustable pressure regulator is used to minimise the effect of mains pressure fluctuations.

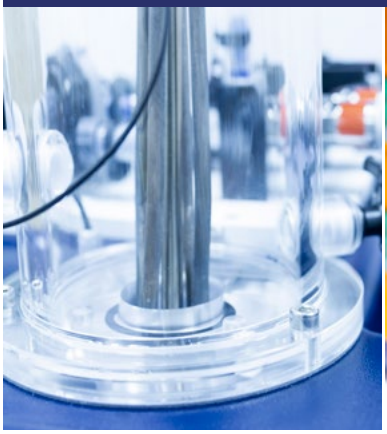
Conditioning circuits for up to 10 K-type thermo-couples are included, (the thermocouples themselves are supplied with the heat exchangers). The instrumentation also includes flowmeters to measure the flow rates of the two fluid streams.

Switching on the unit puts it into "Standby" mode. From this mode it is necessary for a regular series of pulses to be received from the software (via the built in USB interface) to fully power up the unit. This ensures that unless the control software is running, the heaters, the pump and the cold water control valve cannot be switched on. The unit also includes an emergency stop switch.

All electrical circuits are located in a bench mounted ABS supporting base, and protected by a Residual Current Device (RSD) for operator safety. The ABS base includes a drip tray and drain tap in case of water spillage or leakage.



HT30XC details showing heater & hot water circulation system



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Issue: 4
URL: http://www.armfield.co.uk/ht30xc
Applications
ChE ME CE IP

Instructional capabilities

Training exercises that are common to each of the heat exchangers when used with the HT30XC:

- Demonstration of indirect heating/cooling by transfer of heat from one fluid stream to another when separated by a solid wall
- Energy balance determination (heat balance) and calculation of efficiencies by measuring the flow rates and temperature changes in the hot and cold fluid streams
- Introduction to different types of heat exchanger and comparison of the differences in operation and performance
- Using the Logarithmic Mean Temperature Difference (LMTD) in heat transfer calculations
- Definition and measurement of Overall Heat Transfer Coefficient (U).
- Demonstration of the differences between counter-current and co-current operation, (not relevant for some HT34 configurations)
- Demonstration of the transition from linear to turbulent flow
- Effect of hot and cold fluid flow rate on the heat transfer coefficient
- Effect of driving force (temperature differential) on the heat transfer coefficient
- Investigation of heat loss and reduction in heat transfer coefficient due to fouling of the heat transfer surfaces (suitable student project using user induced fouling)

Requirements

Single Phase Electrical supply:

HT30XC-A: 230V, 50Hz, 10Amp
HT30XC-B: 115V, 60Hz, 20Amp
HT30XC-G: 230V, 60Hz, 10Amp

- Software requires a computer running Windows XP or above with a USB port (computer not supplied by Armfield)
- At least one heat exchanger module is required, additional heat exchangers are optional.
- Cold water supply and drain: 5 Litres/minute at 1bar gauge (min)

Scale

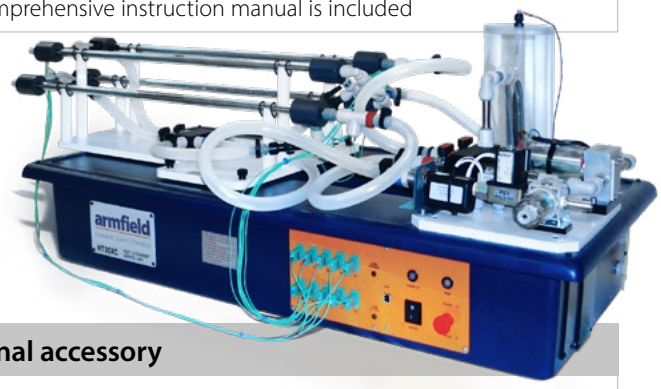
Overall dimensions

Length	0.45 m
Width	1.00 m
Height	0.5 m
Packed and crated shipping specifications	
Volume	0.33 m^3
Gross weight	33 kg

Ordering specification

HT30XC - Computer Controlled Heat Exchanger Service Module

- A lightweight bench top service unit, designed to accommodate a range of different small scale heat exchangers
- Comprises hot water vessel, hot water recirculation pump, cold water control system, computer interface and all necessary instrumentation
- The hot water vessel is made from clear acrylic (for visibility) and includes a 2kW heater with thermostatic over-temperature cut-out and low water level detection
- Hot water direction can easily be reversed using the quick release pipe couplings enabling co-current and counter-current investigations over a wide range of computer controlled flow rates
- The cold water system includes a manually adjustable pressure regulator and a flow control valve, which is under computer control
- Flow rates for both fluid streams in excess of 5L/min are achievable, but this may be restricted by some designs of heat exchanger (e.g. HT32 & HT36 Plate Heat Exchangers)
- Up to ten temperatures (K-type thermocouples) can be monitored using the service unit. Operating range, 0-75ºC, resolution 0.1ºC
- Two flow meters are included. Operating range 0.2 to 9 L/min, resolution 0.1 L/min
- All data is available to a (user supplied) Windows PC, via a USB interface. This computer is also used to control the flow rates, hot water temperature, the flow rates and hot water temperature
- Full software for educational use is included
- Ability for users to write and use their own software (Eg. Labview)
- Includes failsafe hardware facilities for remote operation, Eg. over the internet, when used with the customers software
- A comprehensive instruction manual is included



Optional accessory

- HT31-Tubular Heat Exchanger
- HT32-Plate Heat Exchanger
- HT33-Shell & Tube Heat Exchanger
- HT34-Jacketed Vessel With Coil & Stirrer
- HT35-Cross Flow Heat Exchanger
- HT36-Extended Tubular Heat Exchanger
- HT37-Extended Reconfigurable Plate Heat Exchanger

Ordering codes

- HT30XC-A
- HT30XC-B
- HT30XC-G

Knowledge base

> 28 years expertise in research & development technology
> 50 years providing engaging engineering teaching equipment

Benefit from our experience, just call or email to discuss your laboratory needs, latest project or application.

An ISO 9001:2015 Company

CE
Products CE certified

armfield.co.uk

Aftercare

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Commissioning
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