

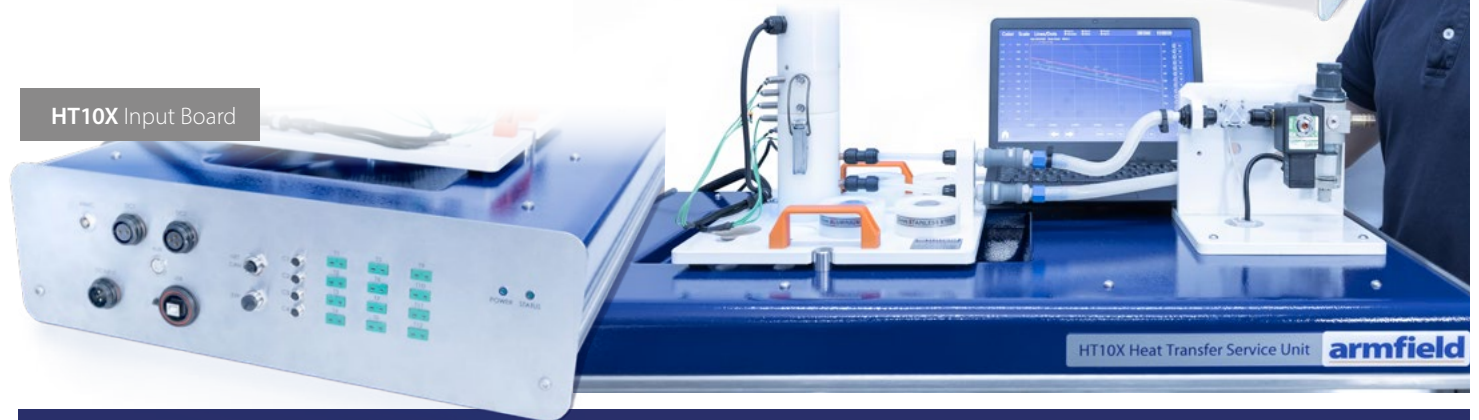
#### Computer Controlled Heat Transfer Service Unit - HT10X

STEADY STATE ACHIEVED IN LESS THAN TWO MINUTES

A bench top service unit, designed to accommodate a range of modular small scale experiment accessories, which demonstrate several modes of heat transfer phenomena.



HT10X Heat Transfer Service Unit



HT10X Input Board

#### Outputs

- ▶ ABMC 24V port for linear actuator and Peltier plate
- ▶ DC1 24V port for DC blower fan (HT14X, HT16X, HT19X)
- ▶ DC2 24V port for the heater power (All accessories except HT17X)
- ▶ AUX 24V port for centrifugal pump (HT17X)

#### Inputs and Instrumentation

- ▶ Thermocouples: up to 10, dependent on accessory, 12 thermocouple ports available in total
- ▶ Heat radiation meter (HT13X)
- ▶ Light radiation meter (HT13X)
- ▶ Air velocity meter (HT14X HT16X, HT19X)
- ▶ Solenoid valve for water flow rate control (HT11X, HT12X, HT18X)
- ▶ The HT10X has some inbuilt potential for future expansion of the armBUS systems and sensors. This includes:
  - 2x 5-way M12 ports
  - 2x K-type thermocouple ports

armBUS NetCan, connects up-to 20 users to one piece of equipment



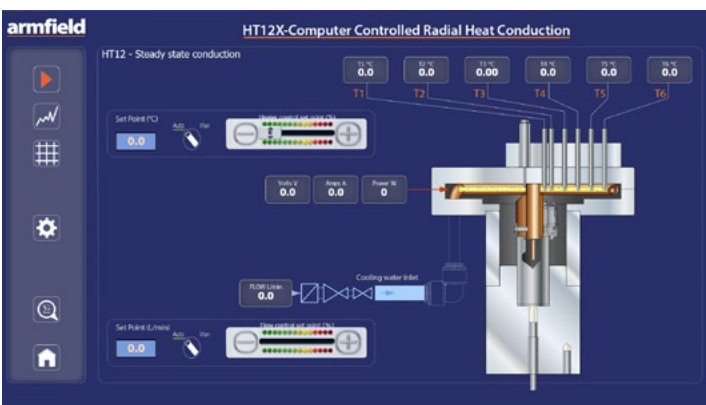
## HT10X Computer Controlled Heat Transfer Service Unit

### Software

A full ArmBus educational software suite is provided with the HT10X for all the Armfield heat transfer accessories.

Individual experiment interfaces and displayed data types vary to match selected experiment accessories, common examples are listed below:

- ▶ Temperatures and other signals such as flow rates, heater voltage and current are displayed on a diagrammatic representation of the equipment
- ▶ Control outputs are operated by a control slider or typing in a value between 0 and 100%. Sensor values are read directly in engineering units
- ▶ PID automatic control option is available, permitting the temperature set-point to be achieved quickly and precisely, coping with disturbance rejection
- ▶ A maintenance screen allows for PID parameter adjustment and thermocouple calibration
- ▶ Data from the sensors are logged into a spreadsheet format, with operator control over the sampling intervals (or 'single-shot')
- ▶ Sophisticated graph-plotting facilities are provided, including plotting of both measured and calculated values
- ▶ Graphs update in real-time as the samples are being taken
- ▶ Processing of measured values to obtain calculated values is linked to the questions and answers to ensure student understanding
- ▶ Experiment data samples are saved, or exported in Microsoft Excel format
- ▶ Real-time sensor data is displayed independently from the data logging. It is possible to check the recent history graphical display to inspect the temperature stability prior to taking a sample



Above HT12X Software screen - Below HT10X Water Regulator



### Ordering specification

A compact PC-Controlled bench top service unit, designed to accommodate a range of modular small scale experiment accessories, which demonstrate several modes of heat transfer phenomena.

- ▶ Comprises of controlled cold water control system (pressure regulator and water control valve), flowmeter, computer interface and all necessary instrumentation
- ▶ Through USB connection the same PC or multiple PC's utilise the Armsoft GUI to control the cold-water flow rate, temperature of the heater and air velocity induced by the centrifugal blower
- ▶ Adjustable parameters can be controlled using PID set-point tracking control, therefore achieving the steady-state faster and rejecting disturbances better than conventional control
- ▶ Flowmeter operating range 0.6 to 10 L/min, resolution 0.1 L/min, operating temperature 0-125°C
- ▶ Up to twelve temperatures (K-type thermocouples) can be monitored using the service unit. Operating range, 0-133°C, resolution <0.1°C
- ▶ Low control voltage (~27V) protects against short circuiting and eliminates electrical hazards
- ▶ A full educational software and data logging suite is included, covering all modular heat transfer accessory modules
- ▶ A comprehensive instructional manual describing how to carry out practical teaching exercises in heat transfer is supplied. Assembly, installation and commissioning is detailed in the manual and within the ArmBus software help menu

### Requirements

### Scale



#### Single Phase Electrical supply:

90-240V 5.5A 50/60Hz or 277V 5.5A 50/60Hz

- ▶ Software requires a computer running Windows 7 or above with a USB port (computer not supplied by Armfield)
- ▶ At least one heat transfer module is required
- ▶ Cold water supply and drain: 1.5 Litres/minute at 1bar gauge (min)

### Overall dimensions

Length	0.51m
Width	0.95m
Height	0.33m

#### Packed and crated shipping specifications

Volume	0.33m <sup>3</sup>
Gross weight	33kg

### Ordering codes

HT10X  
ArmBUS NetCan: Network Interface

Issue: 1

URL: <http://www.armfield.co.uk/ht10x>

Applications

Me ChE CE IP

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