NEW ACCESSORY - HT19 FREE & FORCED CONVECTION

The Armfield HT10XC is a service unit, which can be used in conjunction with a range of small scale accessories for a wide range of demonstrations into the modes of heat transfer. The factors that affect 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.

KEY FEATURES

> Small scale, bench top equipment
> Common service unit avoids unnecessary cost duplication for control and instrumentation
> Multiple accessories available covering a wide range of heat transfer investigations
> Computer control of heaters, water flow, air flow, with safety functions implemented to allow for remote operation
> Improved accuracy for quantitative results which can be related directly to theory
> Integral USB interface
> Full educational software, with data logging, control, graph plotting, and detailed 'Help'

Remote operation capability

A specific feature of the HT10XC is that it incorporates the facilities and safety features to enables the accessories to be remotely controlled from an external computer, if required.

With suitable (user provided) software the equipment can be operated remotely, for instance over an intra-net or even over the internet. All the facilities can also be accessed locally using the front panel controls and display.

HT10XC shown with Free and Forced Convection accessory - HT19

enviro PRODUCTS

ArmSoft™ SOFTWARE

BM TRADA CERTIFICATION
ISO 9001:2008

UKAS QUALITY MANAGEMENT 012

EXTENDED WARRANTY 2 years 2-YR WARRANTY ON ALL ARMFIELD PRODUCTS

This data sheet is available online at:
www.armfield.co.uk/ht10xc

ISSUE 3

The following heat transfer accessories are available for use under manual control:

HT11:   Linear heat conduction
HT12:   Radial heat conduction
HT13:   Laws of radiant heat transfer and
             radiant heat exchange
HT14:   Combined convection and radiation
HT15:   Extended surface heat transfer
HT16:   Radiation errors in temperature measurement
HT17:   Unsteady state heat transfer
HT19:   Free & forced convection

In addition the following accessories can be used in computer control and remote control applications:

HT11C: Computer controlled linear heat conduction
             (material samples still need changing manually)
HT12C: Computer controlled radial heat conduction
HT14C: Computer controlled combined
             convection and radiation
HT15:   Extended surface heat transfer
HT16C: Computer controlled radiation errors in
             temperature measurement
HT18C: Thermo-electric heat pump

NOTE: The HT13 and the HT17 are not suitable for computer control due to the amount of manual intervention required. The standard HT15 can be used for computer control as no manual intervention is required.

HARDWARE DESCRIPTION

The service unit is housed in a robust steel enclosure and designed for use on a bench or table. It provides control outputs to the accessories, and instrumentation inputs from the accessories.

OUTPUTS:

> A stabilised, variable low voltage DC supply to the heater of the heat transfer accessory under evaluation
> Drive to the flow regulation valves used on HT11C and HT12C
> Drive to the variable speed air blowers used on HT14C and HT16C

INPUTS AND INSTRUMENTATION:

Temperatures: (up to ten off, dependant on accessory being used)

Heater voltage: (All accessories except HT17)
Heater current: (All accessories except HT17)
Heat radiated: (HT13)
Light radiated: (HT13)
Air velocity: (HT14, HT14C, HT16, HT16C, HT19)
Cooling water flowrate: (HT11C, HT12C, HT18C)

In manual mode, the outputs listed above are under control of potentiometers on the front panel of the unit. In remote mode the outputs to the accessories are controlled by the computer.

A 'Watchdog' system is implemented in remote mode to ensure operator and equipment safety in event of a computer or communications failure. In both modes the signals from the accessory can be shown on the front panel displays. Selector switches are used to select the chosen signal onto one of the two displays. These signals are also available on the USB interface for datalogging on the computer (even if the computer is not controlling the equipment).

SOFTWARE

Full educational software is provided with the HT10XC for all the Armfield Heat Transfer Accessories. Separate programs are provided for each accessory, and each program contains a selection of separate exercises that can be performed. The actual details are exercise specific, but typically the following interfaces are available:

> All the temperatures and other signals such as flow rates, heater voltage and current, etc. are displayed on a diagrammatic representation of the equipment.
> A software 'button' switches the equipment from 'standby' mode to fully on.
> The control outputs are operated by using up/down arrows or typing in a value between 0 and 100%. The sensor values can be read directly in engineering units.
> Data from the sensors is 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. Comparisons between data taken on different runs can be displayed. Also the graphs update in real time as the samples are being taken.
> Student questions and answers, including a layered 'Hint' facility.
> Processing of measured values to obtain calculated values (this can be linked to the questions and answers to ensure student understanding).
> The data samples can be saved, or exported 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.

Included separately on the software CD are the 'drivers' required to enable other software applications to communicate with the HT10XC via the USB system. This enables users to write their own software instead of using the Armfield provided software. This software can be written in many different formats, typically LabView, MatLab, 'C', 'C++', Visual Basic, Delphi, and any other software environment, which allows calls to external drivers can be used.

In this way users can write software to suit their specific requirements, in an environment that they are fully familiar with and which is compatible with their other equipment.

An extension of this methodology enables the equipment to be operated remotely, such as over a Local Area Network (LAN) or even over the internet. The HT10XC is ideal for this remote operation as it has been designed to ensure that the unit shuts down safely in the event of a communications failure. It has also been designed so that once the heat transfer accessory has been installed and configured, all the controls to perform a series of investigations are under software control, and so the student does not need to be present with the equipment.

In a typical installation, the HT10XC would be connected to a local PC via the USB bus. The local PC would be connected to the users' PCs via a Local Area Network. The operator interface software would be run on the remote (users) PC and communicate to the control software on the local PC.

(Note, Armfield do not provide the software to implement this type of system).

For remote use, the appropriate heat transfer accessory would be connected to the service unit and the unit switched on. It remains in 'Standby' mode until appropriate software is run requesting the unit to power up fully. The functions which can be implemented remotely are dependant on the accessory being used. For some accessories the configuration has to be manually implemented locally. E.g. on HT11C the required material sample has to be inserted manually. However, once this has been done, a full set of investigations can be performed for that configuration remotely.

REQUIREMENTS

Single phase electricity supply:
HT10XC-A: 230V, 50Hz, @ 5A
HT10XC-B: 115V, 60 Hz, @ 10A
HT10XC-G: 220V, 60Hz, @ 5A

(current figures are worst case figures, including the supply to appropriate accessory)

OVERALL DIMENSIONS

Height: 0.24m
Width: 0.32m
Depth: 0.39m

SHIPPING SPECIFICATION

Volume: 0.05m^3
Gross weight: 15kg

ORDERING SPECIFICATION

HT10XC - COMPUTER CONTROLLED HEAT TRANSFER TEACHING EQUIPMENT

- A bench top service unit designed to interface to a range of heat transfer accessories.

- Provides a variable, stabilised 0-24V DC supply to the heater of the heat transfer accessory, with a current capability of 9A.

- Provides a drive signal for a proportioning solenoid valve used for flow control.

- Provides a control signal to a variable speed blower used for generating airflow.

- Ten temperature inputs and conditioning circuits for K-type thermocouples:

  > Nine off, 0-133°C, resolution <0.1°C
  > One off, 0-500°C, resolution <0.15°C

- Instrumentation inputs for heater voltage, heater current, air flow, water flow, radiation and light meter.

- Integral USB interface, and educational software for all accessories.

- Outputs can be controlled manually from the front panel, or controlled by the software from a user supplied PC.

- Easy interfacing to 3rd party software e.g. LabView.

- Watchdog circuit for operator and equipment safety in case of computer or interface failure when being controlled remotely, e.g. over a network or the internet using customer written software.

- A comprehensive instruction manual describing how to carry out the laboratory teaching exercises in non-steady state heat transfer and their analysis as well as assembly, installation and commissioning is included.