HT SERIES

This Armfield accessory has been designed to demonstrate the laws of radiant heat transfer and radiant heat exchange using light radiation to complement the heat demonstrations where the use of thermal radiation would be impractical.

Laws of Radiant Heat Transfer and Radiant Heat Exchange – HT13X

HT13X Radiometer

HT13X Instruments, filters and plates

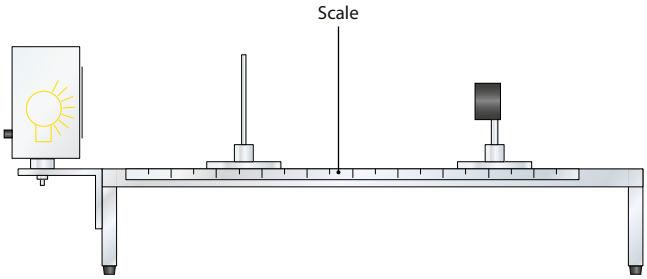
Hardware description

The equipment supplied comprises an arrangement of energy sources, measuring instruments, aperture plates, filter plates and target plates, which are mounted on a linear track, in different combinations to suit the particular laboratory teaching exercise chosen.

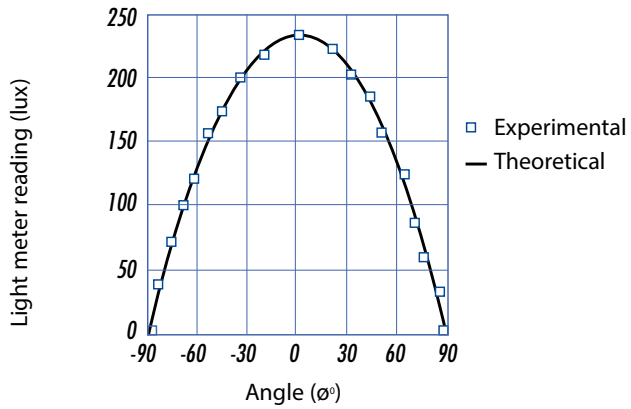
- The track consists of a rigid aluminium frame with twin horizontal rails which incorporates sliding carriages to enable the positions of the instrumentation, filters and plates to be varied
- The heat source consists of a flat copper plate 100mm diameter, which is heated from the rear by an insulated electric heating element operating at low voltage for increased operator safety
- Heater can be voltage or PID controlled allowing for the temperature set-point to be achieved rapidly and maintained within 0.1°C
- The front of the plate is coated with a heat-resistant matte black paint which provides a consistent emissivity close to unity. The surface temperature of the plate is measured by a thermocouple, which is attached to the front of the plate
- Radiation from the heated plate is measured using a heat radiation detector (radiometer), which can be positioned along the graduated track on the carriage
- Two cork-coated metal plates are supplied that enable a vertical slot aperture of adjustable width to be created between the source and detector to demonstrate area factors
- The position of the carriages relative to the energy source can be measured using a graduated scale attached to the side of the track
- Metal plates with different surface finishes are supplied to demonstrate the effect of emissivity on radiation emitted and received. Two black plates, one grey plate and one polished plate, supplied together with a track-mounted carrier which positions the plates in front of the heat source. Each plate incorporates a thermocouple to indicate the surface temperature of the plate
- Plastic filter plates of varying optical density (absorptivity) are supplied to demonstrate the laws of absorption
- The light source consists of a lamp in a housing with a glass diffuser and operates at low voltage for increased operator safety. The source may be rotated through 180° where the angle is measured using an integral scale. The power supplied to the lamp can be varied and measured using the armBUS software
- The radiation from the light source is measured using a light meter which can be positioned along the graduated track on the carriage. Filter plates of varying opacity and thickness are supplied to demonstrate the laws of absorption

Experimental capabilities

- Inverse-square law using the heat source and radiometer or light source and light meter
- Stefan-Boltzmann law using the heat source and radiometer
- Determination of the View Factor
- Emissivity using the heat source, metal plates and radiometer
- The Inverse Square Law for Light
- Kirchhoff's circuit laws using the heat source, metal plates and radiometer
- Area factors using the heat source, aperture and radiometer
- Lambert's Cosine Law using the light source (rotated) and light meter
- Lambert's law of absorption using the light source filter plates and light meter



Schematic diagram showing HT13X set up for exercises using light



Typical result showing Lambert's cosine law using the light source and light meter

HT13X mimic and control screen

Requirements Scale

HT 10X

HT10X Computer Controlled Heat Transfer Service Unit

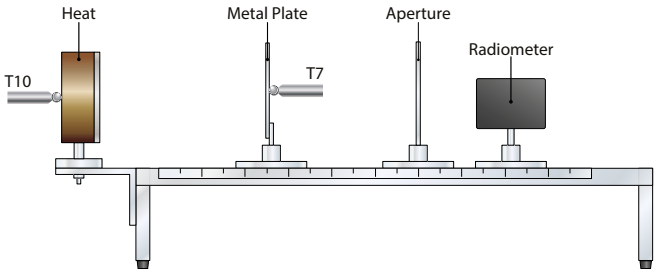
Essential accessories

HT10X Computer Controlled Heat Transfer Service Unit

Ordering specification

A small-scale accessory designed to introduce students to the basic laws of radiant heat transfer and radiant heat exchange.

- A heat source with radiometer and a light source with light meter are used where appropriate to demonstrate the principles
- The heat source consists of a flat circular plate 100mm in diameter, which incorporates a 216W electric heating element (operating at 24V DC maximum)
- The PID controller in the heat source allows for fast temperature set-point achievement and control to 0.1°C
- The light source consists of a 60W light bulb (operating at 24V DC maximum) mounted inside a housing with a glass diffuser
- The heat and light sources, instruments, filters and plates are mounted on an aluminium track with graduated scale, which is designed to stand on the benchtop and connect to the Heat Transfer Service Unit (HT10X) without the need for tools
- A comprehensive instruction manual describing how to carry out the laboratory teaching exercises in radiant heat transfer/ exchange and their analysis as well as assembly, installation and commissioning is included



Schematic diagram showing HT13X set up for exercises using heat

Overall dimensions

Length	1.23m
Width	0.30m
Height	0.44m
Packed and crated shipping specifications	
Volume	0.3m^3
Gross weight	14kg

Ordering codes

HT13X