



Boiling Heat Transfer Unit H656

Figure 1: H656



- ***Three Modes of Pool Boiling Observed Easily***
- ***Allows Safe Investigation into the Normally Dangerous condition of Film Boiling***
- ***Safe and Suitable For Unsupervised Student Operation***
- ***Ozone Friendly, Low Pressure, Non-toxic Working Fluid***
- ***Responds Rapidly to Control Changes***
- ***Negligible Operating and Maintenance Costs***
- ***Two year Warranty***



Introduction

Boiling and condensation are vital processes in the transfer of heat from a hot to a colder region in numerous applications, e.g. power generation, refrigeration, refining, heat transmission, etc.

Three distinctive modes of pool boiling occur: convective, nucleate and the potentially dangerous film boiling. Student engineers need to be aware of the boiling mode characteristics if they are to be involved in the design, operation or service of any heat transfer process.

The Hilton H656 Boiling Heat Transfer Unit is bench mounted, fully instrumented and operates from a simple mains electric and water supplies.

The unit will be of particular interest to those studying:

- **Mechanical Engineering**
- **Chemical Engineering**
- **Plant and Process Engineering**
- **Engineering Physics**
- **Marine Engineering**
- **Nuclear Engineering**
- **Control and Instrumentation**
- **Building Services**

Experimental Capabilities

- Visual demonstration of convective, nucleate and film boiling.
- Study of the heat flux and surface heat transfer coefficient at constant temperature.
- Investigation of the effect of pressure on critical heat flux.
- Study of filmwise condensation and condenser overall heat transfer coefficient.
- Investigation of the pressure- temperature relationship of a pure substance, and the effect of air in a condenser.
- Demonstration of:
 - Liquid carry over or priming in boilers.
 - Law of partial pressures

Description

A glass reinforced plastic panel supports a vertical glass cylinder containing a horizontally mounted heating element immersed in the liquid. The heat input can be varied to control the heat flux and hence the mode of boiling.

At the top of the cylinder is a coil through which cooling water flows. This condenses the vapour produced by the heat input and the liquid formed returns to the bottom of the cylinder for re-evaporation. Control of the cooling water flow maintains a constant pressure during an experiment.

The standard instrumentation consists of a surface temperature thermocouple plus four glass thermometers, wattmeter, pressure gauge and water flowmeter. These enable all relevant heat transfer calculations to be made.

For student safety, the unit is fitted with both overload and residual current circuit breakers. A high pressure cut out and internal safety valve prevents a safe pressure being exceeded. The heating element is protected by a high temperature switch.



Experimental Results

Figure 2: Relationship between Critical Heat Flux and Saturation Pressure

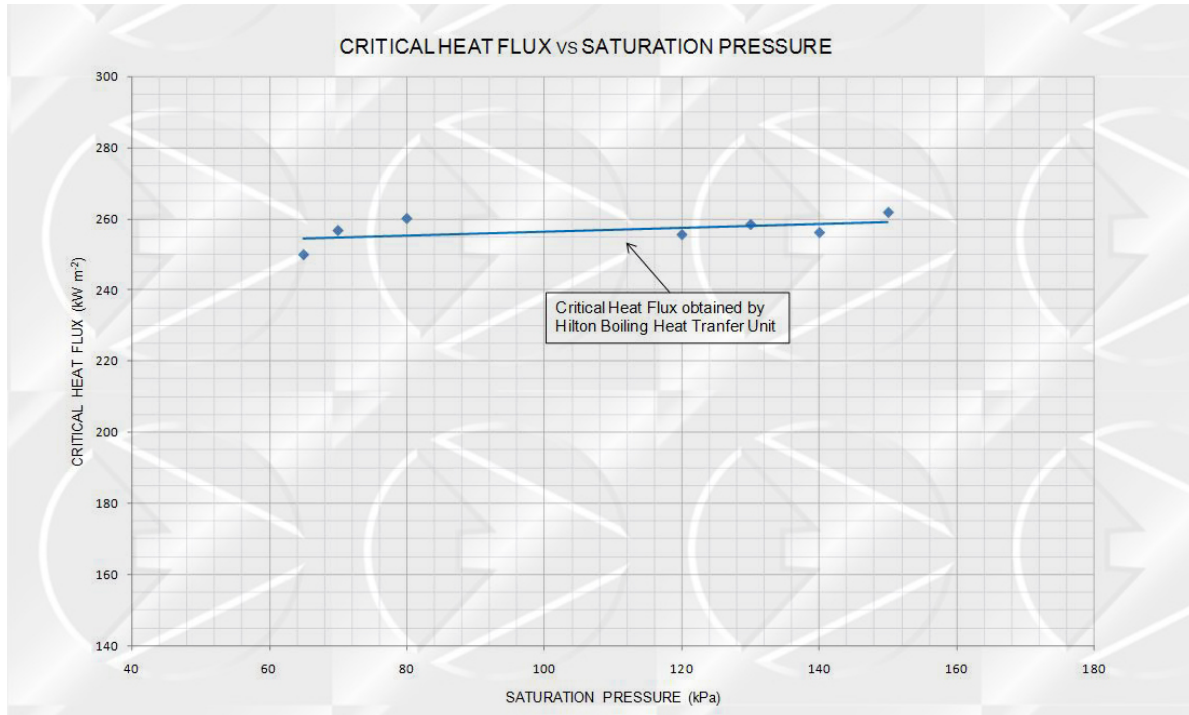
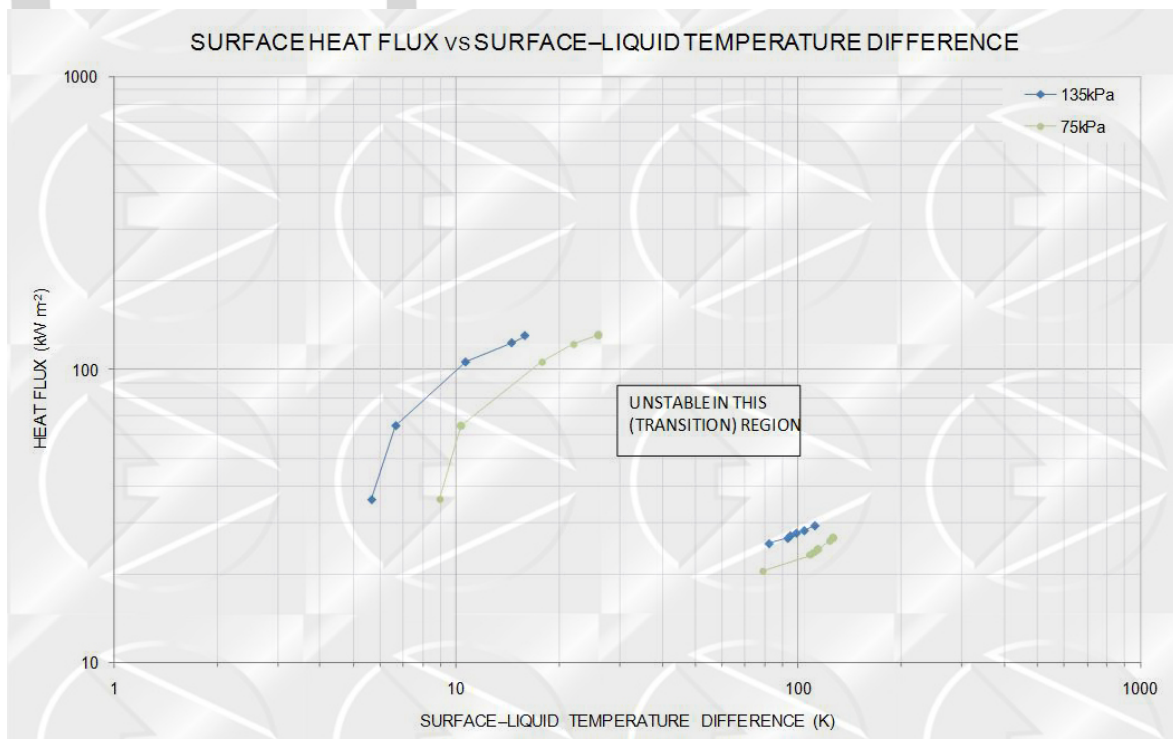


Figure 3: Relationship between Heat Flux and Surface to Liquid Temperature Difference





Specification

General

A fully instrumented bench top pool boiling heat transfer unit using low-pressure non-toxic fluid with water-cooled cylindrical glass condenser.

Detailed

A bench mounted pool-boiling unit comprising a thick walled glass cylinder with electric heater and water-cooled condenser coil. Operates with ozone friendly, low pressure, non-toxic fluid.

Internal electric and mechanical safety devices to allow for unsupervised operation by students. Instrumentation fitted to enable measurement of heat input, surface, liquid and vapour temperatures and condenser water flow rate and temperatures. Supplied with a detailed experimental operating and maintenance manual giving example of experimental results and sample calculations.

Accessories and spares for two years normal operation together with a full two-year warranty.

Dimensions

Height: 760mm Depth: 485mm
Width: 760mm Weight: 39kg

Services Required

Electrical:

A: 220-240 Volts, Single Phase, 50Hz (With earth/ground). Line current up to 3.0A at 230v

B: 110-120 Volts, Single Phase, 60Hz (With earth/ground). Line current up to 6.0A at 110v

Water: 1.8 litres m⁻¹ at a minimum of 5m head.

Note that the condensing pressure is determined by cooling water flow rate and temperature. The maximum recommended cooling water inlet temperature is 22°C. Details of a suitable water chiller can be supplied where this temperature is likely to be exceeded.

Also Available On Request

Further detailed specification.
Additional copies of instruction manual.
Recommended list of spares for 5 years operation.
Suitable chiller details.

Accessories and Spares

Unit supplied with:

One experimental operating and maintenance manual in English, Spanish or French.

Accessories and spares for 2 years normal operation. List available on request.

Ordering Information

Order as: H656 Boiling Heat Transfer Unit

Electrical Specification

Either: **A:** 220-240 Volts, Single Phase, 50Hz (With earth/ground).

B: 110-120 Volts, Single Phase, 60Hz (With earth/ground).

Language

Either: English, Spanish or French.

Shipping Specifications (Approx)

Net Weight: 39kg.
Gross Weight: 82 kg.
Packing Case Dims: 0.92 x 0.65 x 1.05m
Packing Case Volume: 0.628m³

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