



# FLOW BOILING DEMONSTRATION UNIT

## H411



Year 2  
study

3 to 4  
participants

10 mins  
setup

40 mins  
duration

Space required  
1.5 x 1.5 m

### Features

- Safe and Suitable For Unsupervised Student Operation.
- Responds Rapidly to Control Changes.
- Negligible Operating and Maintenance Costs.

### Description

The H411 Hilton Flow Boiling Demonstration Unit has been produced to provide students with a clear visual demonstration of what is happening inside the vapour generating tubes of practical plants. In this unit it is possible to see all the processes and types of flow involved during an actual (NOT simulated) evaporation process, from sub-cooled liquid to superheated vapour. The system operates on a solvent at below atmospheric pressure. Liquid is fed by a fine control valve to the lower end of the vertical generating tube, which is the core tube of a concentric tube heat exchanger constructed from Pyrex glass. Heat transferred from hot water flowing through the jacket of the heat exchanger, causes the compound to boil. The vapour formed enters a thick walled glass chamber in which a water cooled coil causes it to condense. The liquid formed is returned to the generating tube via the control valve. Hot water for the jacket is provided by a 500W heating element in a second glass walled chamber. Vigorous circulation of the water is ensured by a glandless centrifugal pump. A water driven air ejector is used as required, to extract air from the condenser. The unit is floor mounted but occupies only 0.25m<sup>2</sup> floor area.

#### Related Laws/Applications

- Chemical Engineers
- Energy Management
- Plant and Process Engineers
- Marine Engineers
- Mechanical Engineers
- Refrigeration Engineers
- Two Phase Flow

#### Learning capabilities

- Demonstration of a heating process accompanied by vapour formation within a tube, including
  - Circulation promoted by natural convection
  - Convective heat transfer to sub-cooled liquid
  - Nucleation in sub-cooled and saturated liquid
  - Slugging
  - Annular flow
  - Droplet entrainment
  - Complete dry out to superheated vapour
- Demonstration of two phase flow with increasing vapour content
- Demonstration of effect of air in condensers

#### Technical Specification

- Stand: Strong steel column and base finished in tough black powder coat.
- Heat Exchanger: Constructed in Pyrex glass. Core tube 1.5m long x 15.4mm bore (nominal).
- Condensing Chamber: Strong glass chamber with plated brass end plates and P.T.F.E. seals.
- Pressure gauge, relief valve, water cooled condensing coil and air introduction/charging valve.
- Pump: Bronze and stainless steel, glandless, centrifugal type, for hot water circulation.
- Water Heating Chamber: Stainless steel tank with lid, fitted with 500W heater, thermally protected.
- Vacuum Pump: Water driven air ejector - to extract air from the solvent system.
- A 5 Amp fuse and Residual Current Circuit Breaker are fitted for additional safety.

#### What's in the Box?

- 1 x H411
- 1 x Transformer (115V version only)
- 1 x 3m Reinforced Pipe
- 1 x Drain Hose
- 1 x Charging Hose and Adaptor
- 3 x SES36 Refrigerant Can
- 1 x Pressure Relief Valve Key
- 2 Year Spares
- Power Lead
- Instruction Manual
- Packing List
- Test Sheet

#### You might also like

- H656: Boiling Heat Transfer Unit

#### Weights & Dimensions

- Weight: 40 kg
- Length: 500mm
- Width: 500mm
- Height: 1800mm

#### Essential Services

- Electrical: 650W 220/240 Volts, Single Phase, 50Hz, (With earth/ground)
- Electrical: 650W 110/120 Volts, Single Phase, 60Hz, (With earth/ground)
- Cooling Water:
  - 2 litre per minute at 10m head continuous (for condenser).
  - 10 litre per minute at 20m head occasionally (for vacuum pump).

#### Ordering information

To order this product, please call PA Hilton quoting the following codes:  
H411/230  
H411/115

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COUNTRY OF ORIGIN - UK WARRANTY PERIOD - 5 YEARS