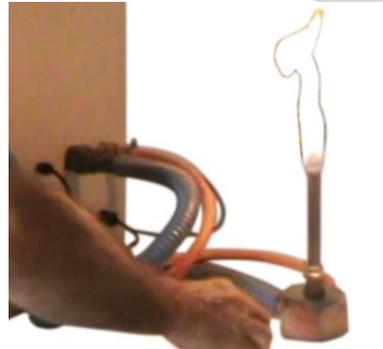


# *Flame Propagation and Stability Unit C552*



(L) Set-up for flame speed experiment, (R) Set-up for 'Smithells' flame separation experiment

- *Enables Students to Investigate the Design Criteria of Simple Gas Burners.*
- *Safe, and Suitable For Student Operation.*
- *Provides Graphic and Interesting Experiments that Hold Student Attention*
- *Operates on all Normal Low Speed Gaseous Fuels.*
- *Two year Warranty.*



## ***Introduction***

The efficient combustion of gaseous fuel has become of vital importance, due to both the rising cost of fuel and compelling evidence of global climate change.

In order to be able to ultimately design efficient gas burners, students must first have a working knowledge of the parameters affecting gas combustion.

The Hilton Flame Propagation and Stability Unit C552 has been designed to allow students, acting under competent supervision, to investigate the behaviour characteristics of flames in both a quantitative and qualitative manner.

Visual observation of flame movement, particularly in the flame speed tube rapidly captures student attention in an imaginative way and leads to a better understanding of flame control techniques employed in the design of combustion systems.

A comprehensive range of experiments can be conducted using slow burning conventional gaseous fuels.

The **Hilton, Flame Propagation and Stability Unit C552** will provide interesting and instructive experimental work for all students, and will be of particular interest to those studying:

- Gas Turbines.
- Chemical Engineering,
- Marine Engineering
- Mechanical Engineering
- Plant And Process Engineering
- Fuel Technology
- Energy Conservation

## ***Experimental Capabilities***

- Demonstrates the processes of:
  - Flame Lift Off
  - Flame Light Back
- Provides data for the construction of flame stability diagrams
- Enables students to investigate methods of improving flame stability limits
- Allows investigation of the relationship between flame speed and air – fuel ratio for a variety of slow burning gaseous fuels.
- May be used for student projects, for example:-
  - Methods of arresting or quenching moving flames in the flame speed tube.

- Investigation of horizontal and vertical flame movement.
- Effect of changing cross-section on flame speed.
- Effect of directional change on flame speed.

## ***Description***

An instrumentation console provides an adjustable and measured flow of both air and gas. Two flowmeter in series, ensure that a wide range of typical slow burning gaseous fuels (e.g. Propane, Butane, Methane LPG) can be used and measured accurately. For operator safety an interlock ensures that gas flow can only be initiated with an operator actively in attendance.

Both air and gas are separately introduced into a mixing block designed to accommodate a variety of burner mixing tubes and adapters.

Various settings of air fuel ratios allow the stability characteristics of a gas flame to be examined, and the upper and lower stability limits of both “lift off” and “light back” plotted on a stability diagram.

The dual structure of pre-aerated flames is illustrated with the aid of the “Smithells” separation experiment. A length of heat resistant glass tube and supporting ring is provided to enable the primary and secondary flames to be separated.

The speed at which the flame passes along a stationary column of gas air mixture is an important factor in the understanding of flame stability. A length of clear tube is connected to the mixing block and a known air fuel mixture is allowed to flow through this to a burner. Shutting off the gas and air supply simultaneously at the source and igniting the mixture at the far end, by means of a spark, allows the flame front to be watched and timed as it travels along the tube.

## ***Specification***

A bench top console housing a centrifugal air blower with flow measurement and control, and a controlled and measured gas supply with two gas flowmeters, allowing for a wide range of gas fuels. A safety interlock ensures gas can only flow with an operator in attendance. An air fuel mixing block allows the use of a wide range of sample burner mixing tubes and accessories to allow direct measurement of flame speed.

## ***Detailed Specification***

**Panel:** vacuum formed solid colour panel in which all controls, fan and instruments are mounted



**Airflow:** Glass variable area flowmeter (1)  
**Gas Flow:** Glass variable area flowmeter (2) to cover wide range of load speed combustible gases (e.g. Propane, Butane, Methane LPG).  
**Burner Tubes:** 4 inter-changeable steel burner tubes in a range of diameters.  
**Stabiliser Cups:** two brass conical cups to fit two of the burner tubes.  
**Smithells Tube:** heat resistant glass tube and brass adapter.  
**Igniter:** Handheld manual.  
**Safety:** Gas control solenoid valve with foot switch. Combined overload cut out and on /off switch, earth leakage circuit breaker.  
**Flame Speed System:** Long, large diameter clear tube, with mains driven high-voltage spark igniter and two adapters each with flame traps.

### **Dimensions**

Height: 440mm    Depth: 300mm  
 Width: 440mm    Weight: 25kg.

### **Services Required**

**Electrical: A:** 220-240 Volts, Single Phase, 50Hz(With earth/ground).  
 Line current up to 8A at 230v  
**B:** 110-120 Volts, Single Phase, 60Hz(With earth/ground).  
 Line current up to 16A at 110v

### **Accessories and Spares**

Unit supplied with:  
 One experimental operating and maintenance manual in either English, Spanish or French.  
 Accessories and spares for 2 years normal operation. List available on request.

### **Ordering Information**

**Order as:** C552 Flame Propagation And Stability 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, French.

### **Shipping Specifications**

**Net Weight:** 25kg Approximately

**Gross Weight:** 50 kg. (approx.)

**Packing Case Dimensions:** 77 x 78 x 48 cm (approx.)

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