Visual Refrigeration Training Unit 801

- ***Shows Clearly the Basic Principles of the Vapour Compression Refrigeration Cycle***
- ***Introduces the Concepts of Change of State, Saturated Liquid, Saturated Vapour and Superheated Vapour***
- ***Optional Student Tool Kit, Test and Service Equipment and Maintenance and Student Practice Package.***
- ***Instruction Manual Contains Course Notes, Instruction Notes and Student Example Worksheets***
- ***Demonstrates Common Faults and Effects on the System***
- ***Two year Warranty.***

Introduction

Students who are new to refrigeration may find some important concepts difficult to understand, for example,

- Latent heat
- Pressure/temperature relationship
- A liquid can boil at sub-zero temperatures
- Saturation temperature
- Superheat
- Sub-cooling

With its transparent evaporator, the Model 801 is designed to promote a clear understanding of these concepts, and to support the teaching of:

- The basic principles of heat transfer
- The Vapour compression refrigeration cycle
- Function and application of different flow controls

Description

Model 801 is one of a range of trainers designed to provide practical training in the fields of Refrigeration and Air Conditioning.

Each trainer has been carefully designed to provide instruction in specific topic areas that trainees are required to study as part of most Refrigeration and Air Conditioning courses.

The unit is mounted on a steel frame with stainless steel panels and comprises an open type compressor with air cooled condenser and clear plastic evaporator.

A variety of different flow controls can be selected and the operation with each type of control studied, including liquid return to the compressor.

All the flow controls and the high and low pressure switches are adjustable by the student to enable basic studies in the control of vapour compression refrigeration.

A standard Student Tool Kit, Test and Service Equipment Package and Maintenance and Student Practice Package are available as optional items.

Further details available on request.

Student Tool Kit

Test & Service Equipment

Specification

DETAILED

The unit is mounted on a steel framework with stainless steel base and back panels.

Air-cooled condensing unit with open type twin cylinder reciprocating compressor.
Transparent plastic evaporator, clearly showing change of state of refrigerant from liquid to vapour phase
Refrigerant flow control options, selected by use of hand wheel valves as follows:

1. Automatic Expansion Valve
2. Thermostatic Expansion Valve, Internally equalised.
3. Capillary with Separate Filter Drier

Liquid/suction heat exchanger
Liquid line filter drier and sight glass
HP/LP switches
Compound and pressure gauges
Suction and discharge service valves fitted
Liquid line hand wheel valve fitted for easy manual pump down of system
Refrigerant R134a

An electrical control box is mounted on the back panel and includes indicators/warning lamp, on/off contactor and overload, as well as residual current device for protection against earth leakage.

Operating Manual

A comprehensive operating manual includes:

- Notes on theory and principles
- Instructor's guide notes
- Student test papers and sample answers
- Electrical wiring diagram.

Dimensions

Height 163 cm Depth 64 cm
Width 134 cm Weight 89 kg

Services Required

Electrical

Either: **A**: 2.5Amp.220-240 Volts, Single Phase, 50Hz (With earth/ground).

OR

B: 5Amp.110-120 Volts, Single Phase, 60Hz (With earth/ground).

Optional Equipment

- Student Tool Kit
- Test And Service Equipment
- Maintenance And Student Package

Ordering Information

Order as: Visual Refrigeration Training Unit 801

Electrical Specification

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

OR

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

Language

Either: English, Spanish or French

Shipping Specification *(Approx.)*

Net Weight:	89 kg
Gross Weight:	138 kg.
Packing Case Dimensions:	143 x 72 x 126 cm
Packing Case Volume:	1.297m^3

Also Available on Request

- Further detailed specification
- Additional copies of instruction manual
- Recommended list of spares for 5 years operation

P.A.HILTON Ltd.

Horsebridge Mill, King's Somborne,
Stockbridge, Hampshire, SO20 6PX, England.

Telephone: National (01794) 388382
International +44 1794 388382

Fax: National (01794) 388129
International +44 1794 388129

E-mail: **sales@p-a-hilton.co.uk**
Website: www.p-a-hilton.co.uk

SCAN ME WITH A SMARTPHONE
P.A.HILTON Ltd.

NOTE: The policy of P.A.Hilton Ltd is one of continual improvement and we reserve the right to change this specification without notice.

Commercial Refrigeration Training Unit 802

- ***Constructed from the Components actually required to install a 2.50 Cubic meter (75 Cubic Feet) Chill room***
- ***Shows how the Basic Principles of the Vapour Compression Cycle are applied in Practical Refrigeration***
- ***Optional Student Tool Kit, Test and Service Equipment and Maintenance and Student Practice Package***
- ***Complete with Comprehensive Installation, Operation and Maintenance Manual***
- ***Demonstrates Common Faults and Effects on the System***
- ***Two year Warranty.***

Introduction

The 802 unit is constructed from components that are required to install a 2.54 cubic metre (75 cubic feet) chill room operating at. -1/+2ºC (30/25ºF.)

This unit quickly enables the student engineer to learn how the basic principles of the Vapour-Compression Cycle, are applied in practical refrigeration, and provides
valuable 'Hands-On' experience in:

- Fault diagnosis and correction
- Refrigerant recovery and recycling
- Changing components
- Evacuation and Charging
- Electrical work

All exercises with the 802 relate directly to installations that students will encounter later in their work as a service and installation engineers.

Description

Model 802 is one of a range of trainers designed to provide practical training in the fields of Refrigeration and Air Conditioning.

Each trainer has been carefully designed to provide instruction in specific topic areas that trainees are required to study as part of most Refrigeration and Air Conditioning courses.

The unit is mounted on a steel frame with stainless steel panels and comprises an hermetic type compressor, air cooled condenser and a forced air evaporator inside an insulated cabinet.

The layout of the system components is exactly the same as fitted to a full size chill room and the unit is designed as an introduction to "real" refrigeration systems. The training objectives of the 802 link directly to the Basic Installation Training Package 803 for a comprehensive range of practical skills training.

A comparison between the student built 803 and 802 clearly establishes whether installation skill and competences are sufficiently developed or if further training and practice are required.
A standard Student Tool Kit, Test and Service Equipment Package and Maintenance and Student Practice Package are available as optional items.

Further details available on request

Student Tool Kit

Test & Service Equipment

802 Maintenance & Student Practice Package

Specification

DETAILED

The unit is mounted on a steel frame and with a stainless steel base and back panel.
The unit comprises:
Air cooled condensing unit with high back pressure, high starting torque hermetic compressor
Complete with:
Suction and Discharge Service Valves
Gauge Manifold Connections
Built in Motor Protector

Forced air, blow through type evaporator, with 15-watt fan motor. Powder coated galvanised sheet steel casing with removable front panel. Evaporator coil constructed from internally grooved copper tube, and fitted with aluminium fins at 5 FPI.

Detachable Insulated hood with variable heat load: 60, 100, 120, 160 or 200 watts.
Dial Thermometer.
Internally equalised Thermostatic Expansion Valve.
Liquid Line Filter Drier.
Heat Exchanger.
High Pressure Switch,
Low Pressure Switch.
High Pressure gauge.
Compound gauge.

An electrical control box is mounted on the back panel and includes indicators/warning lamps on/off and heat load contactors and overloads as well as residual current device for protection against earth leakage.

Operating Manual

A comprehensive operating manual includes:

- Notes on theory and principles
- Instructor's guide notes
- Students test papers and sample answers
- Electrical wiring diagram

Dimensions

Height: 165 cm Depth: 64 cm
Width: 134 cm
Weight: 101 kg

Services Required

Electrical either:

A: 13 Amp 220-240 Volts, Single Phase, 50Hz (With earth/ground).

OR

B: 26Amp 110-120 Volts, Single Phase, 60Hz (With earth/ground).

Optional Equipment

- Student Tool Kit
- Test and Service Equipment
- Maintenance and Student Practice Package

Ordering Information

Order as: Commercial Refrigeration Training Unit 802

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

Net Weight:	101 kg.
Approximate Gross Weight:	151 kg.
Packing Case Dimensions:	143 x 72 x 126 cm
Packing Case Volume:	1.297m^3

Also Available on Request

- Further detailed specification
- Additional copies of instruction manual
- Recommended list of spares for 5 years operation

P.A.HILTON Ltd.

Horsebridge Mill, King's Somborne,
Stockbridge, Hampshire, SO20 6PX, England.

Telephone: National (01794) 388382
International +44 1794 388382

Fax: National (01794) 388129
International +44 1794 388129
E-mail: **sales@p-a-hilton.co.uk**
Website: www.p-a-hilton.co.uk

SCAN ME WITH A SMARTPHONE
P.A.HILTON Ltd.

NOTE: The policy of P.A.Hilton Ltd is one of continual improvement and we reserve the right to change this specification without notice.

Hermetic Refrigeration System Training Unit

804

- ***Designed for the Training of Domestic Refrigeration and Air Conditioning Service Engineers***
- ***Promotes clear understanding of hermetic systems using a capillary tube as flow control***
- ***Built in System Faults***
- ***Optional Student Tool Kit, Test and Service Equipment and Maintenance and Student Practice Package.***
- ***Instruction Manual Contains Course Notes, Instruction Notes and Student Example Worksheets.***
- ***Two year Warranty***

Introduction

Hermetic refrigeration systems using a capillary tube as the flow control are very extensively used in domestic and small commercial refrigeration appliances such as:
Freezers
Air Conditioners
Water Chillers etc.
Effective, economically acceptable and lasting repairs are only possible when the Service Engineer has a thorough understanding of the Hermetic System.

The comprehensive 804 Hermetic Refrigeration System Training Unit manual supplied, leads the student from a fundamentals understanding to a full understanding of the hermetic system.

Description

The 804 is one of a range of trainers designed to provide practical training in the fields of Refrigeration and Air Conditioning.

Each trainer has been carefully designed to provide instruction in specific topic areas that trainees are required to study as part of most Refrigeration and Air Conditioning courses.

The unit is mounted on a steel frame with stainless steel panels and comprises an hermetic type compressor with air cooled condenser and evaporator with capillary tube flow control.

Using the push button switches, five system faults can be introduced into the system:

i. Excess discharge pressure
ii. Faulty compressor valve
iii. Choked capillary
iv. Overcharged system
v. Undercharged system

A standard Student Tool Kit, Test and Service Equipment Package and Maintenance and Student Practice Package are available as optional items.

Further details available on request.

Student Tool Kit

Test & Service Equipment

804 Maintenance & Student Practice Package

NOTE: The policy of P.A.Hilton Ltd is one of continual improvement and we reserve the right to change this specification without notice.

Specification

DETAILED

Unit is bench mounted on a steel framework with stainless steel back and base panels incorporating a drip tray for condensate.

The unit includes:
Fan cooled hermetic condensing unit with high starting torque compressor
Front mounted evaporator with suction accumulator
Liquid line dryer
Compound and Pressure gauges
Suction and discharge service valves fitted
High pressure safety switch
Digital readout of condenser outlet temperature
On/off switches for compressor and condenser fan
Fault selection control switches

Operating Manual

A comprehensive operating manual includes:

- Notes on theory and principles
- Instructor's guide notes
- Student test papers and sample answers
- Electrical wiring diagram.

Dimensions(Approx).

Height 73cm Depth 73 cm
Width 103cm Weight 66 kg

Services Required

Electrical

Either: **A**: 4Amp.220-240 Volts, Single Phase, 50Hz(With earth/ground).

OR

B**:** 8Amp.110-120 Volts, Single Phase, 60Hz(With earth/ground).

Optional Equipment

- Student Tool Kit
- Test And Service Equipment
- Maintenance And Student Package

Ordering Information

Order as: Hermetic Refrigeration System Training Unit 804

Electrical Specification

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

OR

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

Language

Either: English, Spanish or French

Shipping Specification (Approx)

Net Weight:	66 kg
Gross Weight:	140 kg.
Packing Case Dimensions:	117x 84 x 94 cm
Packing Case Volume:	0.924m^3

Also Available on Request

- Further detailed specification
- Additional copies of instruction manual
- Recommended list of spares for 5 years operation

P.A.HILTON Ltd.

Horsebridge Mill, King's Somborne,
Stockbridge, Hampshire, SO20 6PX, England.

Telephone: National (01794) 388382
International +44 1794 388382

Fax: National (01794) 388129
International +44 1794 388129

E-mail: **sales@p-a-hilton.co.uk**
Website: www.p-a-hilton.co.uk

SCAN ME WITH A SMARTPHONE
P.A.HILTON Ltd.

NOTE: The policy of P.A.Hilton Ltd is one of continual improvement and we reserve the right to change this specification without notice.

Advanced Training Unit
805

- ***Fully Operational small scale coldroom***
- ***Multiple circuit, incorporating secondary controls***
- ***Push button selection of built in faults***
- ***Push button selection of Refrigeration circuit***
- ***Optional Student Tool Kit, Test and Service Equipment and Maintenance and Student Practice Package***
- ***Two year Warranty.***

Introduction

The Advanced Training Unit 805 is a fully operational, small scale coldroom, which enables the student to relate all test results, system faults and adjustments directly to situations encountered in service and maintenance.

It is a multiple circuit unit, incorporating important secondary controls, is constructed entirely from standard commercial components and will give the student invaluable experience in fault diagnosis, system adjustment and replacement of faulty components.

Components include:

- Electric Defrost System
- Evaporator Pressure Regulation
- Crankcase Protection
- Capacity Regulation
- Variable Coldroom Heat Load

The push-button Switches Enable:

1. Selection of simple or more complex refrigeration circuit.
2. Comparison of controls.
3. A clear demonstration of the correct use of internal and externally equalised thermostatic expansion valves.
4. Selection of built in faults.

Description

Model 805 is one of a range of trainers designed to provide practical training in the fields of Refrigeration and Air Conditioning.

Each trainer has been carefully designed to provide instruction in specific topic areas that trainees are required to study as part of most Refrigeration and Air Conditioning courses.

The unit is mounted on a steel frame with stainless steel panels and comprises a semi hermetic type compressor with air cooled condenser and forced air evaporator with electric defrost inside an insulated cabinet with hinged lid.

A variety of different controls can be selected and the operation with each type of control studied.

All the controls and the high and low pressure switches are adjustable by the student to enable advanced studies in the control of vapour compression refrigeration equipment.

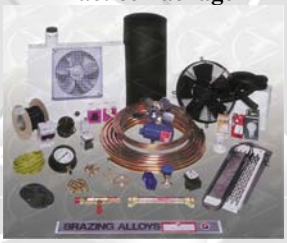
A standard Student Tool Kit, Test and Service Equipment Package and Maintenance and Student Practice Package are available as optional items.

Further details available on request.

Student Tool Kit

Test & Service Equipment

805 Maintenance & Student Practice Package



Specification

DETAILED

The unit is mounted on a steel framework, with stainless steel base and back panels and incorporates:-
Semi-hermetic condensing unit, with fan cooled condenser and receiver.
Forced-air evaporator, with electric defrost, mounted in insulated box with hinged lid.
Heat load – variable 75 to 600 watts.
Pressure gauge.
2 Compound gauges.
High-pressure control and low pressure control
Thermostat.
Oil separator.
Heat exchanger
2 Liquid line driers
3 Thermostatic expansion valves.
Evaporator pressure regulator.
Crankcase pressure regulator.
Capacity Regulator.
7 Solenoid valves.
3 Handwheel valves.
Refrigerant R134a.
6 Sight glasses

Electrical

ON/OFF switch with indicator light.
7 Push button switches to control refrigerant flow path and to select in-built faults.

Separate push-button to switch:

- Condenser Fan Motor
- Evaporator fan motor
- Coldroom heat load

Overload protector
Contactor
Earth leakage protector
De-frost timer

Operating Manual

A comprehensive operating manual includes:

- Notes on theory and principles
- Instructor's guide notes
- Student test papers and sample answers
- Electrical wiring diagram.

Dimensions

Height: 163 cm Depth: 64 cm
Width: 134 cm Weight: 164kg

Services Required

Electrical

Either: **A**: 15Amp.220-240 Volts, Single Phase, 50Hz (With earth/ground).
OR
B**:** 30Amp.110-120 Volts, Single Phase, 60Hz (With earth/ground).

Optional Equipment

- Student Tool Kit
- Test And Service Equipment
- Maintenance And Student Package

Ordering Information

Order as: Advanced Training Unit 805

Electrical Specification

Either: **A**:220-240 Volts, Single Phase, 50Hz (With earth/ground).
OR
B: 110-120 Volts, Single Phase, 60Hz (With earth/ground).

Language

Either: English, Spanish or French

Shipping Specification *(Approx)*

Net Weight: 164 kg
Gross Weight: 218 kg.
Packing Case Dimensions:
143 x 72 x 126 cm
Packing Case Volume: 1.297m³

Also Available on Request

- Further detailed specification
- Additional copies of instruction manual
- Recommended list of spares for 5 years operation

P.A.HILTON Ltd.

Horsebridge Mill, King's Somborne,
Stockbridge, Hampshire, SO20 6PX, England.

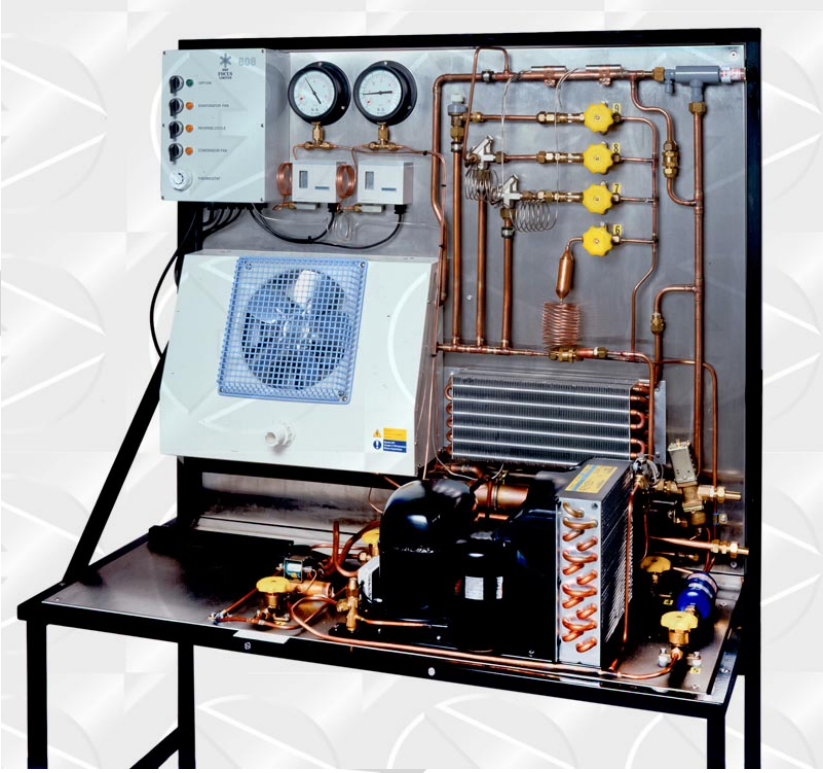
Telephone: National (01794) 388382
International +44 1794 388382

Fax: National (01794) 388129
International +44 1794 388129

E-mail: **sales@p-a-hilton.co.uk**
Website: www-p-a-hilton.co.uk

SCAN ME WITH A SMARTPHONE

Reverse Cycle Refrigeration and Air Conditioning Training Unit 808



- ***Air Cooled and Water Cooled Condenser***
- ***Forced Air and Static Evaporator with dual temperature operation***
- ***Optional Student Tool Kit, Test and Service Equipment and Maintenance and Student Practice Package.***
- ***Comprehensive Instruction Manual Contains Course Notes, Instruction Notes and Student Example Worksheets***
- ***Demonstrates Common Faults and Effects on the System***
- ***Two year Warranty***

Introduction

The 808 is designed to augment the student engineer's existing knowledge of the theory and practice of refrigeration and lead him to an understanding of a more complex system.

Some features of the 808:

- Reverse Cycle Operation
- Air Cooled and Water Cooled Condensers
- Forced Air and Static Evaporators
- Dual Temperature Operation
- Compact and self contained, the 808 needs only a water supply, drain and a single phase electrical supply.

Description

Model 808 is one of a range of trainers designed to provide practical training in the fields of Refrigeration and Air Conditioning.

Each trainer has been carefully designed to provide instruction in specific topic areas that trainees are required to study as part of most Refrigeration and Air Conditioning courses.

The unit is mounted on a steel frame with stainless steel panels and comprises of a hermetic compressor with air and water cooled condensers.

The static and forced air evaporator are fitted with the necessary controls to allow dual temperature operation.

Reverse cycle operation allows the study of the application of the vapour compression to air conditioning and heat pump systems.

A standard Student Tool Kit, Test and Service Equipment Package and Maintenance and Student Practice Package are available as optional items.

Further details available on request.

Student Tool Kit

Test & Service Equipment

808 Maintenance & Student Practice Package

NOTE: The policy of P.A.Hilton Ltd is one of continual improvement and we reserve the right to change this specification without notice.

Specification

Detailed

The unit is mounted in a steel frame with stainless steel base and back panels and incorporates **Hermetic Condensing Unit:**

Having a high starting torque motor with built-in:

- Winding protector, air-cooled condenser and liquid receiver
- Remote Water-cooled Condenser
- Forced Air Evaporator:
- Coil block: $^{3}/_{8}$" O.D. copper tube with aluminium fins.
- Flow Controls:
- Automatic expansion valve.
- Internal equalised thermostatic expansion valve.
- External equalised thermostatic expansion valve.
- Selection by handwheel valve.

Static Evaporator:

- Coil block as for Forced Air Evaporator.
- Flow Control:
- Capillary tube with separate filter drier.
- Selection by handwheel valve.

Reverse Cycle Operation:

- Evaporator pressure regulating valve for dual-
- temperature operation.
- High pressure switch.
- Low pressure switch.
- Compound Gauge.
- High Pressure Gauge.

3 – Sight Glasses.
4 – Check Valves to control direction of refrigerant flow.
9 Hand valves

An electrical control box is mounted on the back panel and includes indicators/warning lamp, on/off evaporator and condenser fan and reverse cycle contactor and overload, as well as residual current device for protection against earth leakage.

Operating Manual

A comprehensive operating manual includes:

- Notes on theory and principles
- Instructor's guide notes
- Student test papers and sample answers
- Electrical wiring diagram.

Dimensions

Height 163 cm	Depth 64 cm
Width 134 cm	Weight 115kg

Services Required

Electrical

Either: **A**: 13Amp.220-240 Volts, Single Phase, 50Hz (With earth/ground).
OR
B: 26Amp.110-120 Volts, Single Phase, 60Hz (With earth/ground).

Optional Equipment

- Student Tool Kit
- Test And Service Equipment
- Maintenance And Student Package

Ordering Information

Order as: Reverse Cycle refrigeration Training Unit 808

Electrical Specification

Either: **A**: 220-240 Volts, Single Phase 50Hz (With earth/ground).
OR
B: 110-120 Volts, Single Phase 60Hz (With earth/ground).

Language

Either: English, Spanish or French

Shipping Specification(Approx)

Net Weight:	115 kg
Gross Weight:	165 kg.
Packing Case Dimensions: 143 x 72 x 126 cm	
Packing Case Volume:	1.297m^3

Also Available on Request

- Further detailed specification
- Additional copies of instruction manual
- Recommended list of spares for 5 years operation

P.A.HILTON Ltd.

Horsebridge Mill, King's Somborne,
Stockbridge, Hampshire, SO20 6PX, England.

Telephone: National (01794) 388382
International +44 1794 388382

Fax: National (01794) 388129
International +44 1794 388129

E-mail: **sales@p-a-hilton.co.uk**
Website: www.p-a-hilton.co.uk

SCAN ME WITH A SMARTPHONE
P.A.HILTON Ltd.

NOTE: The policy of P.A.Hilton Ltd is one of continual improvement and we reserve the right to change this specification without notice.

Automotive Air Conditioning

Training Unit

810

- ***Complete System Bench Mounted***
- ***Fitted with 12 Volt Control System***
- ***Optional Student Tool Kit and Test and Service Equipment***
- ***Instruction Manual Contains Course Notes, Instruction Notes and Student Example Worksheets***
- ***Demonstrates Common Faults and Effects on the System***
- ***Two year Warranty***

Introduction

The 810 is designed to train students in the operation, fault finding, maintenance and repair of automotive air conditioning systems.

It comprises a complete automotive air conditioning system on an alloy frame suitable for bench mounting. The unit operates on R134a refrigerant used in most current vehicle air conditioning systems and connections are provided to allow the use of standard R134a manifold gauges.

Description

Model 810 is one of a range of trainers designed to provide practical training in the fields of Refrigeration and Air Conditioning.

Each trainer has been carefully designed to provide instruction in specific topic areas that trainees are required to study as part of most Refrigeration and Air Conditioning courses.

The compressor is driven by a synchronous AC electric motor and the complete unit has an internal Residual Current Device for additional operator safety. Apart from the drive motor all other controls are 12V as used in automotive air conditioning systems.
Temperature control is by an adjustable electronic thermostat and the evaporator has three fan speeds to show the effect of air velocity and varying load on the system

Four common faults can be demonstrated –
Blocked Thermostatic Expansion Valve
Blocked Drier
Compressor Fault
Poor Condensing

A standard Student Tool Kit and Test and Service Equipment Package are available as optional items.

Further details available on request.

Student Tool Kit

Test & Service Equipment

NOTE: The policy of P.A.Hilton Ltd is one of continual improvement and we reserve the right to change this specification without notice.

Specification

Detailed

A complete vehicle air conditioning system mounted on an alloy frame and fitted with standard R134a manifold gauge connections.

Incorporating:-

Electric Motor nominal 1500rpm with overload cut out.

Five cylinder open type compressor with duty of up to 7.5 Kw at maximum rated speed.

Air cooled condenser and fan with 12v dc motor.

Evaporator fitted with three speed 12 dc fan and Thermostatic Expansion Valve.

Electronic thermostat, adjustable for temperature control.

Transformer to provide 12v automotive control circuit.

Electrical control box with key locked emergency of button, on – off switch, ignition key and residual current device.

Four switch controlled fault conditions:

- Blocked Thermostatic Expansion valve
- Blocked drier
- Compressor Fault
- Poor condensing

Refrigerant R134a

Operating Manual

A comprehensive operating manual includes:

- Notes on theory and principles
- Instructor's guide notes
- Student test papers and sample answers
- Electrical wiring diagram.

Dimensions

Height 46 cm Depth 57 cm
Width 91 cm Weight 100kg

Services Required

Electrical

Either: **A**: 13Amp.220-230 Volts, Single Phase, 50Hz (With earth/ground).
OR
B**:** 26Amp.110-120 Volts, Single Phase, 60Hz (With earth/ground).

Optional Equipment

- Student Tool Kit
- Test And Service Equipment

Ordering Information

Order as: Automotive Air Conditioning Training Unit 810

Electrical Specification

Either: **A**: 220-230Volts, Three Phase, 50Hz (With earth/ground).
OR
B: 110-120Volts, Three Phase 60Hz (With earth/ground).

Language

Either: English, Spanish or French

Shipping Specification *(Approx)*

Net Weight:	100 kg
Gross Weight:	150 kg.
Packing Case Dimensions:	100 x 60 x 75 cm
Packing Case Volume:	0.450m^3

Also Available on Request

- Further detailed specification
- Additional copies of instruction manual
- Recommended list of spares for 5 years operation

P.A.HILTON Ltd.

Horsebridge Mill, King's Somborne,
Stockbridge, Hampshire, SO20 6PX, England.

Telephone: National (01794) 388382
International +44 1794 388382

Fax: National (01794) 388129
International +44 1794 388129

E-mail: **sales@p-a-hilton.co.uk**
Website: www.p-a-hilton.co.uk

SCAN ME WITH A SMARTPHONE
P.A.HILTON Ltd.

NOTE: The policy of P.A.Hilton Ltd is one of continual improvement and we reserve the right to change this specification without notice.

Advanced Training Unit

For Fault Location

811

- ***Demonstrates multi-evaporator system operating at different temperatures***
- ***Incorporates 25 typical system faults, each activated by a push-button switch.***
- ***Allows practical fault detection and location.***
- ***Introduces students to 3 phase systems.***
- ***Two year Warranty.***

Introduction

The Advanced Training Unit for Fault Location 811 is a fully operational refrigeration unit with two visible evaporators simulating freezing and cooling rooms, operating from a single semi-hermetic condensing unit.

The unit is constructed entirely from standard commercial components, including all of the necessary primary and safety controls and will give students valuable experience of system adjustment and fault finding on a multi-evaporator three phase refrigeration system.

A combination of **25 refrigerant circuit and electrical circuit faults** can be activated by the instructor allowing both normal and fault condition operation to be investigated. The faults include:-

- Compressor valve fault
- Oil separator fault
- Overcharge
- Undercharge
- Check valve leak
- Evaporator pressure controller fault
- Thermostatic expansion valve not operating – freezer evaporator
- Thermostatic expansion valve fault – freezer evaporator
- Thermostatic expansion valve not operating – cold room evaporator
- Thermostatic expansion valve fault – cold room evaporator
- Suction line freezer evaporator – frosted
- Suction line cooler evaporator – frosted
- Filter dryer restriction
- Discharge pressure fault
- Hot gas defrosting fault
- Suction pressure too low - decreasing evaporator capacity
- Suctions pressure too high
- One phase fault
- Two phase fault
- One contact set (motor overload protection) disconnected
- Two contact sets (motor overload protection) disconnected
- Thermal overload protection of motor switch box
- Coil fault – motor protection – starter box
- Thermostatic fault – freezing room – not working
- Thermostat fault – cooling room – not working

Description

The 811 is one of a range of trainers designed to provide practical training in the fields of Refrigeration and Air Conditioning.

Each trainer has been carefully designed to provide instruction in specific topic areas that trainees are required to study as part of most Refrigeration and Air Conditioning courses.

On the model 811 all standard components are visible, mounted on a steel frame with stainless steel panels. Instrumentation includes condensing, evaporating and suction pressures, mechanical and digital temperature measurement, digital multi-meter and optional refrigerant flow meters. The system includes reverse gas defrost, suction accumulator, oil separation and variable speed evaporator and condenser fans. Instructor controlled faults are induced by internal components which are hidden from student view.
A standard Student Tool Kit, and Test and Service Equipment Package are available as optional items.

Further details available on request.

Student Tool Kit

Test & Service Equipment

Specification

Detailed

The unit is mounted on a wheeled steel frame with stainless steel base and back panels and incorporates:-

- Compressor: Semi-Hermetic, 0.37 kW. 1450 rpm
- Condenser: Air-cooled, aluminium finned, copper coil
- Evaporators: Display-case evaporators. Aluminium finned, copper coils with hot gas defrosting
- Injection controls: 2 thermostatic expansion valves
- Liquid receiver
- Control equipment: Low and high-pressure control, thermostatic control, evaporator pressure control, capacity control, condensing pressure control and crankcase pressure control, low pressure switch, high pressure switch
- Measuring equipment: Digital temperature indicator with 10 ways elector switch
- 4 pressure gauges (3 compound,1 high pressure)
- 2 dial thermometers.
- Hand-held digital multi-meter

Refrigerant: R134a.

25 switches located on the side panel under a hinged cover allow combinations of faults to be activated by the instructor.

An electrical control box is mounted on the panel and includes accessible three phase relays, fuses and an overload protector. An internal three phase residual current device protects against earth leakage. Fan speed controls and defrost switch with indicator are also panel mounted.

Operating Manual

A comprehensive operating manual includes:

- Notes on theory and principles
- Instructor's guide notes
- Student test papers and sample answers
- Electrical wiring diagram.

Dimensions

Height: 1700mm Depth: 700mm
Width: 2160mm
Shipping Weight: 425kg

Services Required

Electrical

Either: **A**: 7Amp.380-440 Volts, Three Phase, 50Hz (With earth/ground).

OR

B**:** 13Amp.210-220 Volts, Three Phase, 60Hz (With earth/ground).

Optional Equipment

- Student Tool Kit
- Test And Service Equipment
- Maintenance And Student Package

Ordering Information

Order as: Advanced Training Unit For fault Location 811

Electrical Specification

Either: **A**: 380-440 Volts, Three Phase 50Hz (With earth/ground).

OR

B: 210-220 Volts, Three Phase 60Hz (With earth/ground).

Language

Either: English, Spanish or French

Shipping Specification *(Approx)*

Net Weight:	263 kg
Gross Weight:	425 kg.
Packing Case Dimensions:	232 x 85 x 190 cm
Packing Case Volume:	3.7648m^3

Also Available on Request

- Further detailed specification
- Additional copies of instruction manual
- Recommended list of spares for 5 years operation

P.A.HILTON Ltd.

Horsebridge Mill, King's Somborne,
Stockbridge, Hampshire, SO20 6PX, England.

Telephone: National (01794) 388382
International +44 1794 388382

Fax: National (01794) 388129
International +44 1794 388129

E-mail: **sales@p-a-hilton.co.uk**
Website: www.p-a-hilton.co.uk

SCAN ME WITH A SMARTPHONE

NOTE: The policy of P.A.Hilton Ltd is one of continual improvement and we reserve the right to change this specification without notice.

Water Chiller Training Unit

812

- ***Fully Operational Water Chiller With Cooling Load***
- ***Evaporator Pressure Regulator to Demonstrate Non-Freeze Cooling***
- ***Optional Data Acquisition Available.***
- ***Optional Student Tool Kit, Test and Service Equipment***
- ***Two year Warranty.***

Introduction

The Water Chiller Training Unit 812 is a fully operational, water chiller, which enables the student to adjust and investigate a typical water cooler operating under load, either with or without evaporator pressure regulation.

The cooling of pure water requires that the evaporator surface temperature does not fall below 0°C or the system will freeze and may result in damage. This unit allows students to safely explore the parameters affecting evaporating pressure without danger to the operator or equipment.

As with all Hilton vocational equipment all of the components are clearly arranged on a panel allowing easy identification.
Components include:

- Hermetic compressor
- Water cooled condenser with adjustable pressure control
- Liquid receiver
- Water cooling evaporator
- Adjustable evaporator pressure regulation
- Suction accumulator
- Cooling load, adjustable in steps of 1.0 and 0.5kW
- Adjustable cooling water flow
- Pressure, temperature and flow rate measurement.
- Control panel that will accept optional computerised data acquisition.

Description

The 812 is one of a range of trainers designed to provide practical training in the fields of Refrigeration and Air Conditioning.

Each trainer has been carefully designed to provide instruction in specific topic areas that trainees are required to study as part of most Refrigeration and Air Conditioning courses.

The unit is mounted on a steel frame with stainless steel panels and comprises an hermetic compressor with water cooled condenser, liquid receiver, water cooling evaporator with adjustable pressure regulator. A pump circulates the cooled water at an adjustable flow rate through a tank with individually switched heaters that load the refrigeration system.
Instrumentation includes condenser and suction pressure gauges, evaporator pressure (service gauge), digital temperature indicator with 10 way selector switch, evaporator and condenser flow rate measurement, optional refrigerant flow meter and optional computerised data acquisition system for all parameters including compressor current.

All the controls and the high and low-pressure switches are adjustable by the student to enable advanced studies in the control of vapour compression refrigeration equipment.

A standard Student Tool Kit and Test and Service Equipment Package are also available as optional extras
Further details available on request.

Student Tool Kit

Test & Service Equipment

NOTE: The policy of P.A.Hilton Ltd is one of continual improvement and we reserve the right to change this specification without notice.

Specification

DETAILED

The unit is mounted on a steel framework, with stainless steel base and back panels and incorporates:-

- Hermetic compressor
- Water-cooled condenser.
- Liquid receiver
- Adjustable condenser pressure regulator
- Water-cooling evaporator
- Thermostatic expansion valve
- Adjustable evaporator pressure regulator with detachable service gauge.
- Suction accumulator.
- Water tank with individual switchable loads of 1kW, 1kW and 0.5kW
- Water circulating pump with flow control.

Instrumentation includes:

- Digital temperature indicator with 10 way selector switch.
- Condenser and evaporator water flow meters.
- Condenser and suction pressure gauges and detachable evaporator pressure gauge.
- Optional refrigerant flowmeter.

Control panel including:

- Overload protection
- Contactor
- Earth leakage protector
- Optional computerised data acquisition system.

Dimensions *(Approx)*

Height: 163 cm Depth: 64 cm
Width: 134 cm Weight: 164kg

Services Required

Electrical

Either: **A**: 15Amp.220-240 Volts, Single Phase, 50Hz (With earth/ground).

OR

B**:** 30Amp.110-120 Volts, Single Phase, 60Hz (With earth/ground).

Optional Equipment

- Student Tool Kit
- Test And Service Equipment
- Refrigerant flow meter
- Computerised data acquisition system

Ordering Information

Order as: Water Chiller Training Unit 812

Electrical Specification

Either: **A**: 15A 220-240 Volts, Single Phase 50Hz (With earth/ground).

OR

B: 30A 110-120 Volts, Single Phase 60Hz (With earth/ground).

Language

Either: English, Spanish or French

Shipping Specification

Net Weight:	164 kg
Gross Weight:	218 kg.
Packing Case Dimensions:	143 x 72 x 126 cm
Packing Case Volume:	1.297m^3

Also Available on Request

- Further detailed specification
- Additional copies of instruction manual
- Recommended list of spares for 5 years operation

P.A.HILTON Ltd.

Horsebridge Mill, King's Somborne,
Stockbridge, Hampshire, SO20 6PX, England.

Telephone: National (01794) 388382
International +44 1794 388382

Fax: National (01794) 388129
International +44 1794 388129

E-mail: **sales@p-a-hilton.co.uk**
Website: www.p-a-hilton.co.uk

SCAN ME WITH A SMARTPHONE
P.A.HILTON Ltd.

NOTE: The policy of P.A.Hilton Ltd is one of continual improvement and we reserve the right to change this specification without notice.

Absorption Cycle Refrigerator

816

- ***Demonstrates the Operation of An Ammonia-Water Absorption Refrigerator***
- ***Electrically Driven With Optional Computerised Data Acquisition.***
- ***Allows Investigation of Refrigerator Performance Under Load.***
- ***All Major Components Visible.***
- ***Two year Warranty.***

Introduction

The absorption refrigerator 816 is a fully operational ammonia-water refrigerator with all of the major refrigeration components visible.

The unit is robustly constructed entirely from standard commercial components. With the built in load and optional instrumentation students can investigate a refrigeration system that operates from an electrical heat source.

Originally invented by Albert Einstein and Leo Szilard the absorption refrigerator has no moving parts and utilises a mixture of ammonia-water and hydrogen. The cycle is complex and not easily understood without reference to an operating unit.
The unit has thermocouples located at 10 strategic and important locations around the refrigeration circuit. These together with a comprehensive system diagram and description in the manual, assist in student understanding of this complex system.

Description

Model 816 is one of a range of trainers designed to provide practical training in the fields of Refrigeration and Air Conditioning.

Each trainer has been carefully designed to provide instruction in specific topic areas that trainees are required to study as part of most Refrigeration and Air Conditioning courses.

On the model 816 all of the main absorption cycle components are visible at the rear of the unit. An instrumentation console with digital wattmeter and multi-way temperature indicator allow all of the important system parameters to be recorded. The system allows the ammonia generator and evaporator load to be independently varied and measured using the wattmeter.

An optional computerised Data Acquisition system C816A, allows all 10 thermocouples to be monitored as well as the ammonia generator power consumption and load current and voltage. This allows the system start condition to be monitored, which aids student understanding plus the system performance variation with change of load. All parameters can be monitored and plotted against time or transferred to a spreadsheet for analysis.

NOTE: The policy of P.A.Hilton Ltd is one of continual improvement and we reserve the right to change this specification without notice.

Specification

Detailed

The unit is mounted on a wheeled steel frame and incorporates:

Electrically driven ammonia-water absorption refrigeration system with insulated freezer compartment. All major components of the refrigeration system: generator, absorber, condenser and reservoir are visible

Variable electrical load inside the freezer compartment
Variable generator heater.

Instrumentation

- Digital temperature indicator
- Digital wattmeter to give instantaneous indication of generator heater input and evaporator load.
- Optional Computerised Data Acquisition System.

Safety

The unit is also protected by double pole combined switches and circuit breakers and a residual current circuit breaker to protect against earth leakage.

Operating Manual

A comprehensive operating manual includes:

- Notes on theory and principles
- Detailed description of system circuit and operation.
- Sample test results.

Dimensions

Height: 730mm Depth: 400mm
Width: 430mm
Shipping Weight: 25kg (approximate)

Services Required

Electrical

Either: **A**: 1 Amp.220-230 Volts, Single Phase, 50Hz (With earth/ground).

OR

B: 2Amp.110-120 Volts, Single Phase, 60Hz (With earth/ground).

Optional Equipment

Computerised Data Acquisition system C816A

Ordering Information

Order as: Absorption Cycle Refrigerator 816
Plus: (Optional) Computerised Data Acquisition system C816A

Electrical Specification

Either: **A**: 220-230 Volts, Single Phase 50Hz (With earth/ground).
OR
B: 110-120 Volts, Single Phase 60Hz (With earth/ground).

Language

Either: English, Spanish or French

Shipping Specification *(Approx)*

Net Weight:	25 kg
Gross Weight:	50kg.
Packing Case Dimensions:	80 x 80 x 120cm
Packing Case Volume:	0.77m^3

Also Available on Request

- Further detailed specification
- Additional copies of instruction manual
- Recommended list of spares for 5 years operation

P.A.HILTON Ltd.

Horsebridge Mill, King's Somborne,
Stockbridge, Hampshire, SO20 6PX, England.

Telephone: National (01794) 388382
International +44 1794 388382

Fax: National (01794) 388129
International +44 1794 388129

E-mail: **sales@p-a-hilton.co.uk**
Website: www.p-a-hilton.co.uk

SCAN ME WITH A SMARTPHONE
P.A.HILTON Ltd.

NOTE: The policy of P.A.Hilton Ltd is one of continual improvement and we reserve the right to change this specification without notice.

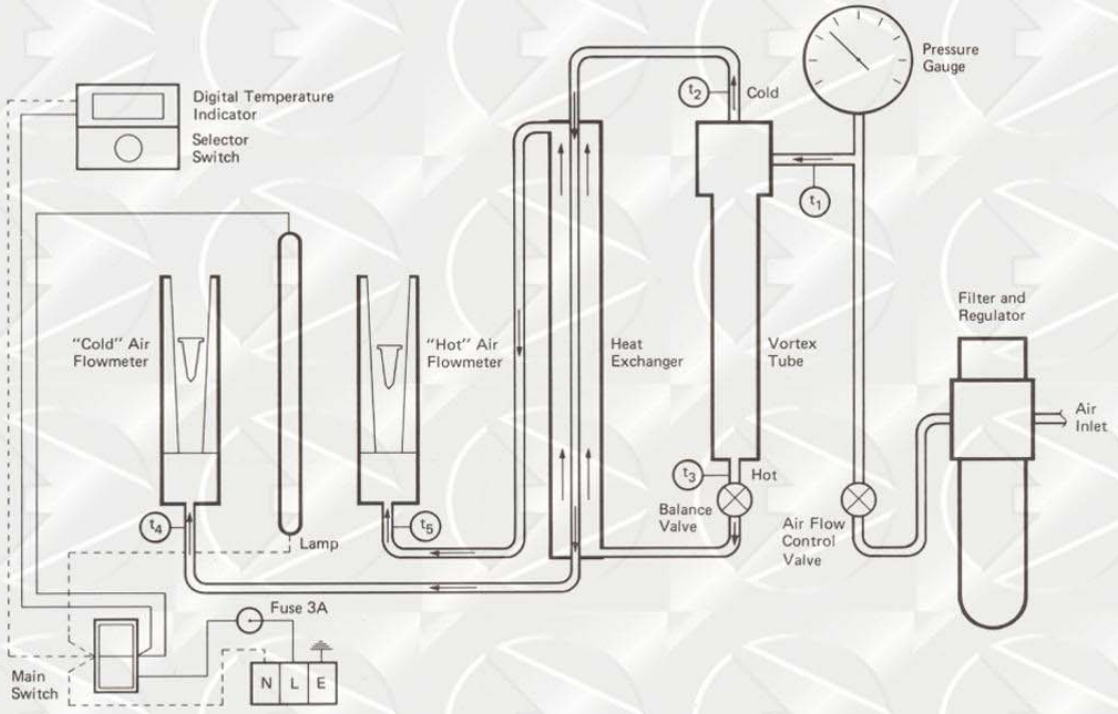
Vortex Tube Refrigerator R433

Machine Code R433 has been superseded by **R434**.
The air flowmeters, though physically smaller, are of similar range to those on the original unit.
A more efficient internal heat exchanger has removed the need for thermocouple stations t_4 and t_5.

Engineering Laboratory
Teaching Equipment

P. A. Hilton Ltd.

Vortex Tube Refrigerator R433



Introduction

The Vortex Tube is an interesting device in which a compressed gas (usually air) is divided into two streams at a lower pressure. One of these streams is about 50K colder, and the other is about 50K hotter than the compressed gas supplied.

Although a hot gas stream is more conveniently produced by other methods, the Vortex Tube has few competitors where a limited amount of cooling air is required in circumstances in which its small size, reliability and freedom from electrical supplies are of prime importance.

In this unit, a modified industrial Vortex Tube has been incorporated into a test unit with all the controls and instruments necessary to provide students with an appreciation of its characteristics and performance.

This unit will be of interest to those concerned with

Refrigeration

Thermodynamics and Fluid Mechanics

Plant and Process Engineering

Experimental capabilities

- Demonstration of the ability to produce hot and cold air from a device with no moving parts.
- Production of performance curves for a vortex tube with
  - (a) Variation of inlet pressure
  - (b) Variation of hot and cold gas ratios
  - (c) Variation of gas (if available)
- Determination of refrigerating effect and comparison of this with the estimated power needed to drive the compressor.

Description

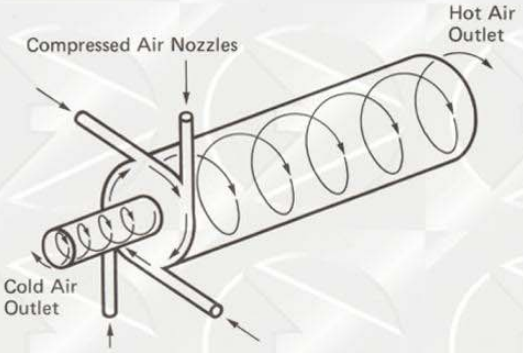


Diagram of Vortex Chamber

The Vortex Tube was invented by Georges Ranques, a Frenchman, in 1928 but initially it aroused little interest. In 1946, Rudolph Hilsch published an article which was widely read and which started the current interest in this unusual method of producing cooling air.

The Vortex Tube consists of two joined and concentric cylindrical chambers of different diameters, open at their ends. Spaced around the circumference of the larger chamber and close to the junction with the smaller chamber, are nozzles arranged to discharge tangentially into the cylinder.

When compressed gas is supplied to these nozzles, the jets discharge into the chamber at a near sonic velocity, and a forced vortex, rotating at approximately 500,000 rev/min, is created. The core of this vortex is cold and is extracted from the smaller end of the chamber, while the periphery which is hot, is extracted from the larger end.

The ratio of cold and hot gas flow rates can be varied by a valve which controls the hot gas discharge.

A number of theories have been put forward to explain the processes within the Vortex Tube and it is valuable for a student to be confronted with a device which works, but about which there is argument about how it works.

One theory due to C. D. Fulton is as follows.

Due to viscous forces, the vortex in the chamber rotates at constant angular velocity (i.e. is a forced vortex) and its linear velocity is proportional to the radius.

Since the momentum of the air leaving the nozzles is a constant, the angular momentum of the core must have decreased by the same amount as the angular momentum of the periphery has increased.

Thus, the core, having done work, falls in temperature, while the periphery having had work done on it, increases in temperature.

In this unit, air (or any other safe gas if available) flows through a pressure regulator and filter, and is supplied to the vortex tube at up to 700 kN m^{-2} gauge. After passing through the vortex, the cold air leaves from the upper end and the hot air from the lower end, both streams being at approximately atmospheric pressure.

To avoid problems with frosting and flow meter errors, the hot and cold air streams are passed in opposite directions through a concentric tube heat exchanger. The air streams, now close to ambient temperature, pass through variable area flow meters to the atmosphere.

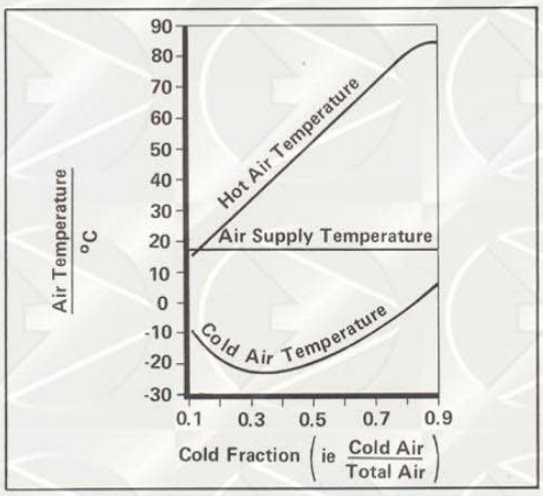
A "balance valve" fitted in the outlet from the hot end of the vortex tube controls the proportions of the total air flow which passes from the "hot" and "cold" ends.

Thermocouple sensors, with a selector switch and digital display allow the measurement of all important temperatures.

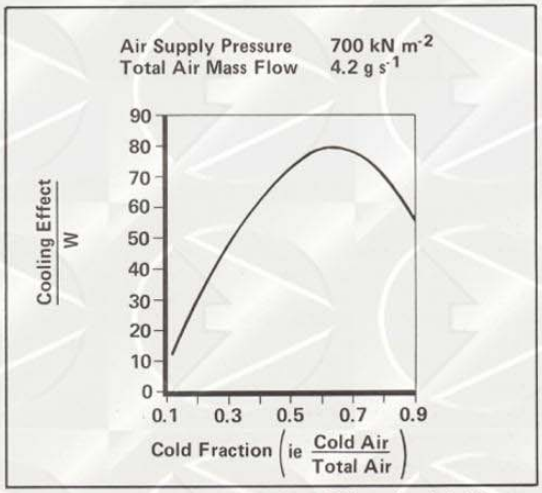
Although no direct measurement of the refrigerating effect is made, the mass flow rate and the temperature of the cold air stream are directly measured. It is assumed that any cooling which can be done by this cold air as it returns to ambient temperature, is its refrigerating effect.

Typical performance curves obtained from this unit are shown below.

Experimental Results



Performance Of Vortex Tube When Supplied With Air At 700 kN m^{-2}g



Relationship Between Cooling Effect And Cold Fraction

Specification

General

A fully instrumented bench top vortex tube test unit for use with compressed air or other suitable gas.

Detailed

Panel: High quality glass reinforced plastic on which all components are mounted.

Vortex Tube: Rated at 300 litre free air per minute at 700 kN m^{-2} gauge.

Pressure Regulator and Filter: To supply clean and pressure stable air.

Heat Exchanger: Concentric tube, contra flow.

Valves: Two, for isolation and balance.

Flow: Two, variable area type flowmeters, calibrated for air up to 4 gm s^{-1}.

Temperature: Digital Temperature Indicator (Resolution 1°C) with selector switch and five thermocouple sensors.

Pressure: 100 mm dia. gauge – range 0 to 800 kN m^{-2}.

Dimensions

Height:	710 mm	Depth:	240 mm
Width:	710 mm	Weight:	29 kg

Accessories and Spares

Unit supplied with:

One copy of Experimental, Operating and Maintenance Manual.

One copy T/S diagram for air.

Accessories and Spares for 2 years normal operation

Also available:

Recommended list of spares for 5 years operation (details on request).

The policy of P. A. Hilton Limited is one of continual improvement and they reserve the right to revise this specification without notice.

Services required

Electrical:

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

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

Compressed Air:

300 litre free air per minute supplied at 700 kN m^{-2} gauge.

Ordering information

Order as:

R433 Vortex Tube Refrigerator

Please specify:

Electrical supply –

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

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

Language – either: English German French Spanish

Shipping specifications

Nett Weight:	29 kg
Gross Weight:	84 kg
Packing Case Size:	0.889 x 0.889 x 0.483 m
Packing Case Volume:	0.382 m^3

Please note

Units fitted with instruments calibrated in other than S.I. units, or for use on non-standard voltages are available on special order.

P.A.Hilton Ltd.
Horsebridge Mill, King's Somborne,
Stockbridge, Hampshire, SO20 6PX, England.
Telephone: National Romsey (01794) 388382
International +44 1794 388382
Fax: (01794) 388129

Leaflet No. R433L/E/1/7758