



# REFRIGERATION CYCLE DEMONSTRATION UNIT

## R634



Year 1  
study

### Features

- Ozone friendly, low pressure, non-toxic working fluid allows evaporation and condensation to be safely observed in glass cylinders.
- A Bench top unit specifically designed for unsupervised operation.
- Fast response to controls allows efficient use of laboratory time.
- Negligible operating and maintenance costs.
- May also be specified with optional Digital Temperature Indicator, Watt Meter & Refrigerant Flowmeter @ extra cost.

### Description

The vapour compression refrigeration and heat pump cycle is of paramount importance in food and drug preservation, air conditioning, heat pumps as well as other industrial and commercial process. The importance of the efficient and safe use of refrigeration systems has now been added to by the problems of ozone depletion and global warming. It is therefore more essential than ever before that students have a thorough understanding of both the practical aspects of refrigeration and the thermodynamic processes affecting the performance of the cycle. Often the most difficult aspect for new students to grasp is the process of evaporation at low pressure and condensation at high pressure. By utilising a non-toxic working fluid with a low vapour pressure, the evaporation and condensation processes are clearly visible in thick walled glass chambers. The evaporator consists of a closed, thick walled glass chamber containing a pool of working fluid into which is immersed a specially treated copper coil. A hermetic compressor draws vapour from the evaporator and compresses this before discharging it to the condenser. The reduction in evaporator pressure causes the refrigerant to boil, so extracting heat from the water flowing through the coil and generating more vapour to be drawn into the compressor. From the compressor the high-pressure vapour passes to the condenser, which is of similar construction to the evaporator but contains a nickel-plated water-cooled copper coil. Vapour condenses on the surface of the coil and falls to the bottom of

the chamber. The heat given up by the refrigerant phase change is transferred to the cooling water flowing through the cooling coil. A float controlled expansion valve at the base of the condenser chamber controls the flow of high pressure refrigerant liquid returning to the evaporator. After passing through the expansion valve the refrigerant expands to form a liquid vapour mixture at the same pressure as the evaporator and the cycle is repeated. The standard instrumentation fitted enables measurement of the condenser and evaporator pressures and temperatures as well as water flow rates and water temperatures. The condensing and evaporating pressures are varied by adjustment of the water flow rate to the evaporator and condenser coils using integral control valves on individual flowmeters. To aid experimental performance and support students learning experience we offer optional accessories including Digital Temperature Indicator (R634/A), Watt Meter (R634/B) and Refrigerant Flowmeter (R634R) which can be added to your order at the point of purchase. Please refer to the Ordering Information section for further details.

#### Related Laws/Applications

- Food and Drug preservation
- Air conditioning
- Heat pumps
- Industrial process
- Commercial process
- Refrigeration

#### Learning capabilities

- Demonstration of the vapour compression refrigeration and heat pump cycle with visual observation of all-important processes.
- Investigation and demonstration of the pressure-temperature relationship during evaporation and condensation.
- Demonstration of pumping over or pumping down the refrigerant charge into the condenser.
- Demonstration of the effect of air in refrigeration systems.
- Determination of effect of evaporating and condensing temperatures on the refrigeration rate and condenser heat output.
- Investigation of the effect of compressor pressure ratio on system performance.
- Determination of overall heat transfer coefficient in a simple shell and tube type heat exchanger.

#### Technical Specification

- Panel: High quality GRP.
- Compressor: Hermetic type.
- Condenser: Vertical, thick walled high strength glass cylinder.
- Evaporator: Flooded type, similar to condenser.
- Pressure Gauges x 2: To indicate pressures in evaporator and condenser.
- 7 x Thermometers: 5 x range 0 - 50°C; 2 x range -10 - 110°C.
- 2 x Water Flow Meters: 1 x range 0 - 12gs-1; 1 x range 0 - 50gs-1.
- Safety Features:
- No moving parts
- Condenser & evaporator relief valves
- High pressure cut out fitted to stop compressor
- Residual current circuit breaker
- Combined double pole main switch and overload cut out.
- Emergency stop button

#### What's in the Box?

- 1 x R634
- Internal transformer (115V only)
- 2 x 3m Reinforced PVC tube
- 2 x Compact lamp
- 7 x Thermometers
- 1 x light oil
- Schematic holder
- Schematic Diagram
- 1 x Power lead
- Instruction manual
- Packing list
- Test sheet

#### Weights & Dimensions

- 760(L) x 430(W) x 760(H) mm
- Net Weight: 64 kg
- Net Weight: 71 kg (115V version)
- Gross Weight: 100 kg
- Gross Weight: 107 kg (115V version)
- Packing Case Dimensions: 0.92(L) x 0.65(W) x 1.05(H) m
- Packing Case volume: 0.63m<sup>3</sup>

#### Essential Services

- 220/240 Volts Single Phase, 50Hz (with earth/ground). Line current up to 4.5A at 230v.
- 110/120 Volts Single Phase, 60Hz (with earth/ground). Line current up to 9.0A at 110V.
- Water: 6 litre/minute at a minimum of 28m head.

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COUNTRY OF ORIGIN - UK WARRANTY PERIOD - 5 YEARS

**Ordering information**

To order this product, please call PA Hilton quoting the following codes:

R634/230 - Refrigeration Cycle Demonstration Unit

R634/230/A - Refrigeration Cycle Demonstration Unit (Fitted with optional Digital Temperature Indicator)

R634/230/B - Refrigeration Cycle Demonstration Unit (Fitted with optional Wattmeter)

R634/230/R - Refrigeration Cycle Demonstration Unit ((Fitted with optional Refrigerant Flowmeter)

R634/230/A/B - Refrigeration Cycle Demonstration Unit (Fitted with optional Digital Temperature Indicator & Wattmeter)

R634/230/A/B/R - Refrigeration Cycle Demonstration Unit (Fitted with optional Digital Temperature Indicator, Wattmeter & Refrigerant Flow Meter)

R634/230/A/R - Refrigeration Cycle Demonstration Unit (Fitted with optional Digital Temperature Indicator& Refrigerant Flow Meter)

R634/230/B/R - Refrigeration Cycle Demonstration Unit (Fitted with optional Wattmeter & Refrigerant Flow Meter)

R634/115 - Refrigeration Cycle Demonstration Unit

R634/115/A - Refrigeration Cycle Demonstration Unit (Fitted with optional Digital Temperature Indicator)

R634/115/B - Refrigeration Cycle Demonstration Unit (Fitted with optional Wattmeter)

R634/115/R - Refrigeration Cycle Demonstration Unit ((Fitted with optional Refrigerant Flowmeter)

R634/115/A/B - Refrigeration Cycle Demonstration Unit (Fitted with optional Digital Temperature Indicator & Wattmeter)

R634/115/A/B/R - Refrigeration Cycle Demonstration Unit (Fitted with optional Digital Temperature Indicator, Wattmeter & Refrigerant Flow Meter)

R634/115/A/R - Refrigeration Cycle Demonstration Unit (Fitted with optional Digital Temperature Indicator& Refrigerant Flow Meter)

R634/115/B/R - Refrigeration Cycle Demonstration Unit (Fitted with optional Wattmeter & Refrigerant Flow Meter)

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