



# *Steam to Water Heat Exchanger Unit H931*



- *Safe and Suitable For Unsupervised Student Operation*
- *Responds Rapidly to Control Changes*
- *Negligible Operating and Maintenance Costs*
- *Two year Warranty*



## ***Introduction***

The H931 Steam to Water Heat Exchanger Unit has been designed to provide visual and quantitative results related to heat transfer in shell and tube type water cooled condensers. Three interchangeable manifolds allow investigation of single, double or four pass cooling water flow through the condenser tubes.

The unit is self-contained and designed for bench top use having its own steam generator and condenser tubes housed in a single thick walled glass cylinder. Instrumentation monitoring the cooling water flow rate, temperature and pressure drop through the tubes allow an interesting and important range of experiments to be conducted. The unit is easily controlled and stabilises quickly allowing many different conditions to be investigated in a single laboratory period.

The above features, together with pressure and temperature safety isolators, make the unit ideal for student operation, in courses for:-

- Mechanical Engineering
- Chemical Engineering
- Plant and Process Engineering
- Marine Engineering

## ***Experimental Capabilities***

The H931 enables the following training exercises to be undertaken:

- Visual demonstration of filmwise condensation and nucleate boiling.
- Demonstration of the increase in heat exchanger effectiveness due to increasing the number of tube passes at constant flow rates.
- Measurement of the effect of coolant flow velocity and the number of tube passes on pressure drop.
- Investigation of the effect of increasing flow velocity and the number of tube passes on the overall heat transfer coefficient.
- Investigation of the saturation pressure/temperature relationship for H<sub>2</sub>O at low pressures.

## ***Description***

Steam generation and condensation take place in a single thick walled glass cylinder with metal cover plates. The lower cover houses a thermally protected electric heating element, a thermocouple to measure the saturation temperature of the H<sub>2</sub>O and a drain valve. The heat input to the element may be increased from 0.4 kW to 3 kW.

The upper cover houses four water cooled copper U tubes. The cooling water is conducted to and from a common distributor via any one of three PTFE manifolds to provide single, double or four tube passes.

A hollow central bolt fitted with a pressure relief valve and connecting to a pressure switch allows rapid changing of the manifolds. Two thermocouples housed in the header sense the cooling water inlet and outlet temperature. Pressure tappings within the header connect to Pressure Transducer and Digital Indicator and this records the overall pressure drop across the condenser. Cooling water circulation is provided by an internal pump and the total flow rate is measured by a variable area flowmeter.

In order to remove the heat absorbed by the condenser cooling water, a small amount is allowed to run to waste and is replaced by a controlled flow of cold water from the mains. The cold water is admitted through a second variable area flowmeter and this allows stable running conditions to be rapidly established.

A multi-point digital electronic thermometer indicates all important temperatures and together with the total water mass flow allows the rate of heat transfer to be calculated.

The unit demonstrates the filmwise mode of condensation that occurs in most industrial plant. In order to investigate quantitatively both filmwise and the more effective dropwise condensation the Hilton Film and Dropwise Condensation Unit H911 is recommended or alternatively the H102K Film and Dropwise Condensation Module designed to operate with the H102 Heat Exchanger Service Unit.



## Specification

### H931 Steam to Water Heat Exchanger Unit

#### General

Steam to water shell and tube condensing heat exchanger having its own 3 kW steam generator and four U tube condensers, all within a single thick walled glass cylinder. Complete with three interchangeable manifolds allowing single, double or four pass operation.

#### Detailed

**Panel:** High quality ABS Plastic, having an attractive appearance, and on which the following components are mounted.

**Digital Thermometer:** measuring steam chamber and condenser inlet and outlet temperatures. Resolution 0.1°C.

Differential Pressure transducer and Display: measuring pressure drop across condenser.

**Flow meters:** (2): indicating total water flow through condenser and water flow from mains. Ranges: One 10 to 90 cm<sup>3</sup> s<sup>-1</sup>. One 1 to 12 g s<sup>-1</sup>.

**Pressure Gauge:** showing steam chamber pressure. Range: - 100 to +100 kN m<sup>-2</sup>.

**Safety Features:** include steam chamber pressure relief valve, pressure switch and heater high temperature cut out. All electrical components earthed and fuse.

#### Dimensions

Height: 960 mm    Depth: 610 mm (approx.)  
Width: 1080 mm    Weight: 41Kg

#### Services Required

##### Electrical:

Either:

**A.** 3.1 kW 220/240 Volts, Single Phase, 50Hz. (with earth/ground)

Or

**B.** 3.1 kW 110/120 Volts, Single Phase, 60Hz (with earth/ground)

**Water:** Cold water, continuous supply, 100 litres/hour at 17m head minimum.

## 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:** H931 Steam to Water Heat Exchanger Unit

## Electrical Specification

**Electrical: A:** 3.1 kW 220/240 Volts, Single Phase, 50Hz (With earth/ground)

Or

**B:** 3.1kW 110/120 Volts, Single Phase, 60Hz (With earth/ground).

## Language

Either: English, Spanish, French.

## Shipping Specifications

**Nett Weight:** 41 kg

**Gross Weight:** 75 kg (approx)

**Packing Case Size:** 96 x 61 x 108cm (approx.)

**Packing Case Volume:** 0.63m<sup>3</sup> (approx.)

## Also Available On Request

Further detailed specification.

Additional copies of instruction manual.

Recommended list of spares for 5 years operation.

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