



P7678

PROCESS PLANT STEAM BENCH

FEATURES

- ◆ Compact modular design
- ◆ Low capital cost
- ◆ Easy Installation
- ◆ Comprehensive instrumentation
- ◆ Pressure test certificates supplied for major components

PRINCIPLE EXPERIMENTS

- ◆ Demonstration of a thermosyphon reboiler, using water as the process fluid and steam as heating fluid.
- ◆ Demonstration of cumulative effect on thermosyphon reboiler boiling rate, and of the boiling off of process fluid lighter fractions.

INTRODUCTION

Steam has many uses in the process industry, this bench is designed to visually demonstrate the use of steam in a natural circulation (thermosyphon) reboiler for the heating of other fluids and the distillation process.

DESCRIPTION

Cussons P7678 Process Plant Steam Bench consists of a sturdy framework and panels of all steel construction, fitted with a student work surface, interconnecting back panel and adjustable feet.

Incorporates a low pressure steam feed line including a Vee-Reg isolating valve, a 1 to 3 bar pressure reducing valve, a pressure relief valve set at 3.5 bar and temperature and pressure measuring points; a process fluid circuit constructed from high strength borosilicate glass components, including a reboiler equipped with a temperature measuring point, a separator with a rubber filler stopper and outlet baffle plate, a condenser, a drain valve, joint couplings and PTFE joint gaskets, reboiler blowdown pipework fitted with a flexible stainless steel braided hose complete with boiler joint adaptor flange and including a Vee-Reg isolating valve, steam trap and non-return valve; condenser cooling water feed line complete with control valve and pressure measuring point and cooling water drain line with non-return valve and pressure safety valve, set to vent at 2.5 bar. A fully insulated steam header line, fitted with pressure and temperature measuring points, supplies steam so the steam heating line. Instrumentation comprises: three pressure gauges, 0-16 bar for steam supply, 0-4 bar for steam to heater and fitted with an overload protection valve and 0-4 bar for cooling water with a red 2.5 bar marker line on the scale; a 0-250°C analogue temperature meter connected via a

3-position selector switch to type K thermocouples fitted at the temperature measuring points; a paddle type Dow indicator in the process circuit. The foregoing are installed on a sturdy frame complete with panels of all-steel construction and service facilities relating to water supply, blowdown and drainage. To enable the unit to be integrated into a steam bench system, it is supplied with an inter-connecting back panel, student work surface, a set of 4 stainless steel flexible inter-connecting hoses and a section of aluminium-clad lagging for the flexible steam header. A 400 ml glass beaker for process condensate supplied loose.

STEAM HEADER ASSEMBLY

Mild steel steam header welded in accordance with BS2633 (1973) to supply steam to a steam heating line and fitted with a pressure measuring point connected to a 0-16 bar Bourdon-type pressure gauge and a temperature measuring point equipped with a type K thermocouple. The steam header is enclosed within a header box and fully insulated with mineral wool.

STEAM HEATING CIRCUIT

Low pressure steam supply line, including a Vee-Reg isolating valve, a 1 to 3 bar steam pressure reducing valve and a pressure relief valve set to vent to atmosphere at 3.5 bar. Fitted with:

- stainless steel flexible hose complete with joint adaptor flange for boiler connection.
- temperature measuring point complete with type K thermocouple.
- pressure measuring point connected to a 0-4 bar pressure gauge complete with an overload pressure valve set at 4 bar.

PROCESS FLUID CIRCUIT

A fluid recirculating circuit with attached condensing facility, comprising components manufactured from high strength borosilicate glass, clamped together with flange type coupling and joint sealed with PTFE gaskets. Maximum operating temperature is 175/200°C. The main components are:

Reboiler

- a boiler type heat exchanger with an internal heating coil, supplied with steam at a maximum working pressure of 3.5 bar and discharging via a blowdown line.

Fittings

- coupling flanges on each branch
- fluid outlet via drain valve
- flange adaptor complete with type K thermocouple.

Separator

- comprises two column adaptors, clamped together at a sealed joint, the upper adaptor being fitted with a rubber filler stopper to prevent splashing over into vapour line. Coupling flanges are fitted to each branch connection

CONDENSER

Condenser type heat exchanger with internal cooling coil designed for cooling water at a maximum working pressure of 2.5 bar. Condensate collected in graduated 400 ml glass beaker, supplied loose.

Fittings

- condenser input with coupling flanges.
- clear PVC flexible hose connected to cooling water feed and drain branches.

FLOWMETER

Paddle type flow indicator with aluminium wheel to indicate flow of fluid, and equipped with coupling flanges.

BLOWDOWN LINE

Steel pipework, including a Vee-Reg isolating valve, a steam trap and a non-return valve, and fitted with a steel flexible hose with flange adaptor for boiler connection.

CONDENSER COOLING WATER PIPEWORK

Copper feed and drain pipework

- feed pipework includes a control valve and a pressure measuring point, connected to a 0-4 bar pressure gauge with the 2.5 bar line marked in red.
- drain pipework includes a non-return valve and a pressure safety valve, set at 2.5 bar.

ADDITIONAL INSTRUMENTATION

A 0-250°C analogue temperature display meter and associated 3-position selector switch.

CERTIFICATION

The steam header is pressure tested at 21 bar and supplied with test certification.

SERVICE SYSTEMS

The bench is equipped with independent service lines relating to water supply (untreated), blowdown and drainage. These lines inter-connect with similar facilities on other steam benches to provide a common service facility

INTERCONNECTION OF STEAM BENCHES

To enable steam benches to be linked to form a system, utilising a common steam supply and service system, the steam bench is supplied complete with:

an interconnecting back panel and student work surface.

a set of 4 stainless steel flexible hoses for the steam and service connections.

a Section of aluminium-clad lagging for the flexible Steam hose.

SERVICES

Steam supply:-

Maximum working pressure of 10.34 bar and maximum temperature of 235°C, which can be supplied by Cussons P7670 Steam Boiler Bench, a Cussons Steam Plant, or clients own steam line.

Water supply:-

From bench water service line.

SHIPPING DETAILS

Case size: 2.32 m³
Gross weight: 310 Kg
Nett Weight: 195 Kg

TENDER SPECIFICATION

Steam bench designed to visually demonstrate the use of steam for heating fluids in the process industry. The bench comprises: a low pressure steam feed line, including a Vee-Reg isolating valve, a 1 to 3 bar pressure reducing valve, a pressure relief valve set at 3.5 bar and a temperature and pressure measuring points; a process fluid circuit constructed from high strength borosilicate glass components including a reboiler equipped with a temperature measuring point, a separator with rubber filler stopper and outlet baffle plate, a condenser, a drain valve, joint couplings and PTFE joint gaskets; reboiler blowdown pipework fitted with a flexible stainless steel braided hose complete with boiler joint adaptor flange and including a Vee-Reg isolating valve, steam trap and non-return valve; condenser cooling water feed line complete with control valve and pressure measuring point and cooling water drain line with non-return valve and pressure safety valve, set to vent at 2.5 bar. A fully insulated steam header line, fitted with pressure and temperature measuring points, supplies steam to the steam heating line. Instrumentation comprises: three pressure gauges, 0-16 bar for steam supply, 0-4 bar for steam to heater and fitted with an overload protection valve and 0-4 bar for cooling water, with an overload protection valve and 0-4 bar for cooling water, with a red 2.5 bar marker line on the scale; a 0-250°C analogue temperature meter connected via a 3-position selector switch to type K thermocouples fitted at the temperature measuring points; a paddle type flow indicator in the process circuit. The foregoing are installed on a sturdy frame complete with panels of all-steel construction and service facilities relating to water supply, blowdown and drainage. To enable the unit to be integrated into a steam bench system, it is supplied with an inter-connecting back panel, student work surface, a set of 4 stainless steel flexible inter-connecting hoses and a section of aluminium-clad lagging for the flexible steam header. A 400 ml glass beaker for process condensate is supplied loose.

PIPE CLOSURE KIT

If this steam bench is to be installed on a stand alone basis **or** is the last unit in a run of steam benches a P7682 Pipe Closure Kit will be required.

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