cussons
TECHNOLOGY

P7672

SEPARATING AND THROTTLING CALORIMETER STEAM BENCH

FEATURES

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

PRINCIPLE EXPERIMENTS

- To determine the dryness fraction of steam i.e. The quantity of dry vapour present in any wet vapour mixture.

INTRODUCTION

When steam is generated in a boiler, the water surface is turbulent and droplets of water are thrown up into the steam which can be carried into the system. Steam which contains these particles of water in a finely divided state is known as wet steam.

The presence of wetness in steam, unless known and allowed for, can cause appreciable errors in the measurement of steam flow and incorrect readings of plant efficiency. The combination of separating and throttling calorimeters is used to measure this “wetness”.

DESCRIPTION

Cussons P7672 Separating and Throttling 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.

The steam bench includes an insulated separating calorimeter, equipped with a water level sight glass, connected via fixed orifice to a lagged throttling calorimeter which exhausts to a water cooled steam condenser. A mercury manometer is provided for measuring the pressure inside the throttling calorimeter and thermocouples are provided for measuring steam supply and. temperatures which may be individually selected for display on an analogue temperature meter.

STEAM HEADER ASSEMBLY

Mild steel steam header welded in accordance with BS 2633 (1973) with a branch incorporating a Vee-Reg. control valve providing steam supply to the separating calorimeter. The steam header is enclosed within a header box and fully insulated with mineral wool.

SEPARATING CALORIMETER

Mild steel fabricated tube welded in accordance with BS 2633 (1973), designed for a working pressure of 10.34 bar, a maximum steam temperature of 235°C and is fitted with:

- a steam inlet, incorporating a down tube to deflect water droplets, and fitted with a pressure measuring point connected to a 0 to 16 bar Bourdon type pressure gauge and a temperature measuring point equipped with a type K thermocouple.
- glass water level tube with graduated scale, protected by a clear perspex guard tube.
- a drain pipe, including an isolating valve.
- 25 mm thick fibreglass lagging enclosed by a mild steel cover.

THROTTLING CALORIMETER

Mild steel fabricated tube, welded in accordance with BS 2633 (1973), designed for a working pressure of 10.34 bar, a maximum steam temperature of 235ºC and fitted with:

- a brass orifice block, with an orifice sized to suit the operating pressure range.
- type K thermocouple to measure steam temperature after orifice.
- pressure measuring point, including an isolating valve, connected to a mercury manometer.
- 25 mm thick fibreglass lagging enclosed by a mild steel cover.

CONDENSER

Water cooled shell and tube type steam condenser, connected for counter-flow of cooling water supplied from the service line via an isolating valve and discharging to drain via a combined sight glass and check valve. Condensate is collected in a graduated 3 litre glass beaker, supplied loose.

ADDITIONAL INSTRUMENTATION

A 0-250°C analogue temperature display meter and associated two-way selector switch.

A graduated measuring cylinder - 250 ml capacity.

CERTIFICATION

The steam header and separating and throttling calorimeter vessels are pressure tested at 21 bar and supplied with test certificates.

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.

INTER-CONNECTION OF STEAM BENCHES

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

- an inter-connecting 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.

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.

TENDER SPECIFICATION

Steam bench designed for determining the dryness fraction of steam. The bench includes series connected mild steel separating and throttling calorimeters, each welded in accordance with BS 2633 (1973), designed for a maximum working pressure of 10.34 bar and a maximum steam temperature of 235°C, and lagged with fibreglass insulation enclosed within a mild steel cover. The separating calorimeter is fitted with a graduated level gauge, protected by a clear perspex tubular shield, and a drain line with isolating valve; the throttling calorimeter is fitted with brass orifice block, a temperature measuring point, a pressure measuring point connected to a mercury manometer via an isolating valve, and a steam outlet line to a steam condenser with cooling water supplied from the service line, via an isolating valve, and connected to drain via a combined sight glass and check valve. Steam is supplied to the separating calorimeter from a fully insulated steam header via a steam control valve ; the steam supply line having temperature and pressure measuring point fittings. Steam supply pressure is indicated on a 0-16 bar Bourdon type pressure gauge and analogue indications of temperatures are provided by a 0-250°C meter connected via toggle switch to type K thermocouples fitted at the temperature measuring points. The foregoing are installed on a sturdy frame and panels of all-steel construction complete with 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 hose. A 3 litre glass beaker is supplied to collect condensate from the condenser, or separating calorimeter, and a 250 ml glass cylinder for measuring condensate. A spare level gauge tube and associated gland bushes (2 off) are included with the unit.

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.
Drain.

SHIPPING DETAILS

Case size:	2.32 m³
Gross weight:	300 Kg
Nett weight:	180 Kg

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