Nozzle Pressure Distribution Unit

TPT

Technical Teaching Equipment

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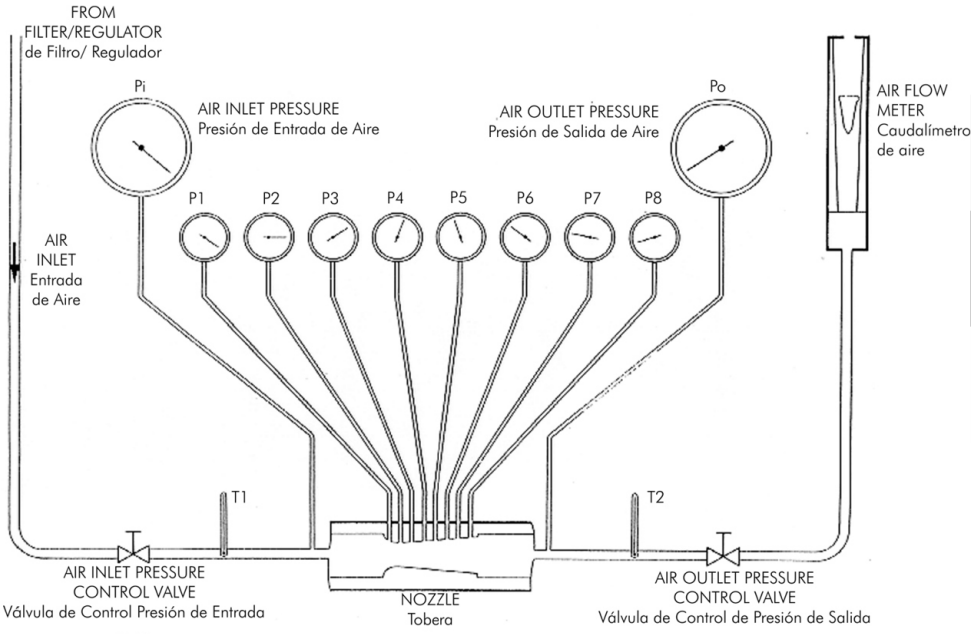
Products
Products range
Units
9.-Thermodynamics & Thermotechnics

PROCESS DIAGRAM AND ELEMENTS ALLOCATION



Note: P= Pressure meter. T=Thermometer

ISO 9001:2000
Certificate of Approval

European Union Certificate

Certificates ISO 14001: 2004 and
ECO-Management and Audit Scheme
(environmental management)

Worlddidac Quality Charter Certificate
Worlddidac Member

DESCRIPTION

This unit has been specifically designed to demonstrate the phenomena associated to fluxes through nozzles and to allow the students investigating quickly the pressure distribution in it. Besides, it allows the investigation of the mass flow rate through convergent-divergent and convergent nozzles.

Since the unit works with ambient temperature air, it is stabilised quickly and its energy consumption is only the necessary one to impulse a relatively small compressor.

Compressed air at a 7 to 9 bars pressure, supplied from an external service. It passes through the filter/regulator, located on the back part of the unit.

In the unit, the air passes through a control valve, which allows an accurate control of the pressure at the inlet of the nozzle. The pressure and inlet temperature are measured and then the air is expanded through the nozzle chosen. When discharging from the nozzle, the pressure is controlled by other valve, and the air goes finally through a flowmeter to the atmosphere.

The nozzles have been made of brass, have been mechanised accurately and several pressure tappings are avalaible, being each one connected to its own manometer to indicate the static pressure.

SPECIFICATIONS

Bench-top unit.

Anodized aluminium structure and panels in painted steel.

Diagram in the front panel with similar distribution to the elements in the real unit.

Nozzles:

Convergent type (conical), with 6 pressure tappings.

Convergent- divergent type, with 5 pressure tappings, for a design pressure ratio of 0.25.

Convergent- divergent, with 8 pressure tappings, for a design pressure ratio of 0.1.

Nozzles can be changed quickly and easily.

2 Pressure meters (manometers), 100 mm. diameter, to measure air inlet and outlet pressures (range: 0 to 10 bar).

8 Pressure meters (manometers), 60 mm. diameter, to determine the pressure at the nozzle tappings (range: -1 to 8 bar).

Variable area type flow meter to indicate air flow at standard conditions ($p = 1.2 Kg/m^{-3}$). (Correction factors for other pressures and temperatures are provided). Range 0 to 9 g s^{-1}.

2 Glass temperature meters, to indicate air temperature before and after nozzle(range: 0 to 50°C).

Valves to give a fine control of air inlet pressure and outlet pressure.

Air filter and pressure regulator to provide constant pressure, clean and water free air to the unit. This is to be installed by the customer in the pipe between his compressed air service and the unit, and must be drained regularly.

Works a ambient temperature-stabilises immediately.

Allows students to make a comprehensive investigation in a normal laboratory period.

Gives students an opportunity to calibrate equipment.

Cables and accessories, for normal operation.

Manuals:

This unit is **supplied with the following manuals:** Required Services, Assembly and Installation, Starting-up, Safety, Maintenance & Practices Manuals.

EXERCISES AND PRACTICAL POSSIBILITIES

Some Practical Possibilities of the Unit:

1.- Flow in convergent-divergent nozzle.
2.- Flow in convergent nozzle.
3.- Pressure distribution in a nozzle.
4.- Visual demonstration of the phenomenon of choking.
5.- Investigation of the relationship between inlet pressure and the mass flow rate.
6.- Demonstration of under expansion and over expansion with re-compression.
7.- Investigation of the relationship between outlet pressure and mass flow rate for a convergent nozzle.
8.- Investigation of the relationship between outlet pressure and mass flow rate for a convergent-divergent nozzle.
9.- Investigation of the pressure distribution in convergent and convergent-divergent nozzles when operating with several overall pressure ratios.
10.- Effect on temperature.
11.- Calibration.

REQUIRED SERVICES

- Water free compressed air at 7 to 9 bar.

DIMENSIONS & WEIGHT

- Dimensions approx.: 1000 x 590 x 890 mm. approx.
- Weight : 50Kg. approx.

✱ Specifications subject to change without previous notice, due to the convenience of improvements of the product.

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