EXPERIMENTAL IMPULSE TURBINE

F300C



Year 1
study

Features

- Single Stage, Axial Flow

Description

The Impulse Turbine Module F300C turbine is a single stage, axial flow impulse machine, operating on air, specially designed and manufactured by P.A. Hilton Limited for experimental and teaching purposes. An impulse turbine with 4 separate nozzles and control valves, a throttle valve and belt brake dynamometer. Inlet and outlet air temperatures are recorded allowing the temperature drop due to work output to be measured. Inlet and outlet air pressures, temperatures and air flow rate, turbine torque and speed are recorded by a combination of instrumentation on the Compressible Flow Range F300 base unit and the optional module. The turbine rotor is carried by a steel shaft which runs in oil lubricated ball bearings housed in an extension to the nozzle plate. The rotor is machined from solid brass and has 45 blades of symmetrical shape with tip angles of approximately 40°. A stainless steel shroud ring is shrunk on to the blades to minimise tip leakage and to increase strength. The nozzle plate carries four equally spaced convergent nozzles which discharge at 20° to the plane of rotation into the blades. A removable thick walled stainless steel sleeve is attached to the nozzle plate with quick release catches, and forms a combined guard and exhaust casing for the turbine. The end of this casing is closed by a polycarbonate window which allows observation of the rotor when in operation. The turbine is equipped with 4 separate nozzles and individual shut off valves. The turbine is mounted centrally in the lower front of a black panel for bench top use. Each nozzle is provided with its own isolating valve so that the number of nozzles in operation may be varied.

Related Laws/Applications

- First Law of Thermodynamics
- Impulse Turbine
- Single Stage
- Axial Flow
- Throttling
- Isentropic Efficiency
- Engineering Physics

Learning capabilities

- Investigation of torque/speed and power/speed characteristics of a single stage impulse turbine.
- Comparison of specific air consumption when the output of a constant speed turbine is Controlled by throttling.
- Comparison of specific air consumption when the output of a constant speed turbine is Controlled by varying the number of nozzles.
- Application of the First Law of Thermodynamics to a simple open system undergoing a steady flow process.
- Determination of the isentropic efficiency of a turbine.
- Construction of retardation curve and from this the estimation of the effect of resistances due to mechanical and fluid friction.

Technical Specification

- 2 x Thermocouples
- 10N Load Cell maximum capacity
- Turbine Speed: 35,000 rpm (continuous)
- Turbine Speed: 40,000 rpm (short periods only)
- Pressure Relief valve setting: 100kN/m2.

Essential Ancillaries

- F300

What’s in the Box?

- 1 x F300C
- 1 x Oil Syringe
- 1 x Lubricating Oil
- 2 x Brake Band
- 2 x Turbine Shaft Bearing
- Instruction manual
- Packing List
- Test Sheet

Essential Services

- Air requirement: approximately 420 litres free air per minute at a pressure of 700 to 1000 kN m-2 gauge supplied to the F300 base unit.

Ordering information

To order this product, please call PA Hilton quoting the following code: F300C

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