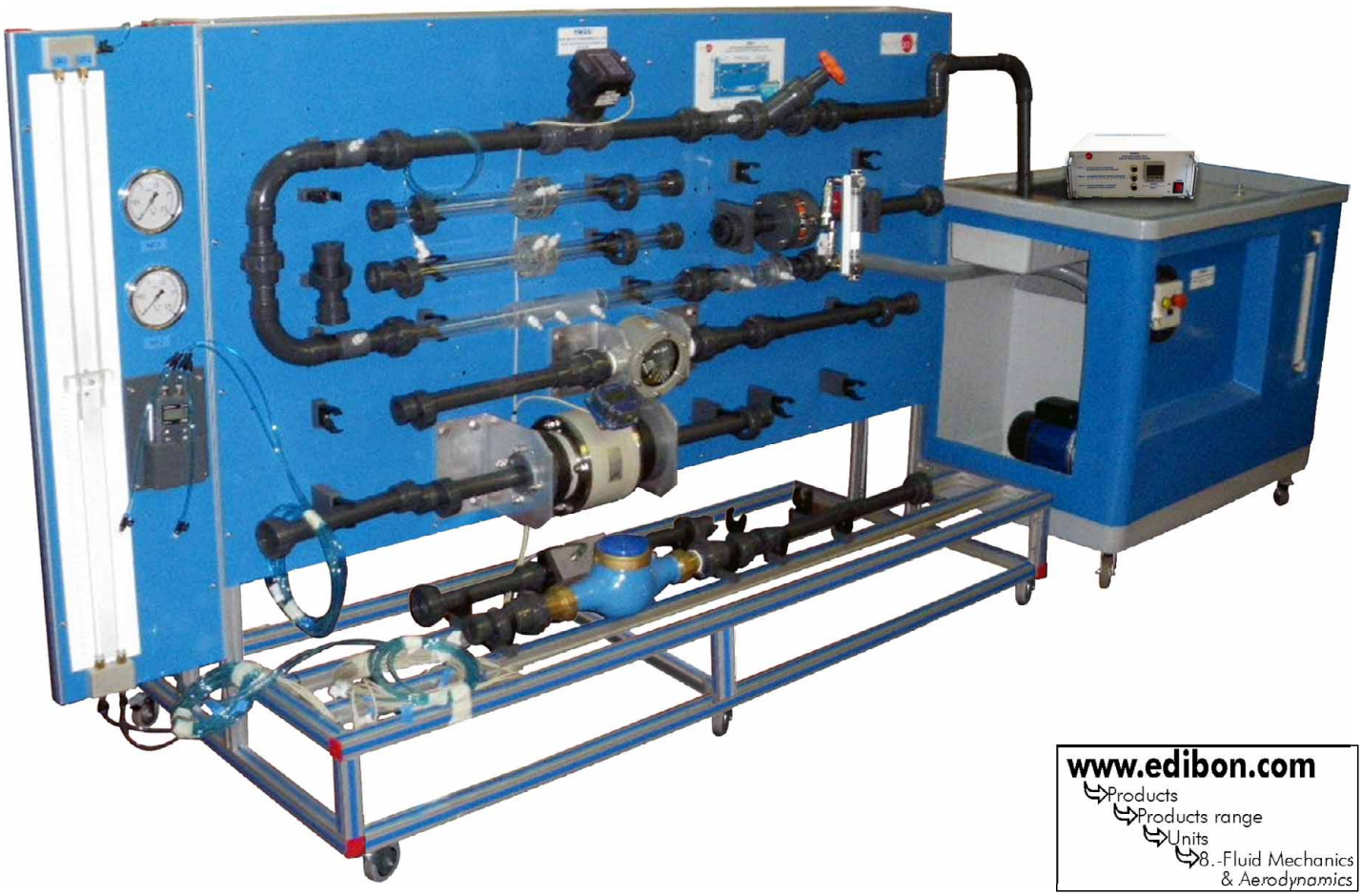
Technical Teaching Equipment

Flow Meters Demonstration Unit

FMDU



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DESCRIPTION

The EDIBON Flow Meters Demonstration Unit demonstrates the important characteristics of fourteen types of flow meters used in the measurement of water flow through pipes or open channels.

The main elements are a service module (Hydraulics Bench), flow meters and flow meters support structure.

A centrifugal pump draws water from the sump tank in the Hydraulics Bench and delivers it to a flow meter test pipe. Flow meters mounted in pipes can be fitted into the unit test zone quickly and easily. These meters give a variety of different measuring principles and degrees of accuracy.

By using a water manometer or two Bourdon type manometers the pressure drop across each of the flow meter can be measured. Valves ensure rapid bleeding of all manometer pipework.

A channel (FMDU-15) accommodates the Broad Crested Weir (FMDU-11) and the Crump Weir (FMDU-12), also the "H" Flume (FMDU-13) and Washington Flume (FMDU-14). By using the hook and point gauge (FMDU-17) the levels in the channel can be determined.

Water discharging from the flow meter on test is collected in the volumetric tank (in the Hydraulics Bench) where the flow may be determined absolutely. This tank is stepped to accommodate low or high flow rates and incorporates a stilling baffle to reduce turbulence. A level tube with a scale shows the water level. Water is returned to the sump tank by a dump valve.

The system incorporates a reference flow meter. This meter remains installed whereas other meters are selected and tested as desired.

DETAIL OF THE FLOW METERS AND OTHER ELEMENTS

Water manometer
Orifice plate
Electro-magnetic
Pitot
Venturi
Auxiliary supply box
Hydraulics bench
Swinging flap
Shunt gapmeter
Volumetric rotary piston
Inferential multistream
Bourdon type manometers
Digital manometer
Helical rotary

Current velocity meter

Broad crested weir

Crump weir

"H" flume

Washington flume

Hook and point gauge

Auxiliary supply box

FMDU. Unit: (complete version)

A self-contained unit to demonstrate the characteristics of flow meters used in measurement of water flow through pipes or open channels.

Anodized aluminium structure and panel in painted steel.

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

This unit has wheels for its mobility.

Pipe circuit, including:

- Flow regulation valve.
- Several pressure measurement tappings.
- Air entrainment device.
- Flexible pipe to connect to the Hydraulics Bench.
- Additional pipes to change the pipe circuit configuration.

Water manometer of 1 m. length and 2 Bourdon type manometers from 0 to 2.5 bar, precision 1%., to measure the pressure drop.

Flow meters are mounted in pipes that can be fitted into the unit test zone quickly and easily.

Meters included:

FMDU-1. Orifice plate:

- Made in transparent methacrylate.
- Pipe diameter D1: 35 mm.
- Orifice diameter D2: 20 mm.
- Area 1 = 9.079 x 10^{-4} m^2. Area 2 = 3.14 x 10^{-4} m^2.

FMDU-2. Venturi:

- Made in transparent methacrylate.
- Diameter h1: 32 mm. Diameter h2: 20 mm. Diameter h3: 32 mm.
- Distance between h1 and h2: 67.5 mm. Distance between h2 and h3: 87.5 mm.
- Area 1 = 8.04 x 10^{-4} m^2. Orifice diameter: 20 mm. Area 2 = 3.14 x 10^{-4} m^2.
- Upstream narrowing: 14°.
- Downstream narrowing: 21°.

FMDU-3. Shunt gapmeter:

- Made in steel.
- Range: 0 to 20 m^3/h.

FMDU-4. Pitot:

- Made in transparent methacrylate.
- Pipe diameter: 35 mm.

FMDU-5. Volumetric rotary piston:

- Precision: +/-0.8%.
- Repeatability: +/-0.3%.
- Measurement range: 30/1800 l/h.

FMDU-6. Swinging flap:

- Pipe Dn40 flowmeter.
- Range: 1 to 12 m^3/h.

FMDU-7. Helical rotary:

- Range: 1 to 150 l/min.
- Precision: +/- 0.01% of the reading.
- Repeatability: +/- 0.01%.
- Maximum pressure: 250 bar.

FMDU-8. Electro-magnetic:

- PVC pipe Dn32.
- Range: 0.05 to 10 m/s.
- Measure error: +/-2%.
- Linearity: +/-1%.
- Reproducibility: 0.25% of medium value.
- Conductivity:minimum 20 mS/cm.
- Operation temperature: 0 to 80°C.

FMDU-9. Current velocity meter:

- Measurement range: 0 to 40 m/s.
- Precision: 0.5% of the value.
- Resolution: 0.1 m/s.

FMDU-10. Inferential multistream:

Maximum flow Qmax.: 20 m^3/h.

Nominative flow Qn.: 10 m^3/h.

Minimum flow Qmin.: 200 l/h.

Sensibility: 48 l/h.

Minimum reading: 0.05 l.

Maximum reading: 1000000 m^3.

Maximum pressure Pmax.: 16 bar.

FMDU-11. Broad crested weir.

FMDU-12. Crump weir.

FMDU-13. "H" flume.

FMDU-14. Washington flume.

FMDU-15. Channel for FMDU-10, FMDU-11, FMDU-12, FMDU-13 and FMDU-14.

FMDU-16. Digital manometer:

Differential pressure manometer. 2 measure scales, ranges:

0 to 199.9 mbar.

0-2000 mbar.

Precision: 0.15% above the range.

FMDU-17. Hook and point gauge.

Auxiliary supply box (for FMDU-7, FMDU-5 and FMDU-8).

Reference flow meter permanently fitted: a turbine flow meter or an electro-magnetic meter.

Quick and easy removal of pipes with test flow meters for evaluation and inspection.

Meters can be used independently to support research or student project work.

Hydraulics Bench:

Mobile hydraulic bench, made in polyester reinforced with fibreglass, and mounted on wheels for mobility.

Centrifugal pump, 0.55 KW, 2.5 Bar, 150 l/min., single phase 220V./ 50Hz or110V./ 60Hz. Pump breaker starting.

Sump tank capacity: 165 litres.

Small channel: 8 litres.

Flow measurement: volumetric tank, gauged from 0 to 7 litres for low flow values and from 0 to 40 litres for high flow values.

Remote hand-operating dump valves in the base of the volumetric tank.

Level tube with a scale that shows the water level in the upper tank.

Flow stilling baffle for reducing the turbulence rate.

Manufactured with corrosion resistant materials ensuring a long life of the unit. Safety and contact light.

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.

OTHER AVAILABLE VERSIONS

FMDU\B Unit:

Only are included the following Meters: FMDU-1 + FMDU-2 + FMDU-3 + FMDU-4 + FMDU-8.

Rest of specifications as FMDU. Unit.

FMDU\Q Unit:

Only are included the following Meters: FMDU-1 + FMDU-2 + FMDU-3 + FMDU-4 + FMDU-5 + FMDU-6 + FMDU-8 + FMDU-16.

Rest of specifications as FMDU. Unit.

FMDU\C Unit:

Only are included the following Meters: FMDU-7 + FMDU-8 + FMDU-9 + FMDU-10 + FMDU-11 + FMDU-12 + FMDU-15 + FMDU-17.

Rest of specifications as FMDU. Unit.

FMDU\A Unit:

Only are included the following Meters: FMDU-7 + FMDU-9 + FMDU-10 + FMDU-12 + FMDU-13 + FMDU-14 + FMDU-15 + FMDU-17.

Rest of specifications as FMDU. Unit.

EXERCISES AND PRACTICAL POSSIBILITIES

Some Practical Possibilities of the Unit:

1.- To demonstrate the important characteristics of fourteen types of flow meters used in the measurement of water flow through pipes or open channels.

2.- Comparing the use, application and limitations of different types of flowmeters.

3.- To study the application of Bernoulli's Theorem.

4.- Understanding the principles on which various types of flow meters are based.

5.- Implications of performance, convenience, accuracy, head loss, etc. on flow meters selection.

6.- Effect of the air in the hydraulic stream on flow meter performance.

7.- To use manometers to measure pressure drop.

8.- Relating pressure drop across a flow meter to flow rate.

9.- Measure error determination using the venturimeter.

10.- Factor C_d determination in the venturi.

11.- Strangulation determination in the venturi.

12.- Measure error determination using the orifice plate.

13.- Factor C_d determination in the orifice plate.

14.- Effective area determination in the orifice plate.

15.- Measure error determination using the Pitot tube.

16.- Factor C_d determination in the Pitot tube.

17.- Measure error using the swinging flap meter.

18.- Measure error using the rotary piston meter.

19.- Measure error using the shunt gapmeter.

20.- Energy loss comparison in the different meters.

21.- Measure error using the helical rotary type flowmeter.

22.- Measure error using the inferential multistream type flowmeter.

23.- Broad crested weir.

24.- Crump weir.

25.- "H" flume.

26.- Washington flume.

REQUIRED SERVICES

- Electrical supply: 220V./50Hz or 110V./60Hz.
- Water supply and drainage.

DIMENSIONS & WEIGHTS

FMDU. Unit:

-Dimensions: 3200 x 1300 x 1500 mm. approx.

-Weight: 300 Kg. approx.

RECOMMENDED ACCESSORIES

- Stopwatch.

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

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