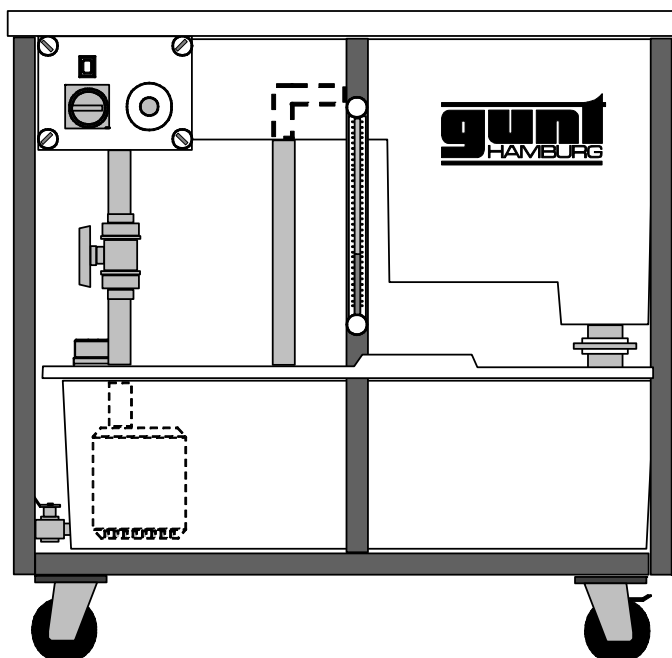


Instruction Manual

HM 150 Basic Hydraulics Bench



Instruction Manual

This manual must be kept by the unit.

Before operating the unit:

- Read this manual.**
- All participants must be instructed on handling of the unit and, where appropriate, on the necessary safety precautions.**

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1 Technical description

The **Basic Hydraulics Bench HM 150** and the various ancillary modules available form a comprehensive laboratory facility which enables a detailed Mechanics of Fluids Laboratory.

The hydraulics bench unit provides the basic services for the pumping and volumetric measurement of the water supply with which all the additional accessories and experiments are used.

The working surface of the unit is in fibreglass, moulded to provide a recessed area on which to mount experiments. An integral weir tank is provided along with a volumetric measuring tank. The measuring tank is stepped to enable for accurate measuring of both high and low flow rates. A level indicator allows convenient read out of the flow.

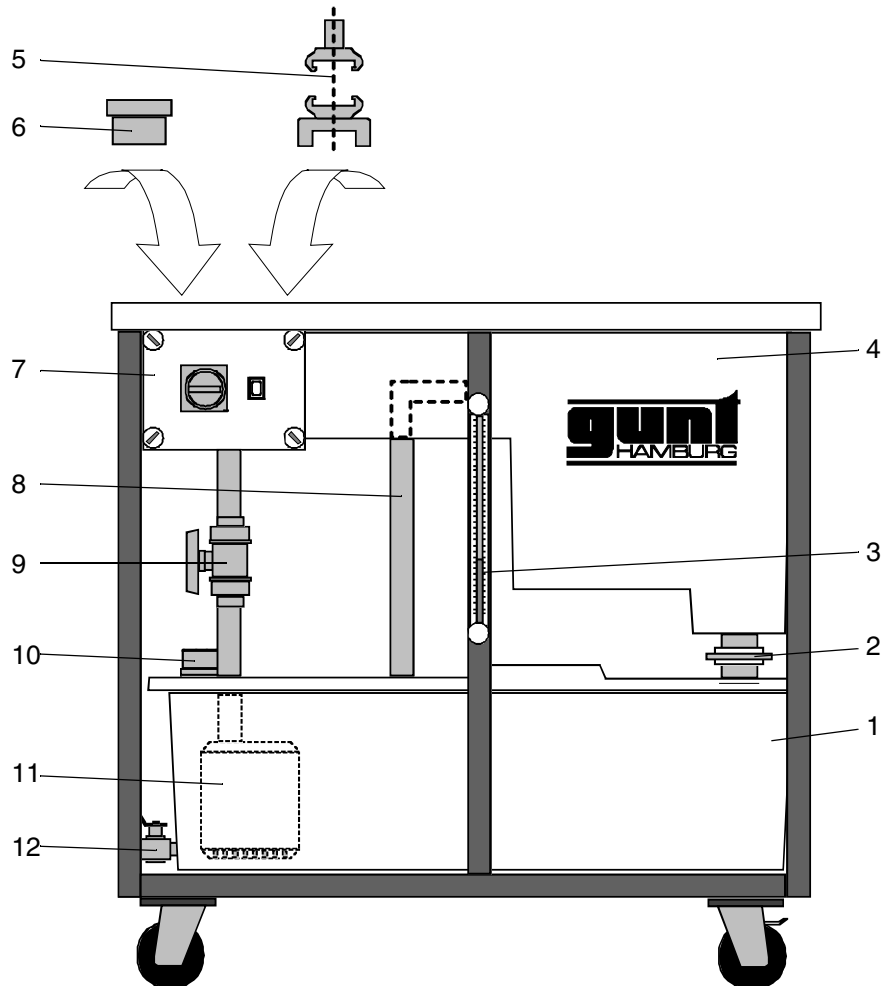
The measuring tank discharges into a fibreglass sump tank via a valve. Overflow pipe is provided.

An electric motor drives a submersible motor driven pump which delivers water to the outlet at the working surface for connection to the individual experiments.

Materials used in the bench construction and its modules have been carefully selected in order to minimise corrosion problems.

The entire unit is self-contained and mobile.

For low volumetric measurement use the 2ltr measuring cup.



Pos.	Item	Pos.	Item
1	Sump tank	7	Switch box
2	Sliding valve	8	Overflow pipe
3	Remote sight gauge	9	Flow control valve
4	Volumetric measuring tank with channel	10	Water supply connection for accessories with pump
5	Water supply connection for accessories without pump	11	Submersible motor driven pump
6	Discharge cap	12	Drain cock

Fig. 1.1 Basic bench

1.1 Intended Use

The **Basic Hydraulics Bench HM 150** is intended for educational, training and research purposes. It is not designed for industrial use.

2 Safety Instructions

2.1 Risk of Death or Injury



⚠ WARNING

Dangerous voltage

When reaching into open control cabinet, there is a risk of electric shock.

- Before opening, disconnect mains.
- Only trained electricians to do service and maintenance work.
- Protect control cabinet against splash water.

2.2 Hazards to the Unit and its Function



NOTICE

Frost damages are possible while storing the device.

- Store the device in a frost-free location.
- When danger of frost, empty the water tank via drain cock.



NOTICE

Operating the submersible motor driven pump without water leads to destruction of pump.

- Never operate submersible motor driven pump without water.

3 Commissioning, Maintenance and Decommissioning

Commissioning

- Set up device on a even surface.
- Fill sump tank with tap water until the water level is 10cm below edge of sump tank.
- Connect electric power supply.
- Screw the discharge cap or a hose at the end of the discharge pipe.
- Switch on main power switch.
- Switch on pump.
- Open flow adjustment valve carefully.

Maintenance

- Replace the water weekly.

Decommissioning

- In case of extended operation pauses, completely empty the water tank via the drain cock.

4 Determine Volumetric Flow Rate

To do so, use stopwatch to establish time t required for raising the level in the volumetric tank of the **HM 150** from 20ltr to 30ltr.

- Close the outlet valve.
- Read the actual volume at the remote sight gauge.

The volume flow-rate is calculated as

$$\dot{V} = \frac{\Delta V}{\Delta t}$$

5 List of Experiments

The experimental topics covered include, together with the individual experimental set-ups:

- HM 150.01 Pipe Friction Apparatus
- HM 150.02 Dead-Weight Piston Gauge
- HM 150.03 Flow Over Weirs Accessory
- HM 150.04 Variable Speed Centrifugal Pump
- HM 150.05 Hydrostatic Pressure Apparatus
- HM 150.06 Stability of a Floating Body
- HM 150.07 Bernoulli's Principle Demonstrator
- HM 150.08 Impact of Jet Apparatus
- HM 150.09 Orifice and Jet Velocity Apparatus
- HM 150.10 Flow Visualisation Apparatus
- HM 150.11 Fluid Friction Apparatus
- HM 150.12 Orifice Discharge Apparatus
- HM 150.13 Methods of Flow Measurement
- HM 150.14 Impeller Vortex Apparatus
- HM 150.15 Hydraulic Ram Pump
- HM 150.16 Twin Centrifugal Pump Configurations
- HM 150.18 Osborne Reynolds Demonstrator
- HM 150.19 Demonstration Pelton Turbine
- HM 150.20 Demonstration Francis Turbine
- HM 150.29 Losses in Bends and Fittings
- HM 150.31 Rotating Tank Vortex Apparatus

- HM 150.32 Pressure Distribution in a Venturi Nozzle
- HM 150.33 Constant Head Inlet Tank
- HM 150.34 Variable Head Outlet Tank
- HM 150.35 Horizontal Osborne Reynolds Demonstrator
- HM 150.36 Pitot-Static Tube Apparatus
- HM 150.37 Rotameter
- HM 150.39 Stability of a Floating Body - Additional Bodies
- HM 150.40 Vortex Flowmeter

These equipment are optionally available.

6 Technical Data

Overall dimension

(L x W x H) 1220 x 760 x 1200 mm

Weight: 125 kg

Pump

Head: H = 11 m

Flow: Q = 230 ltr/min

Electrical supply 230V, ~ 50Hz; 0,55 kW

Alternatives optional, see name plate

Sump tank 180 ltr

Volumetric tanks

High flow: 40 ltr

Low flow: 10 ltr

Beaker: 2 ltr

Stop watch: 1/100 s

7 Contents of Supply

Basic unit hydraulics bench with the following components:

- 1 integral fibreglass surface with volumetric tank
- 1 sump tank
- 1 pipe system with valves, PVC
- 1 level gauge
- 1 submersible motor driven pump
- 1 electrical control
- 1 beaker
- 1 stop watch
- 1 Instruction manual