OPERATING MANUAL

Constant / Falling Head Permeability Test Set

HM-891, HM-892, HM-893, HM-894, HM-895

HM-891

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Constant / Falling Head Permeameter

HM-891, HM-892, HM-893, HM-894, HM-895

The Gilson Constant/Falling Head Permeability Test Sets were designed to determine the coefficient of permeability by the constant or falling head test method with fine- and coarse-grained soils. Soils containing 10% or more particles passing a No. 200 test sieve are tested using the falling head method, and more granular soils, containing 90% or more particles retained on the No.200 test sieve, are tested using the constant head method.

The permeability chamber has four main pieces:

- a base with a water flow valve
- an acrylic chamber
- a clamping ring
- a top plate with bleed and water flow valves

The chamber is acrylic to permit viewing of the sample during the test. It is equipped with valves, tubing for connection to a water source, vacuum, and manometer tubes, and porous stones or perforated screens, depending on the diameter.

A spring is positioned in the top plate to apply 5–10lb of force against the top stone or screen to prevent soil density changes during the test. End caps and clamping rings are made of anodized aluminum. An adjustable constant head funnel mounts to the upright scale and can be easily removed. All tubing and connections are included.

Constant/Falling Head Permeaters

Model	Inside Diameter	Area - Nominal - in²
HM-891	2.5in (6.35cm)	4.9087
HM-892	3.0in (7.62cm)	7.0686
HM-893	4.5in (11.43cm)	15.904
HM-894	6.0in (15.24cm)	28.274
HM-895	9.0in (22.86cm)	63.617

1.0 CONSTANT HEAD TEST STEPS

1. Select a representative sample of air-dried soil containing less than 10% of particles passing the No. 200 (0.075mm) test sieve and equal in amount to twice what is required for filling the permeameter chamber (approximately 800g).

2. Mix sufficient water into the soil to prevent segregation of particle sizes during placement in the permeameter. The water content should be such that the mixture just flows freely to form layers.

3. Unscrew the three clamping knobs and lift the top from the assembly. Position one porous stone on the base at the bottom of the chamber.

4. Using a scoop or funnel, pour the prepared specimen into the lower chamber to a depth of ±1/16in, pouring in a circular manner so that a uniform layer is formed. Compact the layer of soil to the desired density using an appropriate tamping device. Repeat the procedure until the sample is within 1.5in of the top of the acrylic chamber.

5. Carefully level the surface of the specimen and place the upper porous stone on the specimen. Place the top with the compression spring on the porous stone and secure it with the clamping knobs. The spring prevents change in sample length. Measure and record the sample length.

6. Connect a vacuum pump or suitable aspirator to the inflow line at the top of the permeameter. Assemble the constant head funnel tube to the base outflow valve, making sure the valve is closed. Adjust the funnel height to the desired head.

7. Fill the constant head funnel with water from the source to be used while testing.

8. Apply a vacuum of approximately 20in for 15 minutes to remove air trapped in the specimen. After evacuation, gradually open the base valve and slowly allow the sample to saturate under vacuum. Disconnect the vacuum pump when the chamber is filled with water and close the top valve.

9. Close the base valve and reposition the constant head funnel tube to the top of the chamber, being certain there are no air bubbles trapped in the tube. Should air enter the permeameter, use the bleed valve on the top to expel any air at the top of the chamber. Place the outflow tube on the base valve and position it over a graduated flask to receive outflow from the chamber base valve and record the outflow port height.

10. Open the top and base valves and maintain a constant water level in the funnel for the duration of the test. Allow the water to flow so that a steady flow from both the funnel port and chamber outflow line is achieved.

11. After equilibrium flow conditions are established, measure and record the time required for a given quantity of water to flow from the chamber. Record the water quantity.

12. Calculate the coefficient of permeability.

2.0 FALLING HEAD CONSTANT TAILWATER TEST STEPS

1–8. Repeat steps 1–8 from Section 1.0

9. Close the base valve. Remove the top tube from the permeameter and connect the manometer tube to the top valve, making sure there are no air bubbles in the tube. Should air enter the permeameter, use the bleed valve on the top to expel any air at the top of the chamber. Allow water to flow through the specimen until a constant flow condition is observed. Fill the manometer to the top graduation and record the height of the water above the chamber outflow port and the date and time.

10. Calculate the coefficient of permeability (see next page).

$$k = \frac{QL}{Ath}$$

k = Coefficient of permeability, cm/sec
Q = Quantity of Flow, taken as the average of Inflow and Outflow, cm^3
L = length of sample in cm
A = Cross-sectional area of specimen, cm^2
t = Interval of Time, over which the flow Q occurs, seconds
h = Difference in Hydraulic Head across the specimen, cm of water

$$k = \frac{QL}{A\,(t_1 - t_o)}$$

k = Coefficient of permeability, cm/sec
Q = Quantity of Flow, taken as the average of Inflow and Outflow, cm^3
L = length of sample in cm
A = Cross-sectional area of specimen, cm^2
t = Interval of Time, over which the flow Q occurs, seconds

3.0 ACCESSORIES AND REPLACEMENT PARTS

Contact Gilson to order replacement parts and accessories for the Constant / Falling Head Permeameter.

Accessories

- Constant Head Tank: HMA-837
- Permeability Compaction Hammer: HMA-836

Replacement Parts

- Single-Tube Manometer: HMA-840
- 2.470in dia. Porous Stone (for 2.5in Permeameter): GSA-218
- 2.955in dia. Porous Stone (for 3in Permeameter): GSA-227
- 4.480in dia. Porous Stone (for 4.5in Permeameter): GSA-336A
- 6in Perforated Plates: RPHM-38061P
- 9in Perforated Plates: RPHM-38091P

4.0 TECHNICAL SUPPORT

Contact Gilson Technical Support for assistance with operation, maintenance, or repair of the HM-891, HM-892, HM-893, HM-894, or HM-895 Constant / Falling Head Permeameter.

- **Telephone:** 800-444-1508
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