

### PERMEABILITY CELLS

Types of permeability cells and test methods vary according to the physical characteristics of the soil (grain size, permeability, density, etc.).

Generally speaking, for soils of high permeability, water is made to pass through the sample at a constant rate while the volume of water seeping through the sample over a defined period of time, or the pressure generated in two or more inner sections of the sample, is measured. For soils of low permeability the water is allowed to vary freely inside a transparent tube of suitable diameter and variation in level is measured over a pre-set period of time.

Very low permeability does not give rise to an appreciable head so it must be determined indirectly by means of consolidation or triaxial tests

Shape and dimensions of the permeability cell vary according to type of test, grain size and kind of treatment to which specimen is to be subjected. For example, should it prove necessary to measure permeability of compacted grit, the cell should have a wall large enough for grains to be dimensioned according to filter section and, at the same time, be made of metal in order to withstand compaction.

Among the numerous possible alternatives, Tecnotest manufactures three types of permeability cells, that is to say:

- a) permeameters with stainless steel central body measuring 4" (Proctor), 6" (C.B.R) and 12" (Rockfill);
- b) 75 mm diameter permeameter with transparent central body and 3 connections for manometer tubes;
- c) 4" metal permeameter with perforated base.

The (b) type permeability cell is specially designed for constant head tests on incoherent soil samples. It has a central body with 3 outlets for 3 manometer tubes through which water is collected after seepage through the sample.

Inlet and drainage ducts are found in the metal base. A movable stem enables stabilisation of the upper surface of the sample.

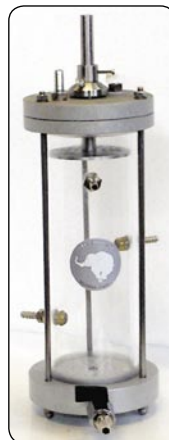
**T 689**

**PERMEABILITY CELL**  
Ø 75 mm. Weight: approx. 3 kg

The (c) type permeability cell has a central body with cutting edge for obtaining a core of the sample. It comprises a completely perforated base for draining, a top plate with connections for water and de-airing tanks. The test is performed with the permeability cell fully immersed in a tank fitted with overflow valve. For falling head tests.

**T 688**

**PERMEABILITY CELL WITH PERFORATED BASE**  
Central body Ø 100 mm.  
Weight: approx. 4 kg



T 689



T 688



T 690

The (a) type permeability cells may be fitted with bases and collars for compaction; the two sealed bases are provided with water inlet and outlet ducts as well as a deaeration valve. These permeameters are generally used for tests on granular soils compacted according to Proctor or C.B.R. methods; they are suitable for both falling and constant head tests.

**T 690**

**PERMEAMETER with 4" diameter**  
Central body Ø 101.6 x 116.4 mm.  
Weight: approx. 7 kg

**T 691**

**PERMEAMETER with 6" diameter**  
Central body Ø 152.4 x 177.8 mm.  
Weight: approx. 13 kg

**T 692**

**PERMEAMETER with 12" diameter**  
Central body Ø 304.8 x 274 mm.  
Weight: approx. 50 kg



T 692

### ACCESSORIES, WATER TANKS AND MEASURING DEVICES FOR PERMEABILITY TESTS

Necessary equipment for permeability tests varies according to the type of tests performed. For constant head tests a stationary flow must be generated. To achieve this a tank is positioned above the rest of the equipment and is continuously supplied with water at a higher rate than seepage rate. Excess water is drained off via an overflow valve. Falling head is given by lowering of the level inside the tank supplying the cell; with samples of moderate permeability a long glass tube is used to measure flow as a small amount of seepage will give rise to a large fall in level of water. If various glass tubes of different diameters are available, it is possible to choose the one which determines a consistent fall over a reasonable period of time. Constant head determines a constant flow of water discharged so measurement is obtained by weighing the quantity of water that has passed through the sample over a defined period of time.

Should the permeameter be equipped with connections for manometer tubes, a panel is required for mounting the tubes together with a series of graduated glass tubes. Permeability will however vary substantially according to the degree of saturation of the sample so it is preferable for measurements to refer to samples in the saturated state. In order to eliminate air bubbles, a vacuum pump and special hydraulic circuitry are used. It is a good idea moreover to use de-aerated water obtained using a de-airing apparatus for this purpose.

### CONSTANT AND FALLING HEAD TEST

**T 697/4**

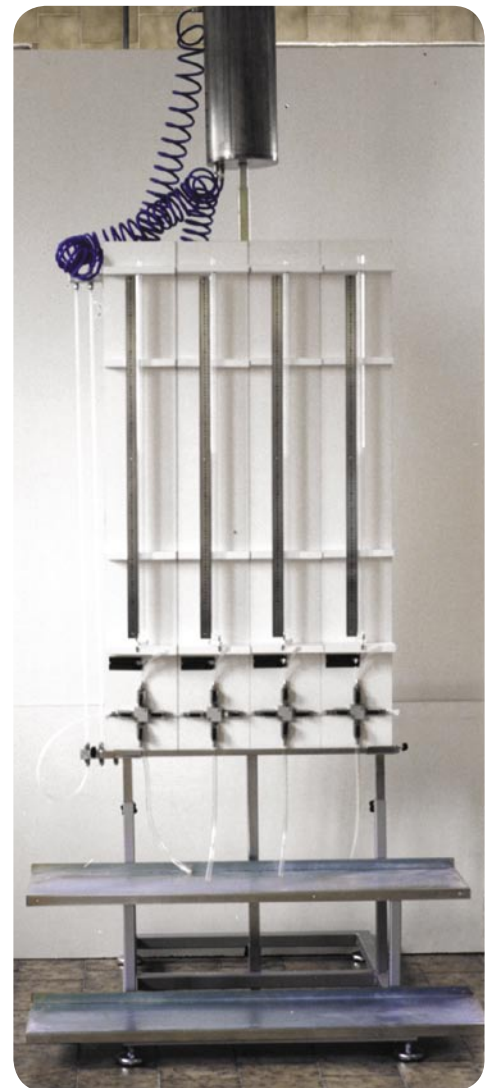
**STAND FOR PERMEABILITY TESTS (4-place model)**

Comprises both the tank with overflow valve for constant head tests and the glass tube for falling head tests. The water tank can be placed at heights from 135 to 435 cm whilst hydraulic circuitry may accommodate up to 4 cells.

The same amount of glass tubes are provided for falling head tests.

Dimensions: 1000 x 900 x 2500 (h) mm.

Weight: approx. 120 kg.



T 697/4

**N.B.: Suitable for T 690 - T 691 - T 692 permeameters**

### CONSTANT HEAD TEST

**T 698**

**CONSTANT LEVEL TANK**

Supplied with support for wall mounting, it comprises a transparent body, water supply ducts, discharge and flow valves. Weight: approx 3 kg

**T 685**

**STANDPIPE WITH 3 MANOMETER TUBES**

Comprises 3 glass tubes all of the same diameter, relevant graduated rods, taps and metal pedestal for bench mounting.

Dimensions: 320 x 500 x 1450 (h) mm.

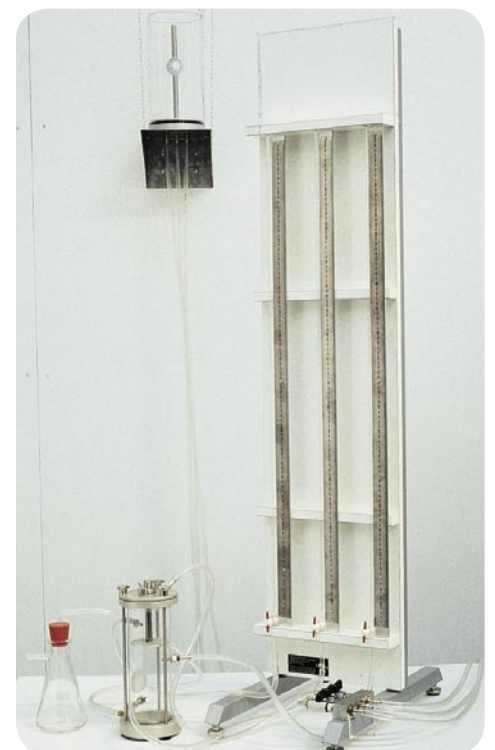
Weight: approx. 15 kg

**N.B.: Suitable for T 689 permeameter**

**Spare parts:**

**T 685/ST**

Kit of 3 glass tubes for T 685



T 698 T 685 T 689

### FALLING HEAD TEST

#### T 690/P

#### STANDPIPE PANEL

Suitable for falling head tests, it comprises 3 glass tubes each 1 m long with bores of 2.0, 3.8 and 5.5 mm diameter as well as a support for water tank. Wall mounted.  
Dimensions: 320 x 250 x 1380 (h) mm.  
Weight: approx. 10 kg

**N.B.:** Suitable for all types of permeameters

#### T 687

#### SOAKING TANK

Used for containing permeameter T 688, it is fitted with an overflow valve so that level is maintained constant.  
Dimensions: diameter 360 x 285 (h) mm.  
Weight: 6 kg.

#### Spare parts

#### T 690/SB

Kit of 3 glass tubes for T 690/P



T 688 T 690/P T 687

#### TR 697/D

#### DE-AIRING TANK

Anodized aluminium base and attachments for wall mounting. Manufactured from transparent Perspex. De-airing jet inlet and flow outlet. Capacity: 15 litres  
Dimensions: 800 x 220 x 220 mm  
Weight: 10 kg



TR 697/D

#### TR 697/V

#### 3-TAP BLOCK

#### V 899

#### VACUUM PUMP (66.6 litres/minute)

Small-sized, it is particularly suitable for laboratory use. Manometer with vacuum indication.  
Max. vacuum 1 Torr.  
Electric motor: 220 V, 50 Hz, single phase. Kw 0.30  
Dimensions: 350 x 450 x 280 mm.  
Weight: approx. 13 kg



V 899

#### V 791/T

#### RUBBER TUBING

Diameter 6-9 mm, length 2 m.