CSI Custom Scientific Instruments, Inc.®

CSI-135

Gas Permeability Tester

Introduction:

Widely used in research and development, food industry, pharmaceutical industry, universities, quality control, and packaging materials industry; the CSI-135 Test System has a broad range of applications. Manufactured from top quality components and superior workmanship, CSI-135 Test System contains all the necessary features to perform the ASTM D1434 test method.

The steady state rate of gases (Air, Ar, CO_2, O_2, N_2, He, H) can be measured through materials such as plastic film, barrier materials, sheeting, laminates, plastic-coated papers or fabrics, PVC, and PVC sheets. This Test System is designed to determine the rate of permeation, the gas transmission rate (GTR) permeance and permeability of plastics membranes to gases using the variable-volume method. The change in volume of the permeated gas is conveniently measured as a function of time by following the displacement of a short column of liquid in the capillary.

The CSI-135 Test System can support test conditions of 0°C to 150°C and under pressure differentials as high as 200 psi. The CSI-135 Test System can also be modified to support higher testing conditions and supplied with any units of measurement required (i.e.: SI, metric, barrers, etc.)

The standard configuration is single station, but a multiple station test system can be provided as well. In a multiple station test system, each Test Cell has its own dedicated vibrator connection and gas measurement and controls. As an optional feature, the Test Cabinet Assembly can be supplied with a multiple gas manifold if more than one gas input is required.

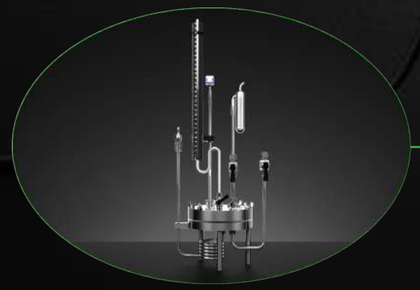
The Test Cabinet Assembly features a dedicated temperature controller and heater for the constant temperature conditioning bath. The constant-temperature conditioning bath is double wall insulated to guarantee that no heat escapes, providing an optimal testing environment.

While the surge tank ensures a constant test gas pressure; the internal heater and Media Stirrer Pump work together to insure that the liquid media is maintained at a uniform temperature. The gas measurement and controls include a gas input control valve, input compression connection, manifold control valve, pressure gage, and Test Cell input connection.

The Test Cell consists of two stainless steel, pressure chambers; a low-pressure (upper) chamber and high-pressure (lower) chamber. This versatile instrument is capable of investigating the permeability of membranes over a wide range of temperatures and pressures. Two pressure relief valves are supplied; one for each pressure chamber. A sealed cylindrical cavity when the two pressure chambers are superimposed.

The Test Cell is supplied with quick-connect gas inlet connection, gas pressure relief valve, precision glass capillary, and gas bubbler. An analog scale is attached to the precision glass capillary to measure the slug displacement. A vibration device assists the capillary slug's movement along its path, ensuring minimal frictional drag between it and the precision glass capillary.

User Friendly Control Console for accurate readings and repeatable results.



Test Cell Assembly

Quick Disconnect feature allowing to quicky and efficiently change input gas types.

Theory of Operation:

The Test Cell is immersed in the constant-temperature conditioning bath to reach the desired test temperature. Gas, from a suitable constant-pressure source, is delivered into the high-pressure (lower) chamber of the Test Cell. The input gas first travels through a heat exchanger coil to lower to its test temperature, before being introduced into the sealed cylindrical cavity where the specimen is located. The high-pressure (upper) chamber is thoroughly purged with the gas through the bottom vent line which, when closed, forces the gas to permeate through the specimen into the low-pressure (upper) chamber. The permeating gas discharges to the atmosphere via the permeate vent line and an oil trap to prevent the back-diffusion of air to the cell.

In order to measure the rate of permeation of the gas through the specimen, the permeate vent line on the low pressure side of the test cell is closed. The slug inside the precision glass capillary is displaced upwards by the permeating gas.

This rise of the capillary liquid, caused by the expansion of permeating gas against atmospheric pressure, is then followed as a function of time.

The movement of this slug offers a direct measure of the rate of permeation of the gas through the specimen. Mercury, Methyl Isobutyl Ketone (MIK) or other appropriate liquid colored with a suitable dye can be used as the capillary liquid. The optional Start-up Kit conveniently has all necessary components to begin testing your samples immediately.

Repeat runs are performed quickly by opening the permeate vent line, causing the capillary liquid to drop back to the bottom of the capillary, and then closing the vent and again measuring the rate of rise of the capillary liquid. High and low rates of permeation can be measured by an appropriate choice of pressure gradient and capillary diameters. Three standard precision capillary sizes are available to choose from: 0.25 mm, 0.50 mm, or 1.0 mm bore diameter.

Technical Specifications:

Number of Stations:	1
Supported Test Gases:	Air, Ar, O_2, He, N_2, CO_2, H
Maximum Test Pressure	200 PSI 1379 kPa
Test Temperature Range:	32 - 302°F 0 - 150°C

Standard Features:

Test Cell Assembly		
	Maximum Specimen Thickness:	0.25 in. 6 mm.
	Specimen Dimenion Diameter:	4.4 in. 111.1 mm.
	Specimen Geometry:	Circular
Includes:		Clamping Hardware, Stainless Steel Heat Exchanger Coil Gas Quick-Connect Connection Gas Bubbler, Glass Analog Scale
	Range:	30 cm.
	Increment:	1/10 cm.
		Vibrator Connection Chamber gas relieve pressure valves Flat Gas Seal Gasket
		Precision Capillary, Glass (must pick one size)
	Diameter (mm.):	0.25, 0.5. or 1.0
	Maximum Travel of Slug (cm.):	30
		Upper and Lower Pressure Chamber
	Test Area:	96.76 cm^2
	Outside Diameter:	152.4 mm.
	Inner Diameter:	111.1 mm.
Test Cabinet		Double Insulated Constant Temperature Conditioning Bath
	Material	Stainless Steel
	Capacity	4 gal 15 L
		Media Stirrer Pump Drain Valve Surge Gas Tank Gas Inlet Connection

Control Panel		Digital Temperature Controller, PID
	Display:	Dual, LED, Red
	Resolution:	4 digits, seconds
	Accuracy:	± 0.1°C
	Temperature Range:	32 - 302°F 0 - 150°C
		Heater ON/OFF switch with LED Indicator Circulator ON/OFF switch with LED Indicator Vibrator ON/OFF switch with LED Indicator Main Power Switch Gas Pressure Gauge
	Range:	0 – 200 PSI 0 - 1379 kPa
	Accuracy:	± 0.25%
		Gas Inlet Control Valve Gas Manifold Control Valve Test Cell Gas Quick-Connect Slug Test Cell Vibrator Connector
Documentation Included		Operator's Manual, Conformance Certificate
Warranty		1 Year Manufacturer's Warranty

Optional Features:

1. Safety Shield	with 6 in. (15 cm.) duct connection
2. Multiple Gas Manifold	to be able to test a mixture of more than one gas
3. Multi-Station Test System	a larger capacity test cabinet having dedicated controls to support more than one test cell
4. Different Test Pressure Configuraiton	per customer specification
5. Different Test Temperature Configuration	per customer specification
6. Different Test Cell Area/ Specimen Geometry	per customer specification

Optional Accessories:

1. Sample Cutting Dies		Per customer specified
2. Arbor Press		Type: Manual or Clicker
3. Precision Capillary Tubes	Diameter: Max. Slug Travel:	0.25, 0.5, 1.0 mm. 30 cm.
4. Test Start-up Kit		Includes: M.I.K., 25 mL; Paper Filter, pack of 25 pieces; Lubricant grease, 25 mL; Bubbler oil, 25 mL; O-Rings, 10 pieces; Hypodermic Syringe, 0.5 mL

Physical Dimensions:

Approx. Instrument Weight (Test Cell):	14 lbs. (6 kg.)
Approx. Instrument Dimensions (Test Cell):	8 Wx 6D x 23H in. (20 Wx 15D x 58H cm.)
Approx. Instrument Weight (Test Cabinet):	185 lbs. (84 kg.)
Approx. Instrument Dimensions (Test Cabinet):	32W x 27D x 52H in. 81W x 69D x 132H cm.)
Approx. Shipping Weight:	400 lbs. (182 kg.)
Approx. Shipping Dimensions:	37W x 32D x 59H in. (94W x 81D x 150H cm.)

Installation Requirements:

Electrical Specifications:	115VAC, 50/60Hz, 1Ph, 15A 220VAC, 50/60Hz, 1Ph, 8A
Max. Gas Inlet Pressure:	200 PSI 1379 kPa
Input Gas Connection:	¼" Inlet Female Compression
Supported Input Gas:	Air, Ar, CO_2, O_2, N_2, He, H

Reference Test Standards:

1. ASTM D1434 (Procedure V)

CSI® Custom Scientific Instruments, Inc.

Specialists In Physical Testing Instrumentation

1125 Conroy Place
Easton, PA 18040-6656 USA
Telephone: +1 (610) 923-6500
Fax: +1 (610) 923-6543
Email: info@csi-instruments.com
www.csi-instruments.com