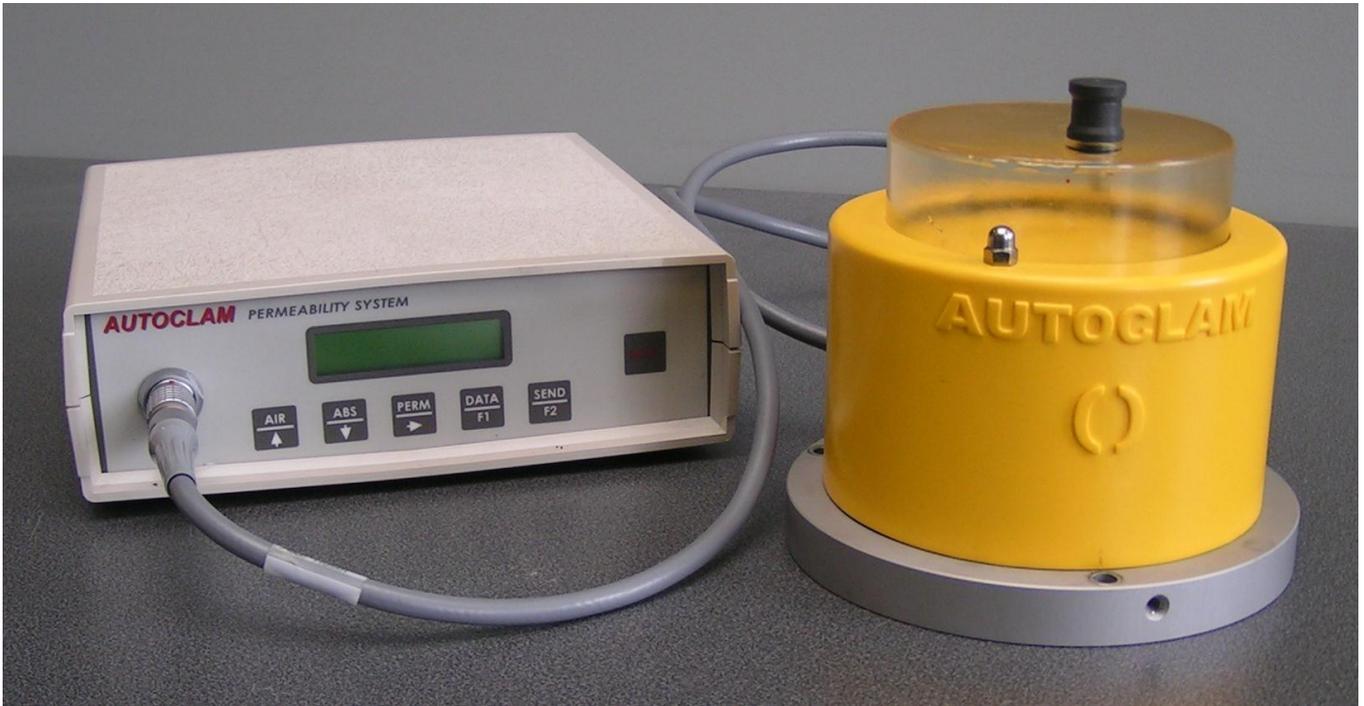


Autoclam

// AUTOCLAM PERMEABILITY SYSTEM for the measurement of those surface properties of concrete which influence its durability and performance in normal or aggressive environments.



Developed by Structural Materials Research Group at Queen's University Belfast, Northern Ireland, UK

AUTOCLAM measures **air and water permeability** and **water absorption** into the near-surface zone of concrete and other building materials, including surface repair materials, without causing damage. It is an exceptionally good tool for assessing the durability of these surfaces when exposed to normal or aggressive environments.

AUTOCLAM can measure the above properties both on site and in the laboratory.

- AUTOCLAM**
- measures permeation properties to enable planned and timely maintenance, **RESULTING IN LOWER REPAIR AND LIFE CYCLE COSTS.**
 - is particularly suited to assess the protection provided by surface coatings, membranes and patch repairs
 - works equally well on vertical, inclined and horizontal surfaces
 - is non-destructive, easy to use and portable for site use
 - records and stores many results and downloads them onto your computer with ease to permit you to perform analysis at a later time, thereby saving much time on site
 - is supported by internationally accepted research

The instrument is uniquely capable of carrying out all three vital tests, to allow complete and specifically relevant testing of structures. The unique design of this instrument makes it very attractive to end users due to its ease of use, range of measurements, recording of data and the ability to transfer data to a PC for future use.

BACKGROUND

Much of the trouble encountered with reinforced and prestressed concrete today is due to the ingress of harmful materials such as carbon dioxide, chlorides and sulphates. In gaseous form or as solids dissolved in water, they penetrate through the zone of concrete that is in contact with the environment where major damage is done. Therefore, knowledge of the penetrability characteristics of the near-surface zone of concrete (and such building materials) is of utmost importance, which can be obtained through site measurement of gas and water permeability and water absorption.



AUTOCLAM APPLICATION AREAS

- Assessment of resistance to carbonation
- Prediction of salt induced corrosion of steel in concrete
- Determination of freeze-thaw deterioration and salt scaling
- Monitoring the effect of microcracking in building materials
- Assessment of sealants, coatings and hydrophobic surface treatments
- Measurement of the effect of curing of concrete
- Measurement of the influence of special formworks, such as controlled permeability formwork
- Indirect prediction of abrasion resistance of surfaces
- Determination of shrinkage and settlement cracking
- Quality assurance of building materials
- Compliance testing of durability specification



RANGE OF TESTING

Gas Permeability tests can be carried out on most building materials for which the coefficient of permeability is less than 10^{-10} m/s.

Both the Water Permeability and Sorptivity (water absorption) tests can be carried out on impermeable materials to those in which the maximum rate of flow of water is 1 mL/minute. The resolution in these tests is 1 microlitre.

01 AIR PERMEABILITY

Related to carbonation in concrete and sulphur dioxide and hydrogen sulphide penetration in building materials.

02 WATER PERMEABILITY

Important for freeze-thaw deterioration, salt scaling and chloride penetration of submerged structures.

03 WATER ABSORPTION

Strongly related to the intake of water borne salts and other aggressive liquids by capillary suction in building materials

Functional purpose of the Autoclam

The Autoclam can be used to measure the air and water permeability and the water absorption (sorptivity) of concrete and other porous materials, both in laboratory and on site. Using this equipment, the rate of decay of air pressure is recorded for the air permeability test, whereas the volume of water penetrating into the concrete, at a constant pressure of 0.02 bar and 0.5 bar are recorded for the sorptivity and the water permeability tests respectively. These tests, which can be carried out quickly and effectively on site without prior planning, are essentially non-destructive in nature and a skilled operator is not needed.

The components of the Autoclam

The Autoclam is supplied in a portable carrying case, and consists of two parts, the Autoclam body and its electronic controller and data recording system. (Fig. 1a).

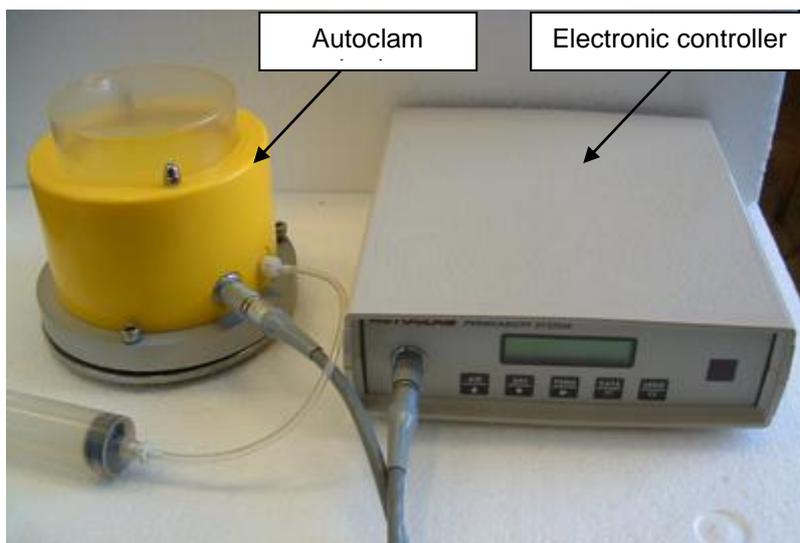


Fig. 1a Autoclam Permeability System



Fig. 1b Bonding type ring

Fig. 1c Bolt on type ring

The Autoclam body comprises of the following components:

Base ring: One base ring that can isolate a test area of 50mm diameter (Fig. 1b) is supplied, which can be bonded to the test surface. Additional rings can be ordered separately and are available with a variety of test areas. Special bases (Fig 1c) for clamping to the test area rather than using adhesive are available.

Base unit or body: Inside the protective (yellow) cover the base unit accommodates –

- an electronically controlled priming system to fill automatically the test area quickly
- a reservoir to hold sufficient water for one test
- a miniature variable volume pump and control valves to apply and maintain pressure and to measure the volume of water or air passing through the test area
- an accurate pressure transducer to record test pressures
- all necessary connections to the electronic controller

The electronic control box contains all the custom designed electronic control and recording hardware. On its front panel (Fig. 2) is a back-lit digital liquid crystal display screen, test selection keys, a reset key, and a twelve

pin circular socket to connect to the Autoclam base unit.

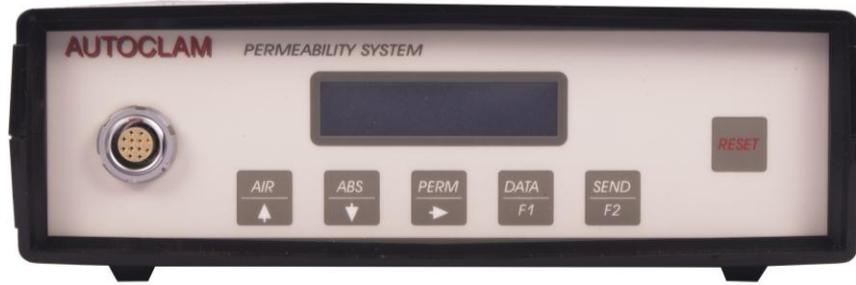


Fig. 2 Front panel of the control box

The control box houses an internal battery to permit use of the instrument on site without needing any external electrical facility. Also supplied with the kit is a DC power supply unit to permit extended site use and to charge the internal battery.

The rear panel of the unit contains a standard RS 232 serial port computer connection and a two pin circular connector to connect a 12 to 24 volt DC supply or the mains power/charging unit and a power switch.

Technical details of the Autoclam

Pressure transducer

Capacity	:	1 Bar
Overload without damage	:	2 x rated range
Pressure Transducer Accuracy	:	± 1% span
Operating temperature	:	0 - 50 degrees C
Excitation voltage	:	5.0 Vdc
Warm-up time	:	30 seconds

Range of permeation properties

Air permeability index	:	0 to 3.912 Ln(pressure)/min.
Absolute maximum rate of flow	:	1mL/min
Resolution in water flow tests	:	1µL

General

Reservoir Capacity	:	100ml
Battery Capacity	:	2.2 AH
External Supply	:	10-15 Volts DC
(for charging 15vDC required)		

Supplier Information

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