# Automated oedometer

**SOIL CONSOLIDATION, OEDOMETER TEST, FREE SWELL, SWELL PRESSURE AND COLLAPSE**


## Automated consolidation system

Proetisa's automated Soilmatic oedometer is an innovative tool replacing traditional oedometers that required the operator to manually place loads.

Proetisa's Soilmatic series SEA is an automated and computer controlled system with an incremental load controller. Loads are applied or removed without needing to use compressed air systems nor place / remove loads by hand. Tests are fully automatized without human intervention.

EDS software makes possible to program great number of incremental load steps in advance, therefore when one of the steps is completed, the system will automatically proceed to the next one. With our automated system it is possible to carry out any test performed with traditional oedometers: oedometer consolidation, free swell, pressure swell, collapse tests, etc. as well as sample consolidation for direct shear tests, etc.

Unlike traditional oedometers, Soilmatic is compact and extremely small and there is no need for additional room to stow weights. With the Soilmatic oedometer, laboratory operators will be available to carry out any other task. One single machine can reliably accomplish the task performed by various traditional oedometers, thus reducing costs and increasing productivity while delivering reliability and accuracy.


The system is fully automated to carry out incremental consolidation tests according to ASTM D2435 Method B Standard, applying successive load increments after achieving 100% of primary consolidation.

This machine is precisely engineered to provide a simple and easy test method that can be particularly useful in universities to prevent students from lifting weights, and therefore increasing health and safety conditions.

## Automated oedometer configuration

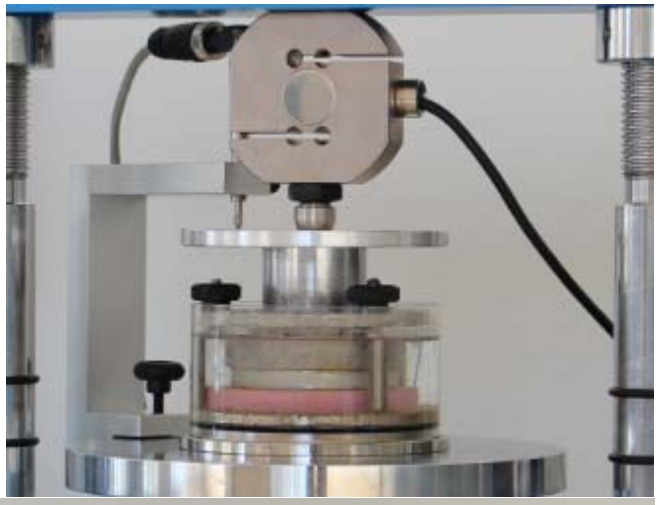
The system operation is extremely easy and simple. The automated oedometer applies vertical loads that are defined in advance, depending on the type of material to test, and takes strain / displacement readings based on the plate movement. It is possible to program the machine to perform a series of automatic incremental or decremental steps, as well as to decide which load value is to be applied in every single step when operated by hand.

This system allows you to considerably reduce production costs as there is no need to assign personnel to pay attention to the test performance or to place weights at the end of the steps.

# Features and Advantages

- Operator's intervention is not required to place weights
- Load steps or increments will take place day or night, at any moment, without operator's intervention.
- There is no need for external, noisy compressed air systems.
- Considerably quicker test performance due to system automation.
- Increase in test results accuracy
- Possibility of free testing development. Sample consolidation meeting special requirements. For example: consolidation with controlled pore pressure at very low speed.
- Automated data recording system for its later processing and reporting.
- PID control allowing accurate load application ranging from 1N to 10kN (unlike pneumatic systems that are typically inaccurate at low load values)

- "N" load steps can be selected, either incremental or decremental, as well as combined sequences of both types.
- Special oedometer cells are not required. Older cells can be used with this system.
- The system can be upgraded to CVC (Constant velocity consolidation).
- Load is quickly and accurately applied without affecting the sample due to PID control.



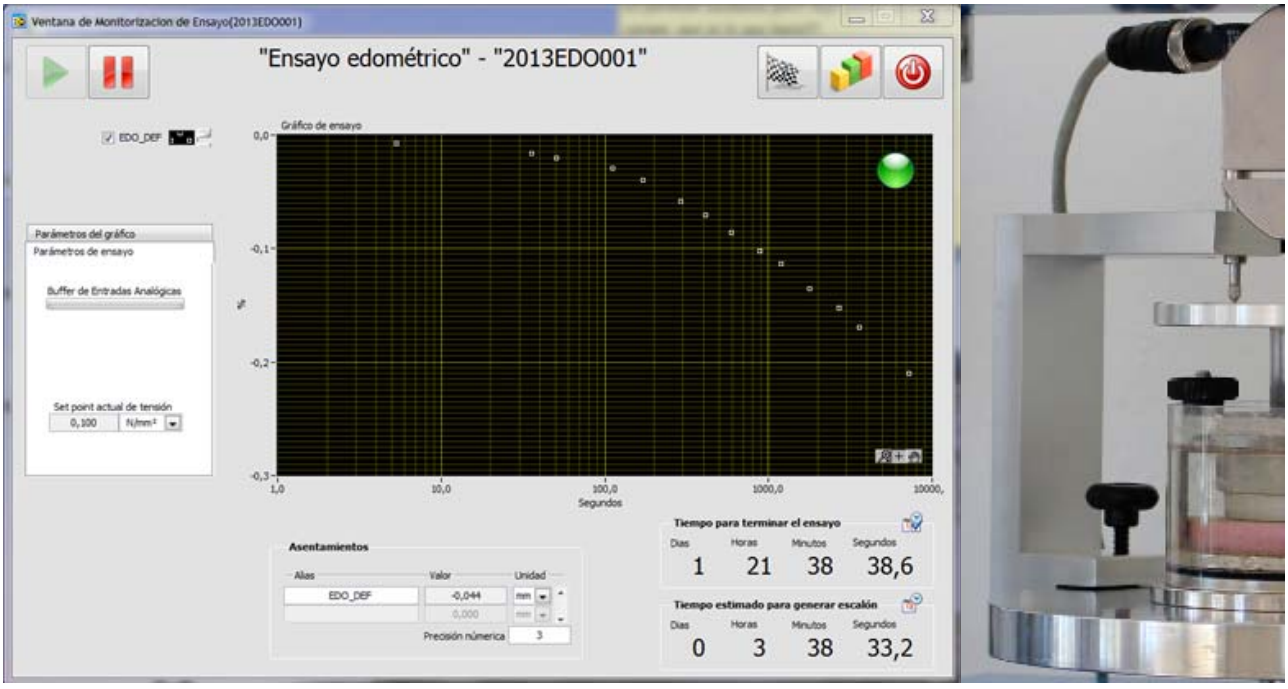
## "EDS" SOFTWARE

Software EDS is the most advanced tool in the market to deal with soil test.

With our leading-edge EDS Soil testing software you will be able to configure tests so as to comply with the desired Standard Method, to program continuous data recording at predetermined values or by events.

You will also be able to perform any type of test using the "free test" tool that makes possible to configure tests to meet your needs using the required sensors. You will be able to include additional strain or pressure sensors in order to monitor interstitial pressure during consolidation. This and other utilities make EDS Software an integral solution and a powerful tool.

EDS Software records data with user customized configuration and displays real time results. Graphs display live sensors one by one or all of them at the same time. You will be able to choose between linear or logarithmic time scales.




EDS also has event utilities making possible to accelerate or decelerate data acquisition, test and data recording finish, alarm activation, etc. All data are recorded and stored for later analysis.

Test results and graphs are printed in Word file format or can be exported to Microsoft Excel.

The software allows the user to program "n" load steps that can be either incremental or decremental. It is also possible to configure their length. To start the test, simply place the sample on the test area and press the "start" button. The software controlling the test performance will apply the previously set load /unload steps. For example: if six load steps and two unload steps have been programmed, the system will start increasing loads and keeping them during the desired lapse of time. Once a load step is finished, the system will automatically proceed to the next load increment and so on until test completion. It is also possible to assign events to the test if desired; therefore, once a predefined value is reached the system will automatically move on to the next load / unload step.

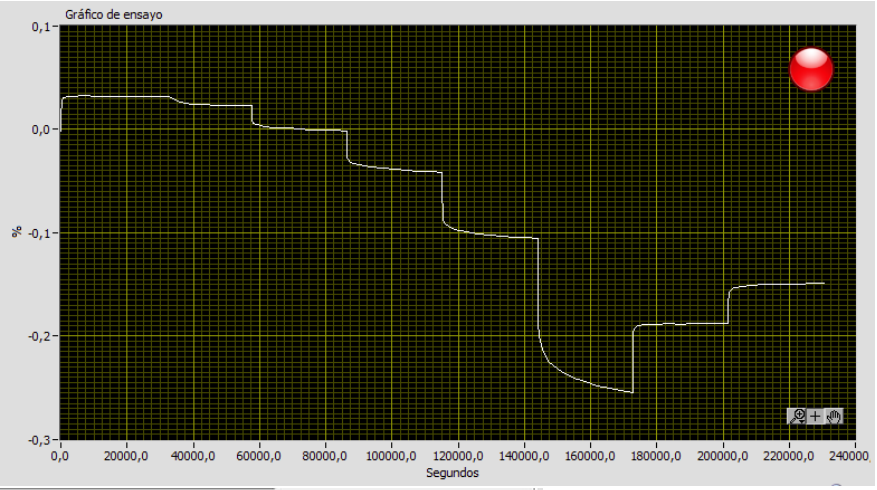
As Soilmatic oedometer is conceived to automatically move on to predefined steps, an incremental consolidation can be completed in 24 to 48 hours if desired.

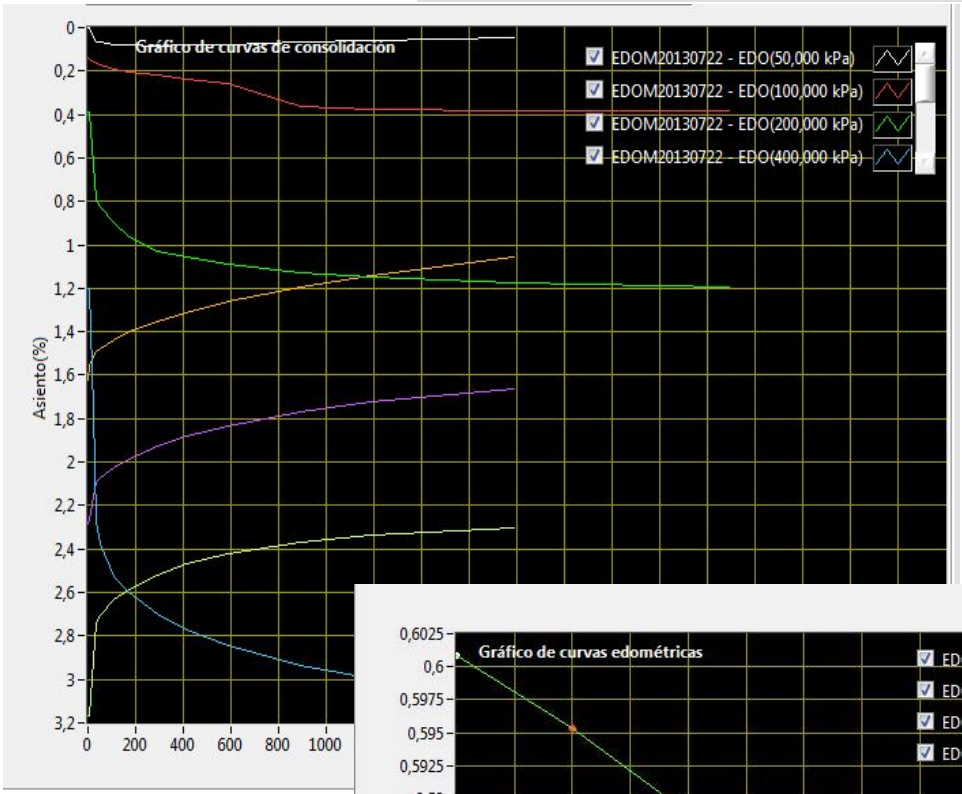
EDS software records strain readings from a displacement transducer and applied load readings from a force transducer. This force transducer allows the system to apply and maintain predefined loads and load increments.

Test results are displayed on the PC screen in real time and stored for later automated processing.

## EDS software allows you to:

- View test performance on the PC screen in real time.
- Analyze test results with post analysis software.
- Directly print reports with Word o export them to Microsoft Excel

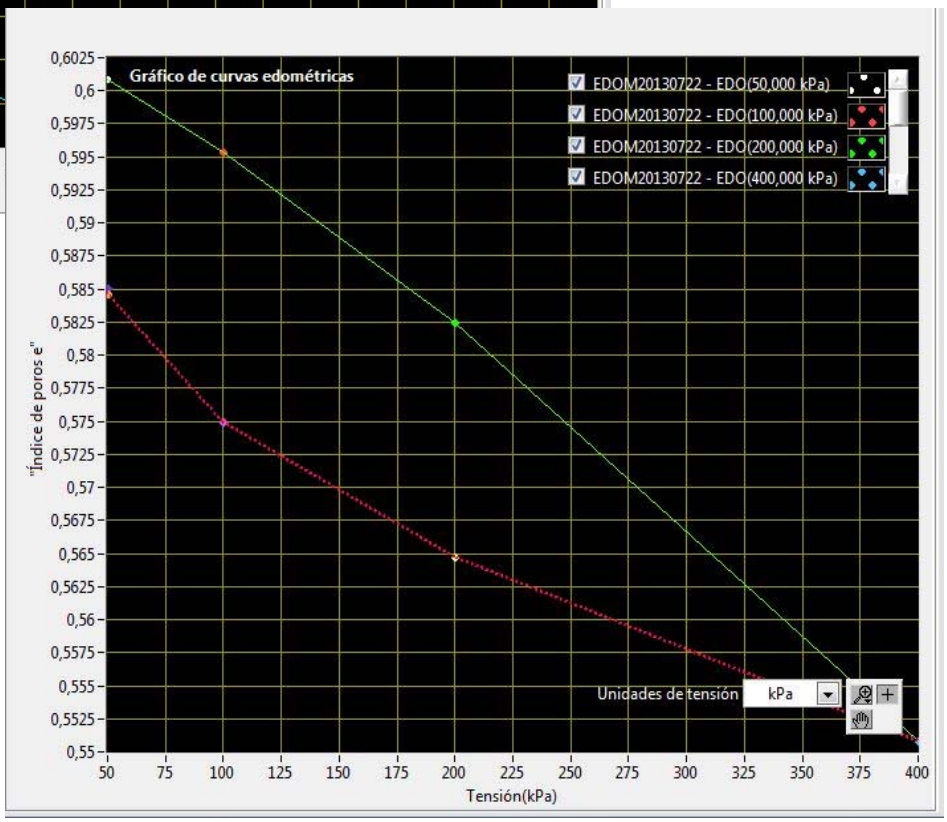



Software A.I. allows you to pause and resume a test or to easily carry on with it after a power cut.

The system displays total test duration and remaining time to completion.

If desired, the system will automatically finish tests.




**With a single PC, you will be able to control as many Automated Oedometers as you wish.**
**Software will control all the oedometers connected to the PC in an independent, automatic and simultaneous way.**

## Upgrading possibilities

This system can be upgrade to a CVC – Constant velocity consolidation (In this case, columns need to be replaced). Pressure or strain transducer can also be added.

**Constant velocity consolidation. CVC includes a one-dimensional cell that make possible to apply "back pressure" and to measure pore pressure while applying incremental loads at extremely low, constant speed.** EDS software controls the entire system, records and displays the consolidation process in real time. Graphs display counter pressure and strain values vs. applied load ad pore pressure. These are not tests that can be performed with traditional oedometers or with oedometers actuated by pneumatic devices. PID control makes possible to quickly apply loads without affecting the sample.

**How does it work? -** Unlike traditional oedometers that apply load increments, our system applies a constant vertical axial load velocity. During the test a back pressure is applied allowing the sample to drain through its base. This feature considerably reduces the time needed to achieve complete consolidation.

**What is needed? -** Generally, a pressure maintainer is used to apply back pressure. The vertical load is applied by a press that could be our automated oedometer, with a force transducer to control the applied load and a pressure sensor connected to the base (where the porous stones are located) to measure the pore pressure. The test sample is placed between two porous discs and this group is confined inside a steel container that prevents horizontal strain and reduces friction

**Performing this type of tests would require:** Replacing automatic oedometer columns in order to make enough room for the new consolidation cell, A CVC cell and a back pressure controller / maintainer and a pressure sensor to measure the pore pressure.


## Other upgrading possibilities

This system can be upgrade to a **"Unconfined Compression Load Frame"**, the load frame provides compression testing for a number of geotechnical test.

Also can be upgrade to a **California Bearing (CBR) Load Frame**. This load frame provides an accurate control of the rate of displacement during loading.

With accessories the system can perform: **CBR s**well, **Lambe** test, as well as sample **consolidation for direct shear tests**, etc.

EDS software will allow you to view test performance on the PC screen in real time, analyze test results with post analysis software and directly print reports with Word o export them to Microsoft Excel.

SOILMATIC — SOIL TESTING EQUIPMENTS

***Models :***

**S0105/SM/10 - Standard Automatic oedometer 10 kN**
**S0105/SM/20 - Standard Automatic oedometer 20 kN**
**S0105/SM/50 - Advanced Automatic oedometer 50 kN**

## Technical features

**Sample size:** from 38 mm to 100 mm (4”)
**Sample size:** up to 200 mm (8”), advanced model

**Standard máximum load:** models 5, 10 y 20 kN

**Standard máximum load:** to 50 kN, advanced model

**Vertical clearance:** 145 mm

**Vertical clearance:** 345 mm, advanced model

**Distance between columns:** 290 mm

**Piston stroke:** 30 mm

**Dimensions:** (L x W x H) 480 x 550 x 760 mm

**Weight:** 82 Kg

**Power:** 110/220 V, 50/60 Hz, Monofásico


## Standard system includes the following items:

Test frame and Consolidation cell
Load cell (10 kN force transducer)
12 mm Linear strain transducer
Linear transducer support

## Accesories required:

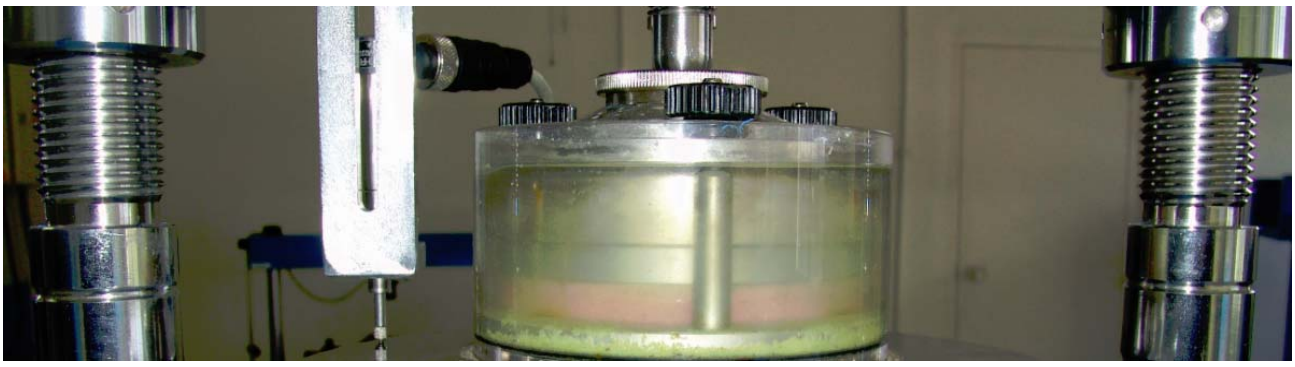
EDS control, data acquisition and analysis Software. 64 / 32 bits PC + monitor

## STANDARDS

UNE 103 602, 106 601, 103406, 103-405.
ASTM D2435, ASTM D3877, ASTM D4546
AASHTO: T216
BS: 1377/5
EN ISO/TS 17892/5

## Data acquisition:

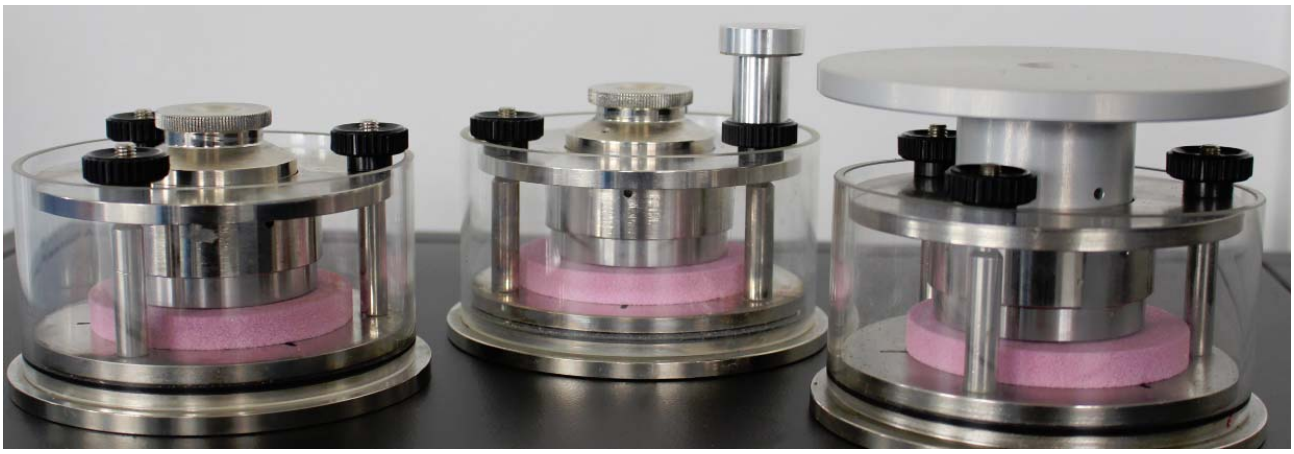
32 bits Ni card



# *Accesories for consolidation test:*

## Consolidation cells

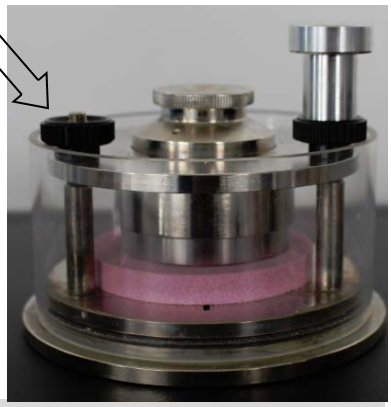
**Automatic Soilmatic oedometer uses any consolidation cell, even those from other manufacturers.**
Compatible Cell Types: Fixed ring, floating ring, fixed ring permeability
**Consolidation cells from 50 mm to 200 mm** (sample size). (other diameter consult)



Displacement transducer. The displacement transducer can be placed on the cell, on the plate or directly on the sample. This last option increases the accuracy of strain measurements.
We have different accesories to be used with any consolidation cell, that will make possible to place the displacement transducer on the cell, on the plate or directly on the sample.

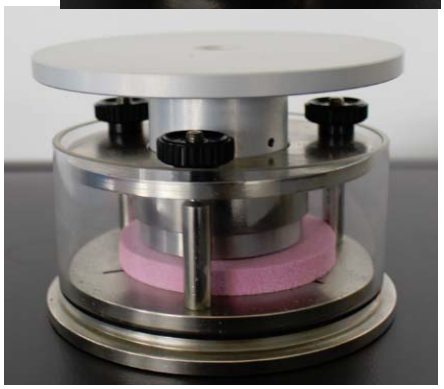
S0105/SM/1 - Kit for swell pressure test. (compatible with any consolidation cell)

**Sensor on the cell**

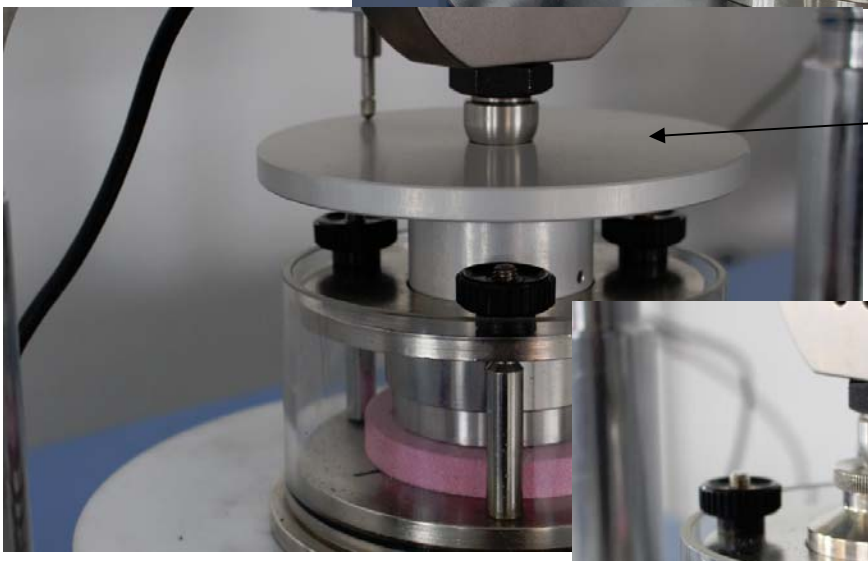


**Sensor on the sample**

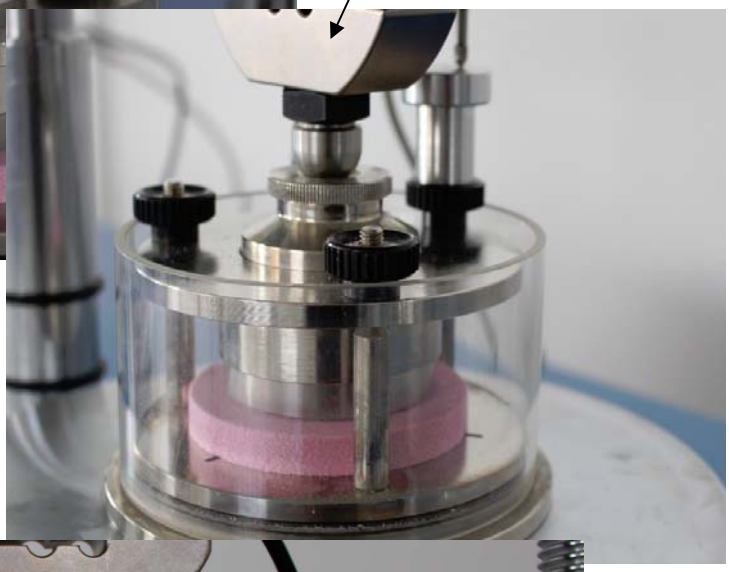
**Sensor on the plate**



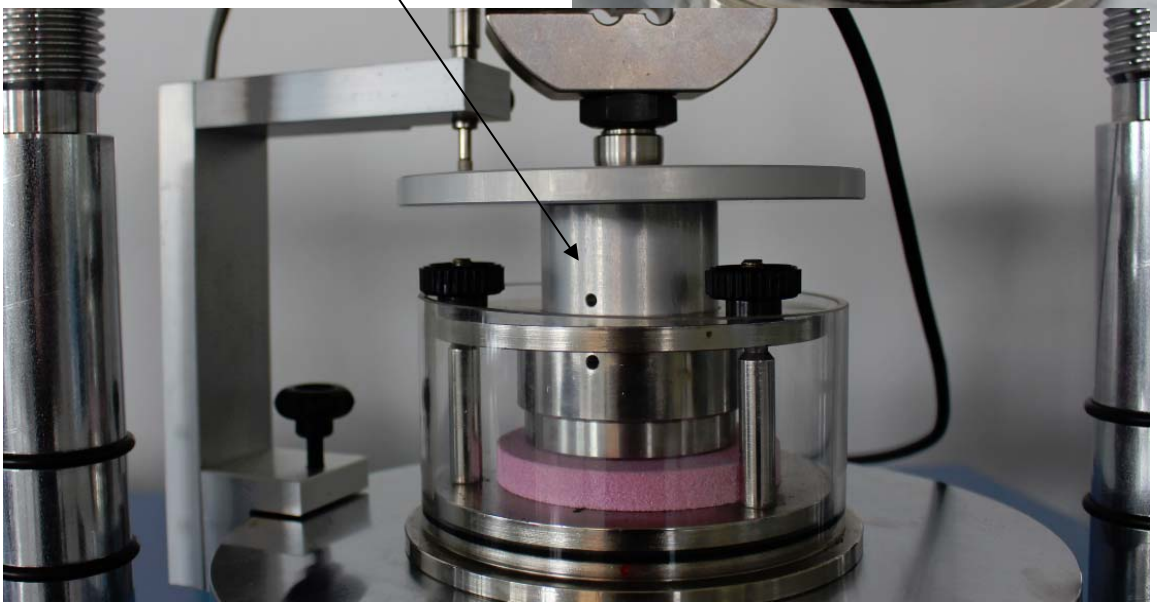
Consolidation and Collapse



Consolidation and Collapse

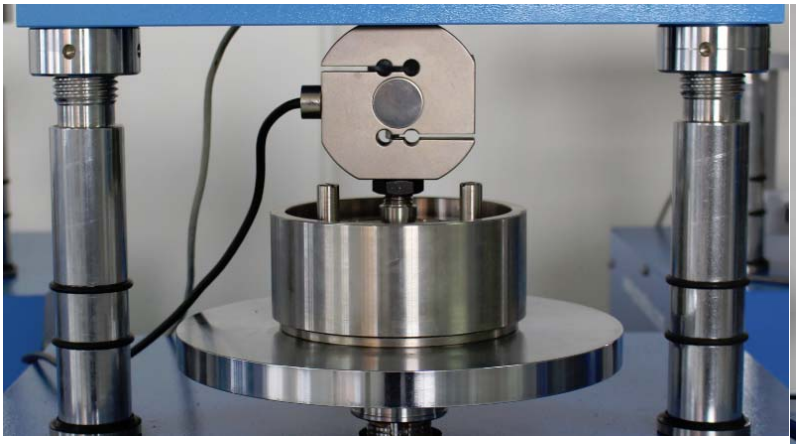


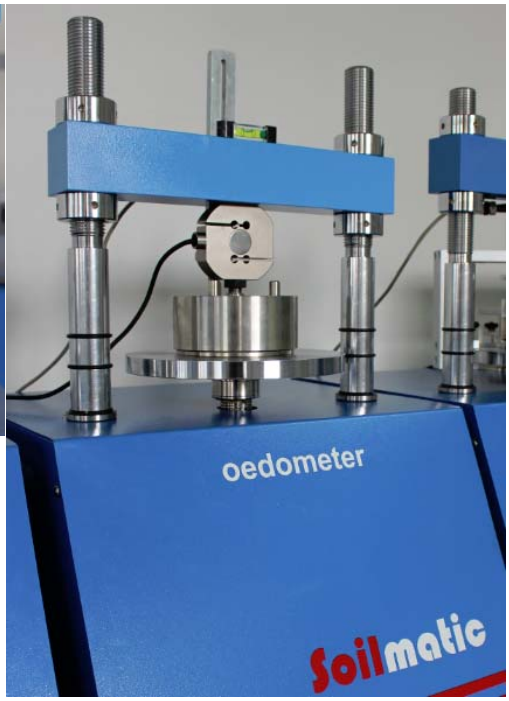
Swell pressure test



# *What other test can I do with my new Soilmatic automatic oedometer?*

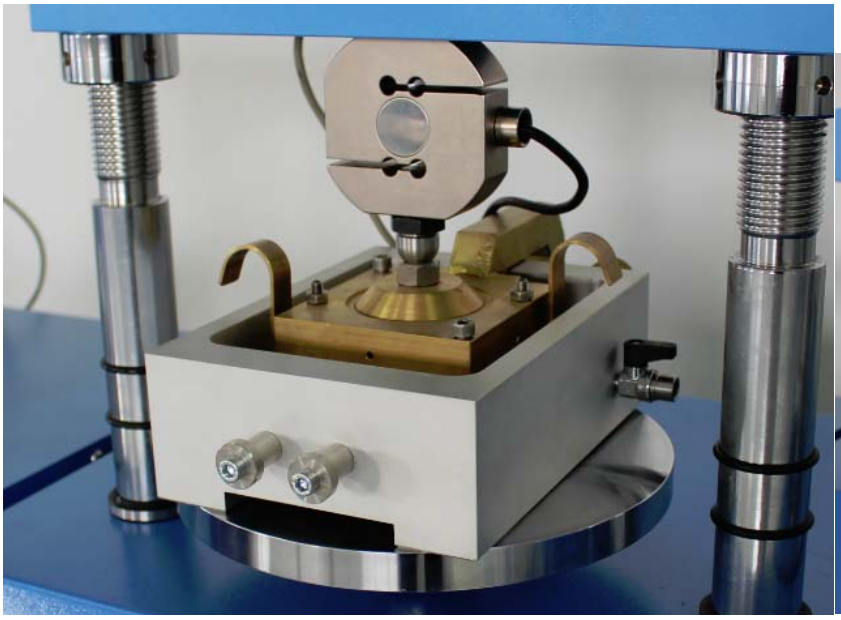
**Replace your old Lambe apparatus** by the new Soilmatic automatic oedometer.
Forget to write readings shown by dynamometer rings!. EDS software will continuously record readings avoiding mistakes and increasing accuracy. You will get a real time graphic of expansivity from your soil specimen.

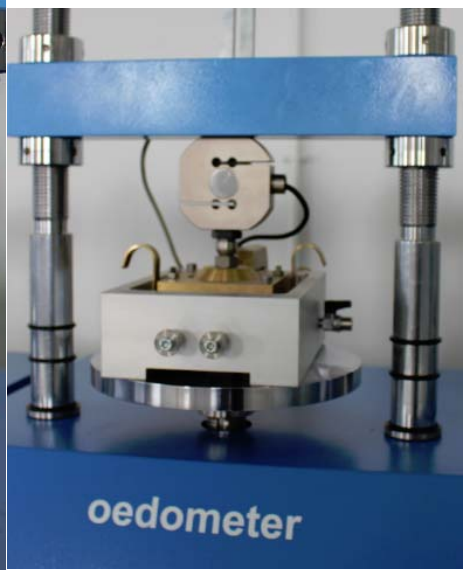





**Lambe test -** Determination of expansivity in soils (Soils Volume Change)
This test is carry out in order to identify quickly soils with problmes of expansivity (volumen change), due to changes in their moisture content. It consist in recognize the expansivity shown in a soil specimen, before compacted, with a previously set moisture conditions up.

**Carry out consolidation of a shear test specimen.** Use your automatic oedometer as a consolidation bench of shear test specimens. Just set consolidation time and load to apply. EDS software will perform the test and if desired, it will calculate the speed test.

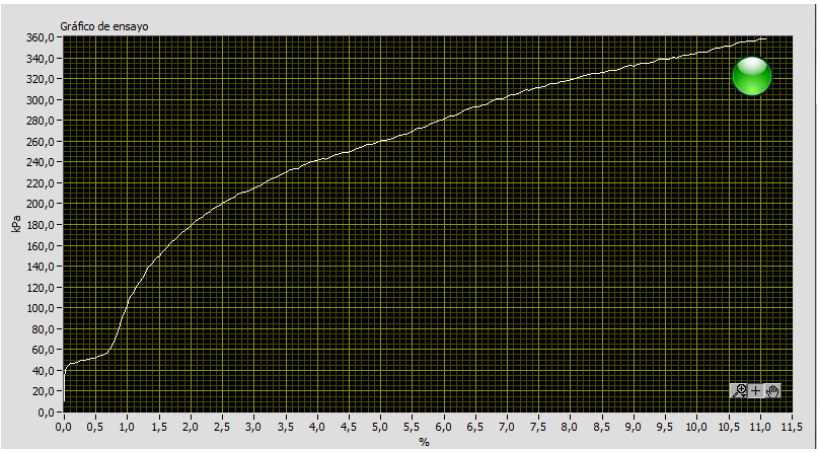




# *What the advanced Soilmatic oedometer offers to you?*

The advanced oedometer **Soilmatic**, besides test already described of collapse, free swell, swell pressure, oedometer consolidation, lambe test and shear test consolidation, also could carry out **simple compression of soils, CBR penetration, CBR swell .....** activating software licenses.


## Frame of simple compression of soils




Graphics of a simple compression test (not confined pressure)

*Just set the CBR piston up and you will have your CBR frame, with control and data adcquisition through EDS software.*


## CBR penetration Load Frame

EDS software carry out completely the CBR penetration test or simple compression, without operator intervention. Records will be registered according to frequency before programmed.