

**AI 150N**  
**ELASTIC MODULUS**  
**of rock specimens in**  
**uniaxial and triaxial**  
**tests**

AI 150N + C089-04N

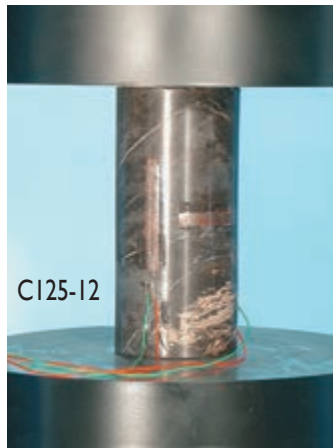
**System:**  
**Automatic with pace rate control also when releasing the load.**

STANDARDS: ASTM D7012 / UNI 9724-8 / ISRM  
 UNE 22950-3

It can be used with a MATEST high stability frame with capacity of, 2000, or 3000 kN coupled to the Automatic Servo-controlled system "Servo-Plus Evolution" (mod. C104N).

The appliance includes:

- **Hydraulic system**  
 It is an hydraulic installation and has a high performance valve directly controlled by the digital unit that grants the automatic control of the pace rate increasing the load, keeps a certain load and than controls the pace rate decreasing the load.  
 The setting of the pace rate is made by a very sensitive valve controlled by a step by step motor that allows a micrometric action on the pace rate granting excellent results in the control of the load. A laser position detector allows a rapid positioning of the piston and a very accurate touch point. This grants a touching sensitivity of test starting of about 0.1 per thousand of the maximum capacity. When used in conjunction with the C104NLP (see page 66) for the application of the side pressure, the hydraulic system permits to maintain the pre-load level with extremely high accuracy.



- **Electronic measuring system**  
 The high performance control and data processing unit controlled by a 32 bit microprocessor; can manage up to 8 high resolution channels for the control of load cells or transducers with strain gages bridge.  
 The unit contains two Analogical/Digital last generation converters with 24 bits resolution. The system processes the signals coming from the load cells and from the extensometers giving all the results required for a further processing following the most updated standards for this application.



• **Data acquisition and processing software UTM2 (Universal Testing machine 2) with License for Elastic Modulus on Rocks.**

The software has been developed on the working line of the already known software UTM-2 (windows menu). It contains the profiles of the main Standards used, but the user can modify as he likes and personalise the test profile, that will be effected in a completely automatic way by the testing machine.

The user must introduce a list of dates concerning the specimen that will be tested and the kind of test that he wants to make: shape of the specimen (cylinder-cube-block), dimensions, age of the specimen, average expected breaking value, etc... The appliance allows verifying the proper reading of the extensometers and, if everything is within the expected tolerances, it manages the average deformation value read by the transducers and processed by the digital unit, than it transmits by means of the serial communication port RJ45 (Network Connection) to a Personal Computer; that can be already by the end user or supplied separately (not included with the Software), all the dates of the test. These dates will be processed by the software and transformed in a graph load/deformation and load/time, following the specific Standards.

The software gives the possibility to print on a standard printer a test certificate reporting all the dates concerning the test and the specimen and the graph of the test. The software includes the license "Servonet" mod. C123N. The extensometers (proposed in two versions: **A** and **B**) are not included in the supply and must be ordered separately (see accessories).

ACCESSORY:

**A150-01N**

Software to make Secant Compression Elastic Modulus tests on concrete

STANDARDS: UNI 6556 / ASTM C469 / ISO 6784 / DIN 1048

NOTE:

The Elastic Modulus of Rocks mod. A150N must be used together with:

A) Extensometers (strain gages), single use, electric (obliged model to perform tests with Hoek cells), available in different sizes,

or:

B) Extensometers/Compressometers, electronic, universal, mechanical frame,

which are not included in the standard supply and have to be ordered separately (see accessories)



C125-10...C125-13

ACCESSORIES:

A) ELECTRIC SINGLE USE EXTENSOMETERS, pack of 10 pieces

Available models:

**C125-10** Electric extensometer; base length 10 mm.

**C125-11** Electric extensometer; base length 20 mm.

**C125-12** Electric extensometer; base length 30 mm.

**C125-13** Electric extensometer; base length 60 mm.

**C125-15**

KIT for the application of single use extensometers composed by: glue, welder, solder, cleanins liquid, accessories, the whole in carrying case

**C125-09**

INTERFACE MODULE, "needed accessory" to connect up to 4 electric single use extensometers. This module allows also the automatic calibration of the zero and of the measuring range after a special thermal compensation. This grants a five times better accuracy than the one requested by the Standards.



C125-09

AS AN ALTERNATIVE:

B) **C134**

EXTENSOMETER / COMPRESSOMETER, electronic, universal, mechanical frame.

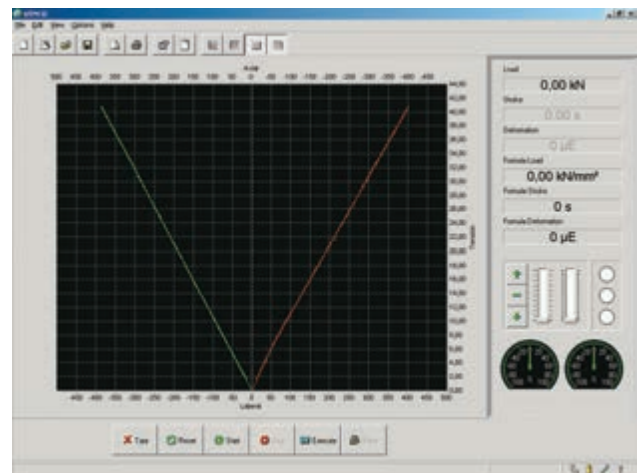
Technical details: see pag. 222



C134

**C134-10**

TEMPLATE, to regulate and calibrate the base length of the C134 extensometer



Typical screen shown while a test is made representing the longitudinal and transversal deformations.

#	n°	Name	Symbol	Value	Unit
1	1	Load	val	193.9	µN
1	2	Axial deformation n°1	me1	308.2	µE
1	3	Diagonal deformation n°1	me1	184.6	µE
1	4	Diagonal deformation n°2	me2	317.3	µE
1	5	Axial tension n°1	me1	25.409	MPa/µm²
1	6	Axial tension n°2	me2	32.738	MPa/µm²
1	7	Diagonal tension n°1	me1	25.409	MPa/µm²
1	8	Diagonal tension n°2	me2	32.738	MPa/µm²
1	9	Maximum tension	me	42.912	MPa/µm²
1	10	Axial modulus	Et	8.107	MPa/µm²/µE
1	11	Diagonal modulus	Et	8.1	MPa/µm²/µE
1	12	Poisson ratio	ν	-0.072	

Test data

## TRIAxIAL TESTS ON ROCK SPECIMENS

STANDARDS: ASTM D7012 / EN 1926, EN 14580

The triaxial test is made on a rock specimen placed into a container (Hoek cell), closed into a latex membrane .  
The specimen receives an axial load and a constant isotropic pressure normally between 5 and 6 Mpa for the whole test.

The electric extensometers are directly applied on the surface of the rock specimen and they are used for the automatic reading in real time of the different parameters and find different information as:



Radial deformation combined with the axial deformation to obtain the Poisson value.

Stress value in relation with the axial and radial deformation.

The maximum or breaking value.

Tangent and secant Young's modulus measured on the axial deformation curve.

Maximum stress value in triaxial conditions.

For this reason it is recommended the use of a compression load frame with capacity of 1500, 2000 or 3000 kN (see concrete sector) combined with the automatic servo-controlled system "Servo-Plus Evolution" model C104N and to the automatic system for the Elastic Modulus on rocks model A150N, that includes the data acquisition and processing software.

The side pressure set by the user, is kept constant between  $\pm 1\%$  using:

### C104N LP

Automatic servo-controlled system "Servo-Plus Evolution" that grants a setting of the pressure up to 70 Mpa.

ACCESSORY:

### C104-51 LP

DISCHARGE CIRCUIT UPGRADE FOR C104N LP

Suitable when rocks causing fast cell pressure increment are tested. This circuit upgrades C104N LP to a more powerful lateral pressure compensation.

The standards require that during the compression test the load on the rock specimen is applied in a continue way in order to obtain the breaking of the specimen within a time included between 5 and 10 minutes, with a constant increase of the load included between 0,5 and 1,0 Mpa/second.



C089-04N + A150N

C104N LP

