SINT Technology

DRMS Cordless

Device for the Drilling Resistance Measurement

The DRMS Cordless (Drilling Resistance Measurement System)

The **DRMS Cordless (Drilling Resistance Measurement System)** is a device designed to perform simple but precise drilling resistance measurements in stone materials and in mortars.

The system can measure continuously:

- Penetration force
- Actual drill position
- Rotational speed
- Penetration rate

Both rotational speed and feed rate are kept constant during operation, and can be continuously regulated between minimum and maximum values.

The outputs of the system are numeric values and x-y plots of Drilling Force.
The equipment has been developed for laboratory tests and specially for outdoor applications with integrated power battery to the unit for a good autonomy.
Special diamond drill bits are suggested to avoid wear effects.

Drill Bit Rotational Speed and Penetration Rate

The rotational speed of the drill ranges from 20 to 1000 rpm, and the penetration rate from 1 to 80 mm/min.
Both rotational speed and penetration rate are controlled and maintained constant during the drilling process. This is realized by an appropriate electronic system of actuation and control.

Drill Bit Position & Starting Point

The position of the drill, referred to the surface of the stone (starting point), is always known because it is directly controlled by the software through the dedicated electronic.
The hole depth measured by the system is exactly referred to the surface of target.

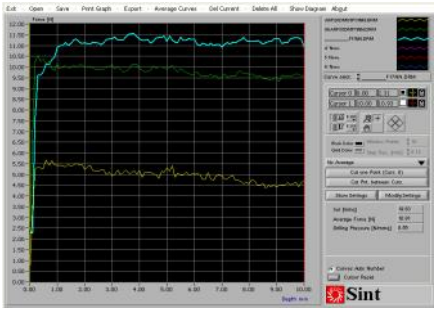
Force Measurement

The force applied to the target is measured continuously. The measurable force is comprised between 0 and 100 N.

Electronic Features

Data Acquisition Board:

- USB port connection on personal computers running Windows XP Operating System or higher
- 12 bit of resolution with PGA (Programmable Gain Amplifier).



Stepper and rotating motor control board:

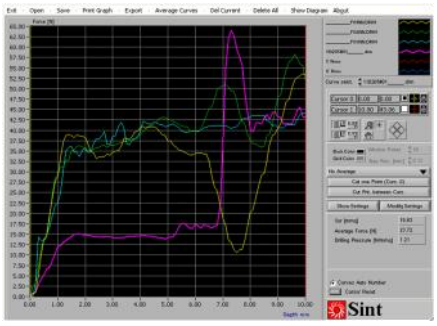
- Programmable parametric values by RS232 connection
- Constant speed PWM control
- High output current (Max 8 A)
- Encoder to control speed and position.

Precision strain gage amplifier (Gain = 100).

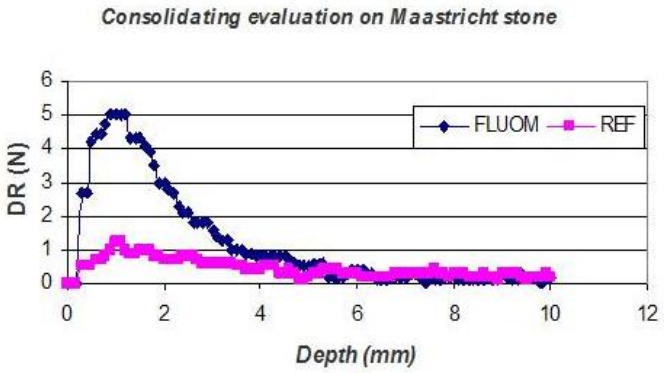
Software Features

The acquired data are transmitted, during the test, to a PC through the USB—serial data connection. The software, developed with LabVIEW™ (National Instruments), has many features related to the graphic data representation, loading and saving data files from the archive. Some important features are the following:

- Complete test management
- Graph of the force and torque against depth
- Mobile averaging of acquired data
- Possibility to show up to 6 test files together
- Possibility to calculate the average curve relative to different test
- Printing of calculated data
- Data export in text format
- Direct data input to the standard database.



Comparison of different test results

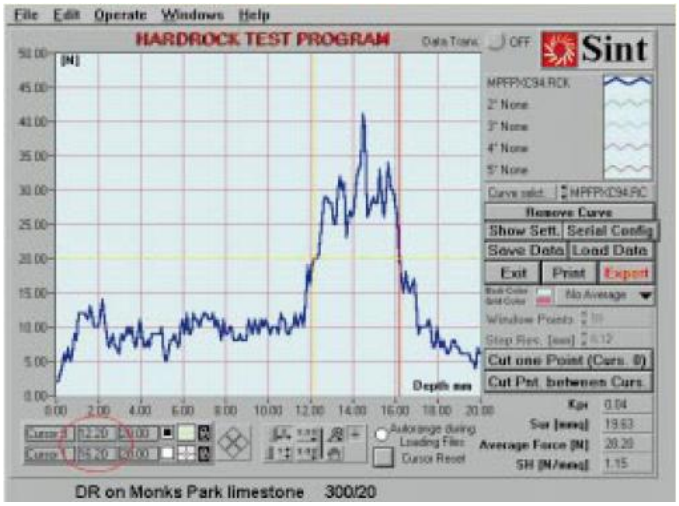


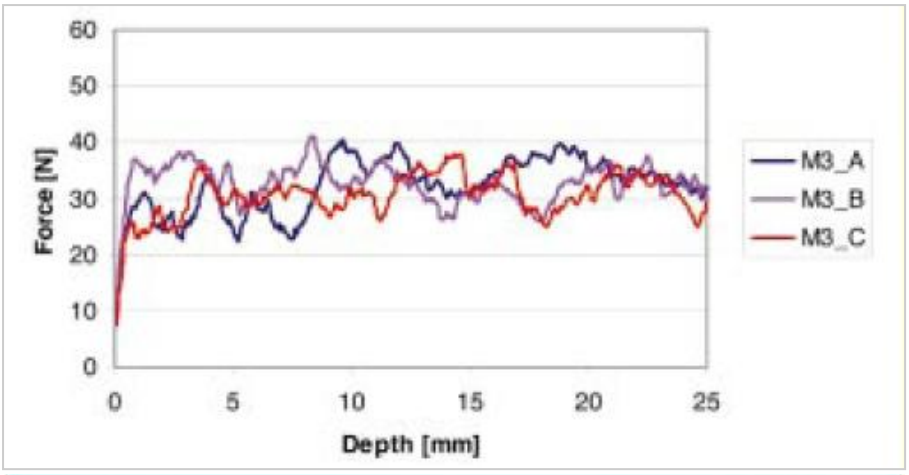
Typical test results:

The following pictures show some typical results obtained during the drilling tests on different materials. In each case a diamond drill bit with a diameter of 5 mm was used.

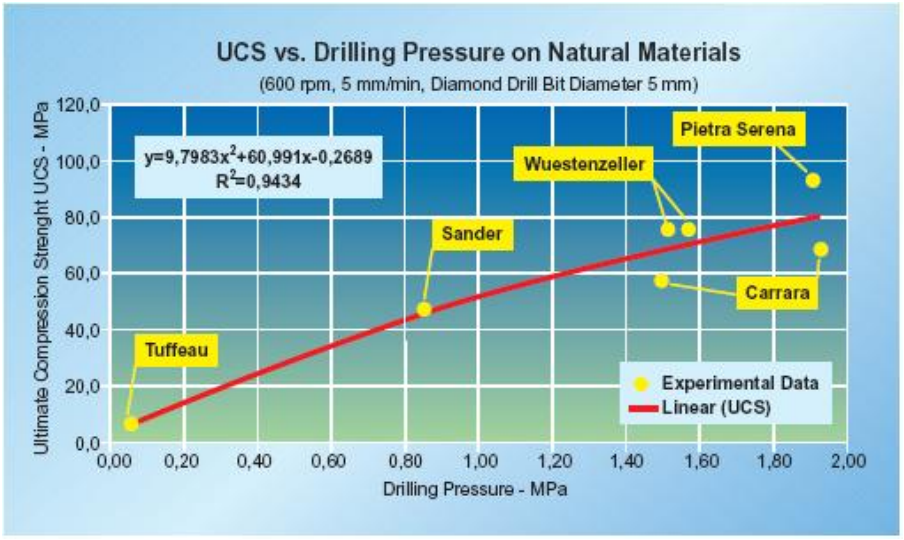
Measured Drilling Force versus Depth on Monks Park Limestone

The graph shows the sensitivity of the system and its capability to analyze any variation in the material





Measured Drilling Force versus Depth on Carrara Marble (3 holes)



Correlation between Ultimate Compressive Strenght and Drilling Pressure

Some of our works:

Drilling Resistance tests in the Santa Croce Basilica (Florence)

Heavy decayed fragment of a marble column

Tests on the Pending Tower (Pisa)

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Recognitions

SINT Technology's test laboratory is accredited to standard ISO/IEC 17025:2005 by the Italian accreditation body **ACCREDIA with certificate no. 0910**

LAB N° 0910

Certification of conformity to the requirements of standard

UNI EN ISO 9001