

■ Controls S.r.l., 20063 Cernusco, Italy

# Servohydraulic control unit for a wide range of mechanical analyses

In collaboration with several prestigious Italian research facilities, Controls S.r.l., Italy, has developed a new machine which satisfies the growing needs of modern concrete laboratories. The Adv-

vantest 9 servo-hydraulic control unit is characterised by high-performance, easy use, flexibility, precision and rapid setting.



*The Advantage 9 machine of Controls is used in the IMM (Mechanical Materials Institute) of Lugano, Switzerland five days a week, for an average of five working hours per day*

The Advantest 9 is ideal for both traditional tests, such as compression and flexure on concrete, cement, mortar, blocks, tiles and similar, and for advanced tests in load, displacement and deformation control. The mono-axial and tri-axial tests on rock core are performed with axial deformation control of the sample, submitted to an axial crushing load; in the case of tri-axial tests, a lateral confinement pressure is added, controlled by the Sercomp 7 machine (also Controls), which raises axial resistance. This makes it possible to measure the axial and transversal modules and to trace the breakage envelope.

In the following, three case studies of the use of the Advantest 9 demonstrate the flexibility and the variety of the new machine.

## **IMM (Mechanical Materials Institute), Lugano, Switzerland**

The IMM SA of Lugano, Switzerland, is a dynamic company with a young and highly skilled workforce. Set up in 1992, it has consolidated its position at international level and it has been awarded such prestigious work as the AlpTransit San Gottardo sud Project (the world's longest railway tunnel, stretching 57 km., worth approximately Swiss Francs 16 billion), for which it installed an on-site test laboratory for management of all quality tests on the construction materials.

One of the testing machines in this laboratory is the Advantest 9 machine that is used full time, five days a week, for an average of five working hours per day.

The Advantest 9 allows the IMM to conduct a wide range of mechanical analysis on samples of various kinds. Its principal characteristic is allowing dual control on the analysis being conducted: a load control, like any other machine of this kind, but also deformation control. In many cases, in fact, it is important to know not so much the breakage point of a sample, but its behaviour once it has exceeded this. It is therefore vital to be able to adjust the load applied virtually instantaneously, in order to control and monitor the breakage mode.

This machine effectively offers the possibility of controlling four different frames from the same data control panel and to investigate virtually all load ranges from fractions of N up to 4,000 kN. It is also possible to simulate mechanical ageing cycles and to characterise the materials from an elastic, plastic and viscous viewpoint.

Also fundamental for the IMM is the software provided with the equipment, which means it can be monitored from a computer rather than the control panel. Three software packages are supplied: the basic one, one for the elasticity modules and a more advanced one which allows a greater degree of freedom.

## **Lecco Regional Campus, Milan Polytechnic, Italy**

The laboratory at the Lecco Campus of Milan Polytechnic conducts compression tests on blocks, compression tests with circumferential deformation control on cylinders, indirect tensile tests on cylinders (UNI 6135), flexure tests on notched joists (UNI 1039), tests on plates (UNI 10634), elastic module tests in conformance with

the standard (UNI 6356). In the area of compression tests, a great deal of attention is focused on research, with particular reference to the degradation in mechanical resistance caused by fire damage and to compression toughness.

The laboratory of the Lecco University Campus is also very experienced in testing fibre reinforced concrete. The importance of the ductility and fracture energy tests on fibre-reinforced concrete lies in the need to characterise the material irrespective of the fibre content or the appearance ratio. This facilitates to use standard UNI-CNR DT204 for the design structures of fibre-reinforced



*In the laboratory at the Lecco Campus fibre reinforced concrete tests are performed*

concrete structures to replace standard steel reinforcement with fibres, significantly increasing the fracture energy of the material. This type of test is becoming increasingly frequent and 10,000 m<sup>2</sup> of flooring was actually installed near Lecco recently, in the town of Inverigo, requiring over 70 tests. The Advantest 9 machine of the laboratory at the Lecco University Campus proved to be a reliable machine for the necessary kind of test methods.

## **Italcementi, Brindisi, Italy**

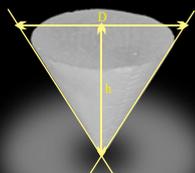
The Italcementi laboratory in Brindisi was opened in 1996, with the purpose of creating a research centre in Southern Italy, to be dedicated to the development of techniques and materials for increasing reliability and durability of large infrastructures, which could also exploit the possibility of collaboration with other research institutes in the south. The laboratory is located inside the "Cittadella della Ricerca", a consortium company inside the Brindisi Science and Technology Park, where both private and public research agencies (ENEA, CETMA, Lecce University) are present.

The laboratory is structured in terms of personnel and equipment to undertake short, medium and long-term projects, in collabora-

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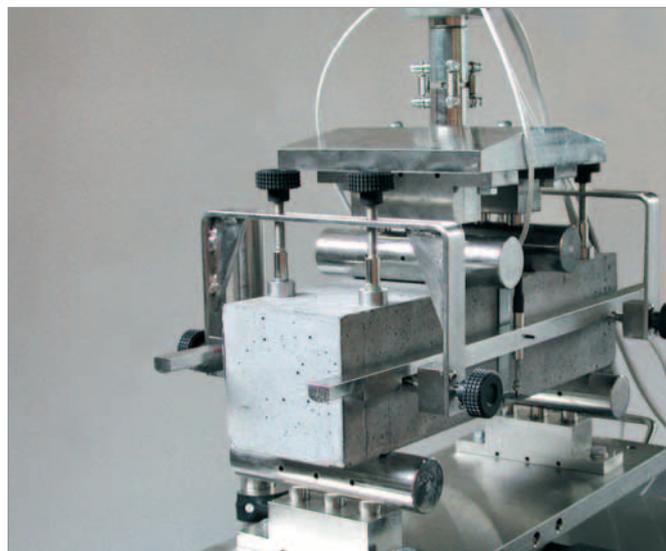


The Advantest 9 machine of Controls

tion with Centro Tecnico di Gruppo (C.T.G. s.p.a.), a company belonging to Italcementi which performs research and provides services for other Group companies. The activities of the laboratory are also directed towards supplying technical services and assistance to the company's customers, through product tests, and organising training days for both customers and for university graduates and postgraduates.

The Advantest 9 machine was purchased due to the need to adapt the system the laboratory already had. This purchase was necessary since the activities of the Research Laboratory in Brindisi had increased over the past few years and there was a growing need to characterise in greater detail the properties of the materials being developed and/or tested.

The Advantest 9 machine is therefore used for both the research conducted by the laboratory personnel and to conduct standard tests on cement-based materials (plasters, mortars and concretes).



The Italcementi laboratory uses the Advantage 9 machine for tests on cement and concrete

This is why a 3000 kN, four-column frame was acquired for tests on concrete, a 250 kN frame for tests on mortars and a 100 kN frame for flexure tests on concrete beams.

The frames and tests are managed by the Advantest 9 machine and by the connected PC. The installed software makes operations simple and effective. Very useful is the possibility of controlling the test both through the load, for performance of standard tests (compression resistance on cubes and/or cylinders, indirect tensile resistance, flexure resistance and cutting elastic module) and by controlling displacement/deformation and/or crack advance, for tests on fibre-reinforced concretes and mortars.

### Conclusion

The Advantest 9 machine offers various possibilities and in terms of cost quality, it seems to be a very profitable investment. It already proved to work precisely and reliable over time, even with intensive working conditions.

#### Further information:

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