

NASA TECH BRIEF

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Fast Semiautomatic Dimensional Test Set and Data Logger

The problem:

Dimensional verification of critical parts in an incoming inspection program sometimes can be very time consuming. One such program, the inspection and visual verification of thermal-protection ceramic tiles for a particular application, requires 20 to 30 minutes per piece to check for out-of-specification dimensions and to log the data for future reference.

The solution:

An open-loop semiautomatic system now measures and records tolerance deviations of each tile in less

than 30 seconds. The accuracy of the machine, shown in Figure 1, is ± 0.001 inch (± 0.002 cm).

How it's done:

The machine consists of an adjustable transducer array mounted above and on each side of a traveling table. As a tile passes back and forth through the array, it activates the transducers which register the measurements on a strip recorder for a permanent record and subsequent data verification. It also activates a real-time digital display for signaling out-of-tolerance tiles. The machine incorporates a

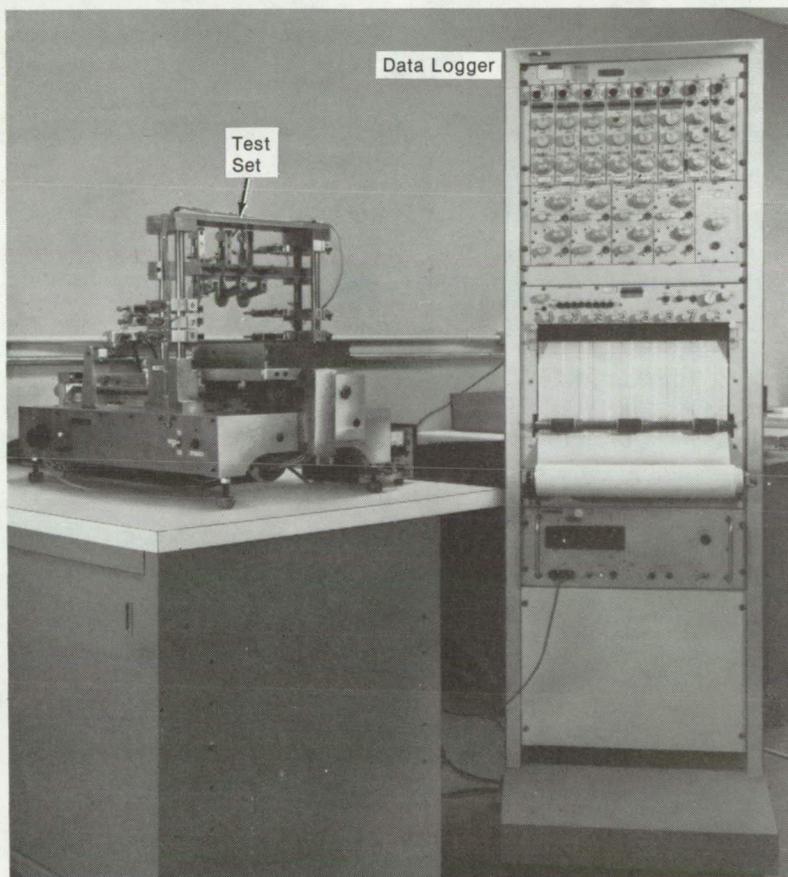


Figure 1. Semiautomatic Dimensional Data Logger/Test Set

(continued overleaf)

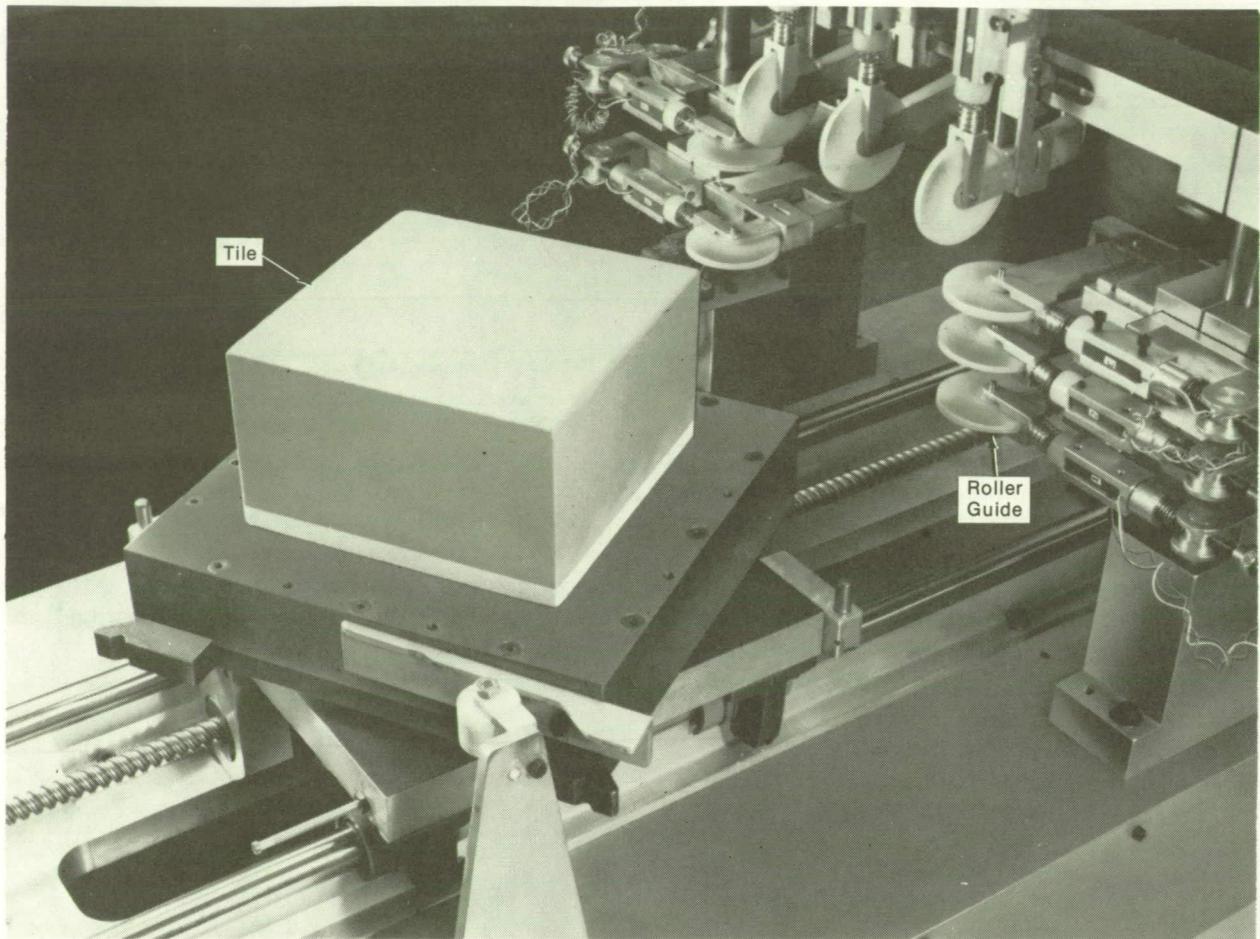


Figure 2. Tile Mounted on Test Set Transducer

specially-designed low-pressure high-volume vacuum chuck to secure the tile to the traveling table. (Commercially-available vacuum chucks are not usually designed for porous material such as these ceramic tiles.)

The table travels on two guide rods and is powered by a motor-driven jackscrew. On the first pass through the transducer array, the top and two sides of the tiles are measured. As the table ends its travel, a cam-and-switch arrangement rotates it 90° and reverses motor travel. The table recycles back through the array to measure the other two sides and the top.

Each of the nine transducers is individually adjustable; contact is made to the tile surface by nylon rollers (see Figure 2). Master calibration blocks, constructed of aluminum, adjust the array and verify dimensional accuracy outputs on the strip recorder and digital readout. Each transducer consists of a film potentiometer which converts linear motion to corresponding output voltage. The input voltage is controlled by a fine-trim potentiometer and is

adjusted to obtain 1 volt output per unit motion; i.e., 0.100 inch (0.25 cm) corresponds to 10 mV dc. The range of each transducer is 0.450 inch (1.143 cm).

Note:

Requests for further information may be directed to:

Technology Utilization Officer
 Johnson Space Center
 Code AT3
 Houston, Texas 77058
 Reference: TSP75-10322

Patent status:

NASA has decided not to apply for a patent.

Source: G. E. Meunier of
 Rockwell International Corp.
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