

Engineering Systems C53 Tablet Hardness & Compression Tester

The Engineering Systems C53 is a horizontal loading mechanical strength testing machine with a standard loading capacity of 53 kg. Easy to use, it has been specifically designed for tablet hardness testing on the factory floor. A weigh balance and / or caliper can be connected to measure tablet weight and thickness. Test results and statistic analysis data can be printed on the internal printer or displayed on a PC via a USB or RS232 interface. Optional 5 kg or 100kg load cells can be fitted to increase the resolution or extend the capacity.



Features

Whilst the C53 is designed for ease of use, a number of advanced functions make it very versatile and suitable for use in a wide range of applications including research and development. A passcode protected setup menu allows the C53 operation to be fully customised to cater for all uses. The setup menu also allows settings such as test speed and displayed units to be changed.

Principle features:

- Automatic sizing of new batches of specimens or tablets
- Maximum load (Hardness) 53 kg with a resolution down to 1 gram with optional 5kg load cell
- Weigh balance & Calliper interfaces for weight & thickness measurement
- 20x4 character LCD displaying load, weight, thickness, tablet count & other information
- USB and RS232 interfaces are provided as standard
- Interface for optional QWERTY keyboard giving access to advanced functions & setup menus
- Integral 30 Column printer with easy to change paper roll
- Statistical analysis including Min, Max, Mean & Standard Deviation with time & date stamp
- A choice of 5 test speeds: 4, 6, 10, 16 or 30 mm/min
- Choice of units: kg, kp, N, lb.
- Maximum specimen size 36mm.
- Test started by Test Button or Safety Guard
- Fully portable (weighs only 8.5 kg)

Advanced Features:

- Fracture detect point adjustable from 30 - 90%
- Batch mode: Automatic statistical analysis after a set number of tests
- Measurement of tablet diameter during automatic sizing routine
- Batch details entry using QWERTY keyboard after automatic sizing routine
- Passcode protected calibration routine including calibration certificate printing & restoration of previous calibration values
- Adjustable power-down time of LCD backlight to save power
- Firmware upgradeable via USB or RS232 interfaces
- Storage & recall of test results via future firmware update
- Statistical analysis of weight & thickness via future firmware update

Operation

In use the tablet is placed in the loading area between two jaws (platen and plunger). The left hand stationary platen is attached to a precision strain gauged load cell. The right hand plunger is motorised and crushes the tablet between the jaws. Tablet fracture is

automatically detected and the fracture load (hardness) is displayed on the LCD.

Meanwhile the plunger returns to its preset position ready for another test and the internal printer prints the hardness, along with the weight and thickness if a weigh balance and / or calliper are connected. Results are also displayed on a connected PC if desired. The tablet fragments are collected in a tray situated underneath the loading platform. When testing of the batch is complete the STATISTICS button can be pressed to print statistical data for the batch.

New tablet sizes are set by pressing the NEW SIZE button, inserting a tablet, and then pressing the TEST button. The new size is automatically detected and the machine is ready to test the new batch. If desired the tablet diameter is measured and printed, along with product details & operator ID.

The plunger operates at two speeds, test speed and full speed. Test speed is adjustable and can be set between 4 and 30mm/min. Full speed is approx. 130mm/min. When testing, full forward speed is applied to the plunger until the tablet diameter is reached, test speed is then applied until tablet fracture is detected, full reverse speed is then applied to the plunger and it returns to its preset position. If desired the test can be started by closing the safety guard rather than pressing the TEST button.

Results Output & Statistical Analysis

After each test is complete the test results are printed on the internal printer and sent to the USB or RS232 port. If a weigh balance and / or calliper are connected weight and thickness are printed along with the hardness, as shown in the example on the right.

If required the results of the last test can be cancelled. This erases the results for the last test, the next test then replacing these results. In the example here the third result was cancelled.

When a batch is complete statistics can be calculated. Min, Max, Mean & Sample Standard Deviation can be printed for the current batch, along with the batch number & size and a time / date stamp. Again the statistics are also sent to the USB / RS232 interface.

Tab No.	Weight (mg)	Thick (mm)	Hard (kg)
1	379	4.73	1.04
2	381	4.74	1.63
3	380	4.74	1.82
LAST RESULT CANCELLED			
3	378	4.71	1.43
4	380	4.72	1.86

BATCH STATISTICS			

Batch No: 3			
Batch Size: 4			
Min: 1.04 kg			
Max: 1.86 kg			
Mean: 1.49 kg			
Std Dev: 0.34			
Time: 15:10 TUE 12/09/06			
Calibration No: 0004			

Load Cell Options

For very low load tests, a 5 kg load cell is available. The resolution is 1g and the minimum peak detect load is 0.03 kg. Alternatively a 100 kg load cell can be fitted to increase the capacity of the machine, giving a resolution of 20g and a minimum peak detect load of 0.6 kg.

Calibrating the C53

Absolute calibration is easily carried out by dead weight loading. Using a purpose designed calibration cradle the machine is placed on its left hand side near to the edge of the bench. A hanger, specially shaped to clear the machine casing and bench, is placed onto the loading platform to enable deadweight loading to be achieved.

A passcode protected calibration routine guides users through the calibration procedure and prints a calibration certificate using the internal printer. Previous calibrations can be restored in case the machine is



calibrated accidentally, and a calibration number is printed on statistical analysis data to check the correct calibration values are in use.

Additional Information

The C53 was introduced in 2006 as a 'factory floor' tablet hardness testing machine and undergoes continual development. It is designed to provide a strong, robust and compact mechanical strength testing machine which is conservatively rated on performance. The precision made mechanical loading system loads the specimen (tablet) at a constant speed regardless of applied load.

The C53 has been designed with reliability and ease of maintenance in mind. Internal connectors are kept to a minimum and circuitry is included to protect the machine from overload and over-travel. During a test the loading plunger will automatically reverse and the test will be cancelled should the load cell be overloaded or if the plunger has travelled too far.

The integral printer is flush mounted on the front panel of the main casing and the paper roll can be easily changed via a door in the base of the machine.

The operating firmware in the machine can be updated using a PC via either the USB or RS232 interface. Specific customer requirements such as special test or statistics routines or output formats can be accommodated through custom written firmware.

During a test, fracture is detected when the instantaneous load detected by the load cell falls to a set % of the maximum (peak) load which has been reached during a particular test. This is typically set to 70% but can be changed if the tablet or specimen characteristics are unusual. The fracture detect point can be selected via the set-up menu between 10 and 90%.

Standard Specifications:

- **Choice of 4 output units:** Kilogram (kg), Kilopond (kp), Newton (N) or Pound (lb)
- **Maximum loads (Hardness):** 53 kg, 53 kp, 520 N or 116 lb respectively
- **Linearity:** Better than +/- 0.2% of FSR. Typically +/- 0.05% of FSR
- **Load resolutions:** 0.01 kg, 0.01 kp, 0.1 N or 0.01 lb respectively
- **Minimum detectable fracture load:** 0.3 kg
- **Load indication:** 20x4 character LCD display, internal printer, USB & RS232 interfaces
- **Choice of 5 test speeds:** 4, 6, 10, 16, 30 mm/min
- **Fast forward and fast return speed:** 130 mm/min
- **Maximum specimen (tablet) diameter:** 36 mm
- **Calibration:** Dead weights in kg.
- **Power requirements:** 110/120 VAC 2.0A or 220/240 VAC 1.0A (external selection via fuse holder)
- **Machine dimensions:** Width 283 mm, Depth 235 mm, Height 160 mm
- **Machine weight:** 8.5 kg
- **Shipping size:** 360 mm x 360 mm x 260 mm
- **Shipping weight:** 11 kg

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