

Internal Bond Tester

(Scott Method)



Scott Test Method:

Test specimens are built, from bottom to top, consisting of: a) stainless steel sample base. b) layer of double-sided tape, c) the paper or board sample, d) layer of double-sided tape, and e) an aluminum angle. Five samples are pressed simultaneously with individual hydraulic cylinders in the Accupress to ensure consistent adhesion within the specimen "sandwich". The samples are cut apart, clamped to a stage and ruptured individually by impacting the aluminum angle with a calibrated pendulum. As shown in the photographs below, the angle rotates rapidly with the impact, splitting the paper or board specimen in the Z-direction. The microcomputer displays the energy absorbed in rupturing the specimen.



The Concept

The Huygen Internal Bond Tester uses the Scott method to produce a high speed Z-direction rupture of paper and paperboard. It is a dynamic test that measures and defines strength in terms of energy absorption.

Correlation with printing and converting failures due to impulses, impacts and shocks is usually excellent. While static/dead-weight tests, such as tensile and Z-direction tensile., focus on the ultimate yield value of a sample the Internal Bond test responds to the semi-elastic nature and behavior of paper and board. Materials that are somewhat elastic and "give" during rupture absorb more energy and exhibit "stronger" behavior in real-world situations.

A key element of this dynamic test is speed: at the beginning of the specimen rupture, the falling pendulum is moving at a speed more than 6500 times as fast as the relative jaw movement of a tensile tester. This produces correlation with many printing and converting failures that typically occur in fractions of a second.

Sequential Photographs



Applications

From its inception, the Scott Internal Bond Tester has been used to monitor the effects of dry strength additives and to evaluate stock preparation and refining. In recent years, applications have expanded to include prediction of blistering for coated web offset grades, picking, manufacturer's flap failures, delaminations, ply separations and "shock induced" failures encountered in paper and board converting operations. The common denominator is that these are high speed phenomena/failures that occur in milliseconds.

In addition to correlations with customer complaints, in-mill processing trouble-spots are of growing interest. Examples of dry-end analysis are monitoring Z-direction strength deterioration due to calendering or the application of relatively brittle coatings.

The increasing use of recycled fiber and dry strength additives in both paper and board open even more applications and create economic value for the test today. At the product research and development level, sequential photographs of the ruptures can further enhance analysis and understanding.

New Design Enhances Performance

- New AV-3 Microcomputer displays test results, statistical data and provides an RS 232C computer output.
- Solid stainless steel pendulum provides ranges of 0-347 x 10³ ft. lbs./in² or 0-729 J/m².
- **Pneumatic/hydraulic sample press** with individual cylinders insures exact control and equalization of the clamping force on each specimen.
- Electronically controlled press time.
- Magnetic pendulum release for positive positioning and repeatable drops.
- Canted, heavy pedestal with improved bearings, designed to also accept new high range pendulum.
- Push button, pneumatic sample clamping for operator speed and convenience.
- Side knife-guides for easier and accurate sample preparation.
- Clutched, gear-driven tape dispenser to reduce release paper "walk".
- Calibration weight set and slide to verify day-to-day and lab to lab performance.

These sequential photographs illustrate that sample rupture is purely Z-directional, without measurable shearing action. The rupture occurred in less than eight milliseconds. Note the explosion of recycled fibers in the last photo.



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Internal Bond Tester



Specifications – Model 1314

0-347 x 10 ⁻³ ft. lbs./sq. in. or 0-729 Joules/m2 (specify with order)
See technical note #1314-94 for range and availability
$3^{1/_2}$ LED digits controlled by AV-3 Microcomputer
RS 232C
0.1°
±2 English Units as determined by calibration test weights
3% with calibrated, solid stainless steel pendulum
Master pendulum and master weight sets at Huygen Corporation
Adjustable: 5 individual hydraulic cylinders driven by pneumatic multiplier
Electronic: adjusted at factory for 3.0 seconds
1.0 inch x 1.0 inch - 5 each
Magnetic
Pneumatic, push button
Average, standard deviation, sample delete, calibrate function (all switch actuated)
Electrical, locking, accessible from front panel
50 psi, 35 cubic inches per press cycle
120 volts \pm 10%/60Hz @ 3 amps 240 volts \pm 10%/50 Hz (specify with order)
5 minutes
24"W x 16"D x 22"H
a) Net 74 lbs. b) Shipping 82 lbs.
29"W x 19"D x 26"H (carton)

Standard/Recommended Operating Procedures

Таре	3M Type 410, Double Sided , 1.0 inch wide
Clamp Pressure	100 ± 2 psi
Clamp Time	3.0 seconds
Sample Cutter	Type 1460: 1 x 7 inch, punch and die (recommended optional item)

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