

# HANATEK

## Crease and Board Stiffness Tester



### CBT3 OPERATING MANUAL (Obsolete Product)

Replaced by: <http://www.hanatekinstruments.com/Carion-Force-Analyser.html>

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# The Hanatek Crease and Board Stiffness Tester

## 1 Introducing your new Crease and Board Stiffness Tester

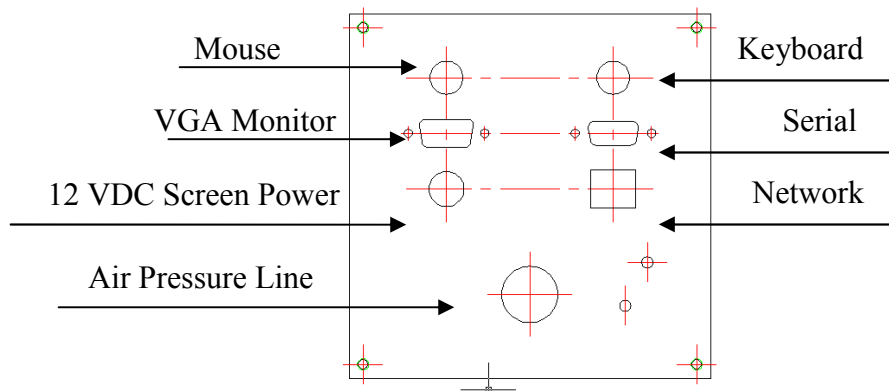
The Crease and Board Stiffness Tester measures the force required to bend a creased sample to a maximum of 170°, or a sample bent through 7.5° to a maximum of 15°.

The results are recorded through every angle of the test and are displayed on the screen when the test is completed.

### Parameter Options

<b>Parameter</b>	<b>Unit</b>	<b>Min</b>	<b>Max</b>	<b>Resolution</b>
<i>Crease Angle</i>	Degrees	1	130	5
<i>Crease Speed</i>	°/sec	5	360	5
<i>Crease Settling Time</i>	Second	0	99	0.1
<i>Board Angle</i>	Degrees	3	25	0.5
<i>Board Speed</i>	°/sec	1	5	0.5
<i>Board Settling Time</i>	Second	0	99	0.1
<i>Rev-Crease Angle</i>	Degrees	-1	-90	5
<i>Rev-Crease Speed</i>	°/sec	5	360	5
<i>Rev-Crease Settling Time</i>	Second	0	99	0.1

## 2 Installation



**Figure 1 - Back Panel**

Connect the Monitor, 12 VDC Screen Power and Serial for the LCD Display and the Air Pressure Line for the pneumatics as shown in figure 1.

To operate, the instrument requires connection to a 110 V - 240 V AC supply via the plug at the rear of the instrument. The instrument is protected by a 3.15 A fuse adjacent to the socket.

The ON/OFF switch and its associated indicator lamp are found on the right of the front panel.

At the beginning of every test the equipment is automatically zeroed. The jaw's initial start position is before the zero degree mark, this compensates for any curvature in the sample as the zero start position will not be set until the sample makes contact with the blade. This will guarantee that the sample will go through the desired angle range.

The sample for testing may now be inserted in the clamp; the clamp is opened and closed by means of the pneumatic system, which is controlled by the green switch on the left of the front panel. Further details of setting up samples in the clamps are given later in the text. Now you are ready to choose your desired options and run the test.

Note that the force on the load bar should NEVER exceed 500 grammes (g), or the Load Cell could be damaged.

### 3 Login

The Touch Screen automatically uses Upper Case but if using a separate keyboard, Upper Case must be selected.

The CBT3 software is divided into 3 different levels of security :

- ◆ **Level 1** : Supervisor , Full Access
  - Edit User
  - Edit Pre-Set Test
  - Run a manual and Pre-Set Test
  - Diagnostic
- ◆ **Level 2** : Technician
  - Run a manual and Pre-Set Test
  - Diagnostic
- ◆ **Level 3** : Line Operator
  - Run a Pre-Set Test

Users and Tests **can only be** set up by someone with Level 1 security. Users cannot sign on before they have been set up.

#### 3.1 Initial Sign on by Level 1 security user

After selecting start, you will see the User Sign on screen.



**Figure 2**

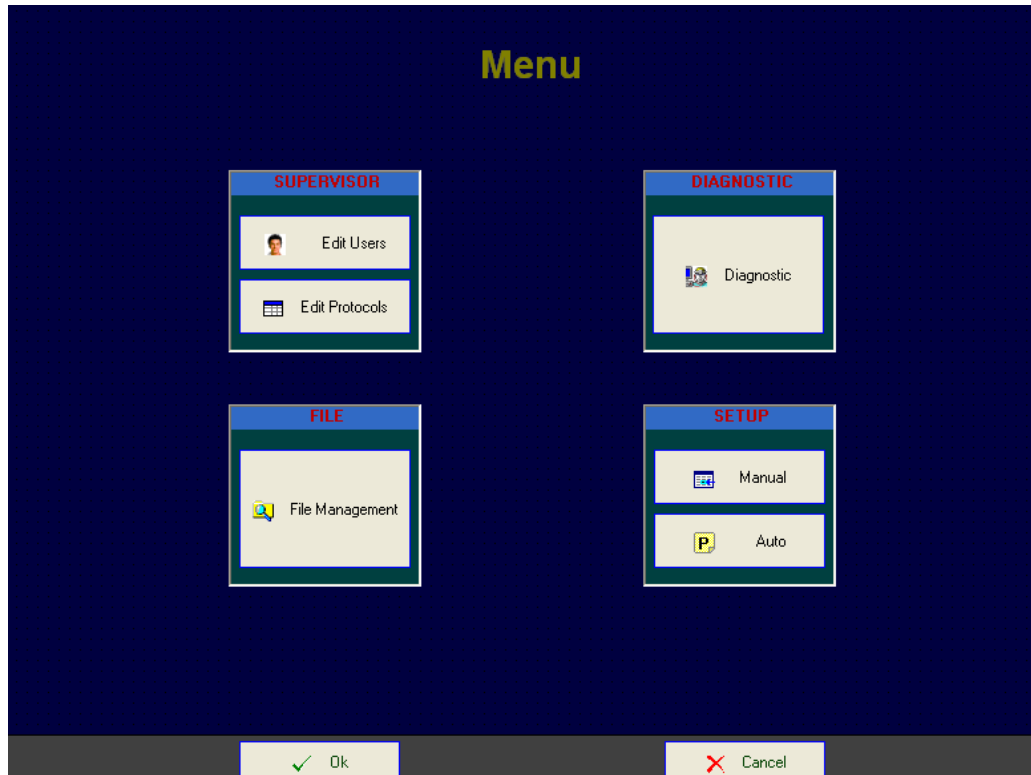
A user name and password is supplied with the initial paperwork to enable a Level 1 User to sign on for the first time.

**It is essential to keep these sign on details as they will be required if all users are inadvertently deleted.**

Once signed on, the “supervisor” will have access to the Main Menu.

## 4 Main Menu

According to your level of security, some access will be restricted and will be indicated by a button with a grey background.



**Figure 3**

## 5 Edit Users – use UPPER CASE for entry

The Edit Users interface manages the entry of New Users and in addition, amendments and deletions of existing users.

The Touch Screen automatically uses Upper Case but if using a separate keyboard, Upper Case must be selected.



Figure 4

### a) Adding a new User

To add a new user select the “Edit Users” button and select the “Add User” button. Complete the following:

- Forename
- Surname
- UserName Used to login and search user
- Access 3 levels of security : Supervisor, Technician and Line operator

Select “Save User” to save the new user details.

Users will be stored in files within the on-board hard disk. They may be copied across the network for backup purposes.

**NB, When the user signs on for the first time, they must use their user name and the password HANATEK. They will then be asked to change their password to a personal one. They must then sign on with their new personal password.**

## b) Database

You can search for a user in the database using the search engine. Type the name of the user and select the find button (binoculars icon).

If you do not know the user name you can use the forward and backward navigation buttons and see users one by one.

To delete a user, make sure that the required user is currently displayed and press the "Delete User" button.

## c) Command Buttons

- Back: Returns you to the Main Menu.
- Print : Prints the list of all users present in the database.

## 6 Edit Protocols – available to level 1 security access only

### Setup Tests

Protocols are a series of tests that can be defined to make the testing procedure as automatic as possible.

Protocols will be stored in files within the on-board hard disk. They may be copied across the network for backup purposes.

All Protocols are saved in the database in alphabetical order.



Figure 5



## Protocol configuration

Each Protocol will contain the following:

- *Protocol Name:* Determined and input by user
- *Set Up By:* Automatically populated with currently signed on user
- *Test Direction:* Toggle between “Machine or Cross” using drop down menu
- *Auto Advance:* Automatically populated with Yes
- *Unit:* Choose between 4 different units : g, mN, g.cm and mN.cm
- *Number of Tests:* Enter required number of tests
- *Angle:* Enter required angle for test
- *Rotation Speed:* Rotation Speed is the speed at which the jaw rotates. Enter required Rotation Speed
- *Settling Time:* Settling time is the delay before reading the load cell value. Enter required Settling Time
- *Blade position:* Determines the distance between the jaw and the blade. Values available are: 10, 20, 30, 40 and 50 for Stiffness tests and 10 only for Crease tests

To set up “Auto” tests (Tests) for operators to use, select the “Add” button, complete all the above fields and select “Save”. Repeat for each desired series of Protocols.

**It is important to give the protocol an appropriate name so that the operator can identify the correct test i.e. MDC3MDS3 (machine direction Crease x 3 tests machine direction Stiffness x 3 tests)**

These Tests will then be available for any operator to access via the “Auto” button in the Main Menu.

The maximum number of test types is 6:

- Machine Direction Stiffness Test - MD ST
- Cross Direction Stiffness Test - CD ST
- Machine Direction Crease Test - MD CT
- Cross Direction Crease Test - CD CT
- Machine Direction Flap Opening Force Test – MD FT
- Cross Direction Flap Opening Force Test – CD FT

b) Test Parameters

<b>Parameter</b>	<b>Unit</b>	<b>Min</b>	<b>Max</b>	<b>Resolution</b>
<i>Crease Angle</i>	Degrees	1	170	5
<i>Crease Speed</i>	°/sec	5	360	5
<i>Crease Settling Time</i>	Second	0	99	0.1
<i>Stiffness Angle</i>	Degrees	3	15	0.5
<i>Stiffness Speed</i>	°/sec	1	5	0.5
<i>Stiffness Settling Time</i>	Second	0	99	0.1
<i>Rev-Flap Angle</i>	Degrees	-1	-90	5
<i>Rev-Flap Speed</i>	°/sec	5	360	5
<i>Rev-Flap Settling Time</i>	Second	0	99	0.1
<b><i>Carton Opening Force Angle</i></b>	<b>????</b>			
<b><i>Carton Opening Force Speed</i></b>				
<b><i>Carton Opening Force Settling Time</i></b>				

c) Database buttons

- *Delete:* Deletes the displayed Test from the Test database
- *Amend:* Allows you to amend an existing Test. To amend, display the required Test and press amend
- *Save:* Saves amended or new Tests
- *Search :* You can search a Test in the database using the search engine. Type the name of the Test and press the “Find” button (binoculars icon).
- *Navigation::*
  - ( |< ) button sends you to the first Test saved in the Test database.
  - ( > ) button allows you to see the next Test in the Test database.
  - ( < ) button allows you to see the previous Test in the Test database.
  - ( >| ) button sends you to the last Test saved in the Test database.

## 7 Identifying the grain direction of carton board

Board is manufactured in a continuous strip. The direction in which it moves through the board-making machine is known as the machine direction (MD).

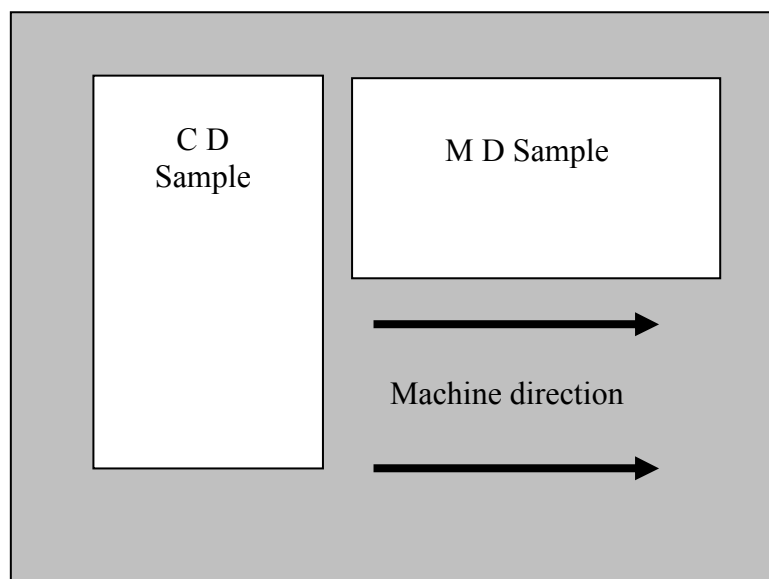
Board is less stiff when bent in the machine direction (i.e. along the grain). The opposite direction, (across the grain) is known as the Cross Direction and the sample will feel stiffer (harder to bend) if gently bent in this direction.

The machine direction of board may be identified by flexing a square sample of the board by holding first one pair of opposite sides, then the other. The board will feel stiffer when the machine direction runs from left to right.

The stiffness tester is used to measure the force required to bend board in both Machine and Cross directions.

## 8 Preparing samples for Board Stiffness measurement

The required size of board sample for measuring board stiffness is 70mm x 38mm. Samples should be cut for Machine and Cross direction tests as indicated in figure 2.



**Figure 6 – Stiffness Test Sample**

### a) Cutting Machine Direction Samples for Stiffness Tests

Place the board in the cutter with its MD running parallel with the cutter handle. The edge of the board must be against the stops at the hinged end of the cutter. Cut samples as required.

## b) Cutting Cross Direction Samples for Stiffness Tests

Place the board in the cutter with its MD running 90° to the cutter handle. The edge of the board must be against the stops at the hinged end of the cutter. Cut samples as required

A number of samples should be tested in each direction and an average figure for board stiffness will be calculated. The larger the number of samples, the more accurate the result. Ten samples per direction should give adequate accuracy, though some formal testing standards require a higher number.

To avoid confusion it is helpful to label the samples MD or CD after cutting.

## 9 Preparing samples for Crease measurement

**It is very important when cutting samples for Crease tests that the crease is not folded or bent before the test.**

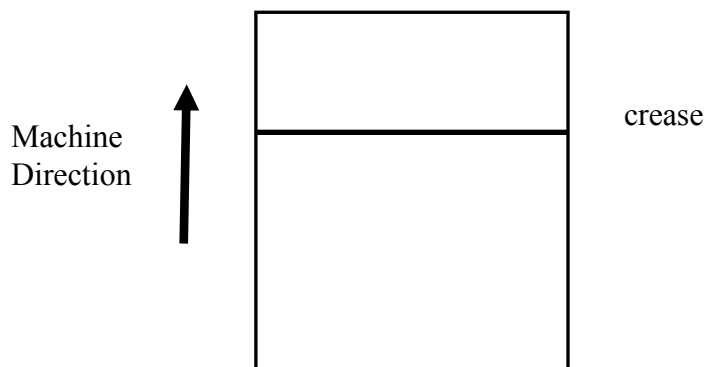
The sample cutter used for cutting Stiffness samples may also be used for cutting the Crease samples, although extra operations are required.

Crease tests sample dimensions are 38mm x 38mm.

Using board with a Crease, identify the Machine and Cross directions.

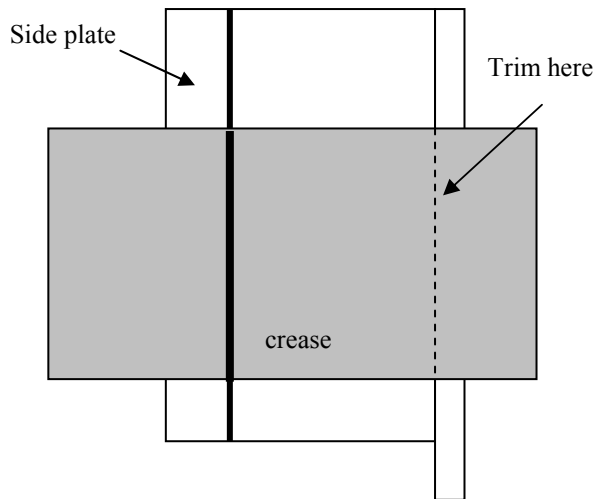
## c) Cutting Machine Direction Samples for Crease Tests

- I. Place the board in the cutter with its MD running parallel with the cutter handle and the Crease at 90° to the handle (figure 3). The edge of the board must be against the stops at the hinged end of the cutter. Cut required number of samples.

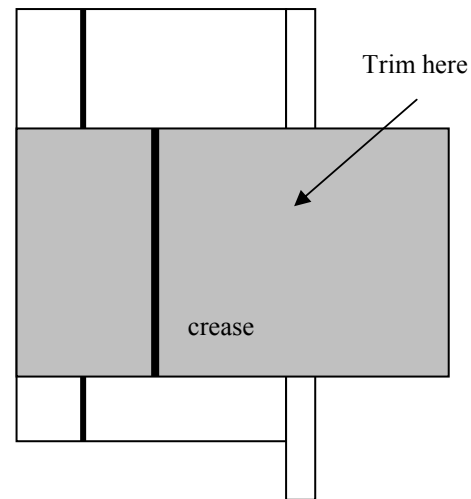


**Figure 7**

- II. Place the long edge of the cut sample against the stops at the hinged end of the cutter and line the Crease up with the line on the side plate of the cutter (figure 4). Trim sample.
- III. Rotate the sample through 180° and place it against the stops at the hinged end of the cutter with the left edge of the sample alongside the left edge of the cutter (figure 5). Trim sample.



**Figure 8**



**Figure 9**

The sample is now ready for testing. Its final dimensions are 38mm square and the Crease will be 25mm from one side.

A minimum of five test pieces is required to obtain a realistic value for the stiffness of a crease. It may be necessary to regard cartons from different die stations as separate samples.

## 10 Explanation of Stiffness Testing

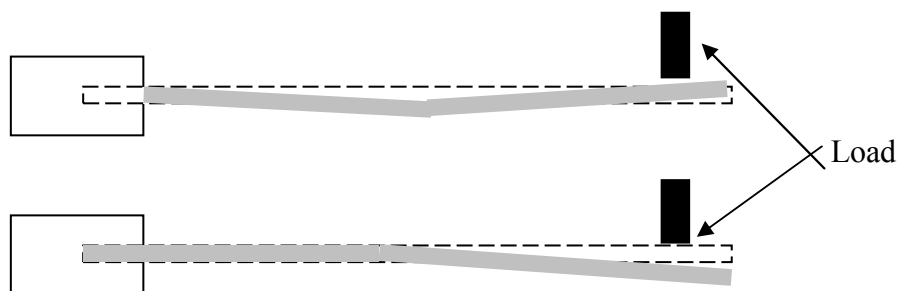
Board Stiffness is measured on a sample 70 mm x 38 mm in size, as cut on the first operation of the cutter. Ten samples or more will be tested in each direction to obtain an accurate measure of board stiffness.

Board does not have to be bent through  $90^\circ$ , as crease does, so the stiffness is tested with a much smaller bend of only a max of  $15^\circ$ .

Board stiffness differs slightly according to whether it is tested with the liner on the side touching the load bar, or on the other side, so at least five samples must be tested with the liner on the inside, facing the load bar, and five with the liner on the outside.

Sometimes board is curled. According to which way it is curled, one of two things may happen. Look at Diagram 5. It shows that if the board is curled towards the load bar, it will push on it before the clamp is swivelled, and this extra force will give an inaccurate result.

Alternatively, the board may curl away from the load bar as in Diagram 5B, so that it does not touch it. Then, when the clamp is swivelled, the board will be bent through less than  $15^\circ$ , and again the result will be incorrect.



**Figure 10**

If either of these things happen, the CBT3 will be able to account for this.

## 11 Testing Procedures

1. Switch on the CBT3 (red button on front panel) .
2. The CBT3 software is automatically loaded when you switch on the
3. instrument.
4. Allow 10 minutes for the instrument to warm up. Once warmed up, select "Start"

### 11.1 Crease & Reverse Flap Testing

7.1.1 **For Crease Test** turn Limiting Dial on jaw until the 2 limiting pins (which can be seen inside the sample slot) **do not** protrude inside the jaw. Insert sample fully in the jaw with the **wrong** side facing operator and the crease just protruding out of the jaw. Clamp the sample by pressing the green button on the front panel of the machine.

11.1.2 **For Reverse Flap** (Reverse Crease) Tests, ensure that the 2 limiting pins **do not** protrude inside the jaw. Insert sample fully in the jaw with the **right** side facing operator and the crease just protruding out of the jaw. Clamp the sample by pressing the green button on the front of the panel machine.

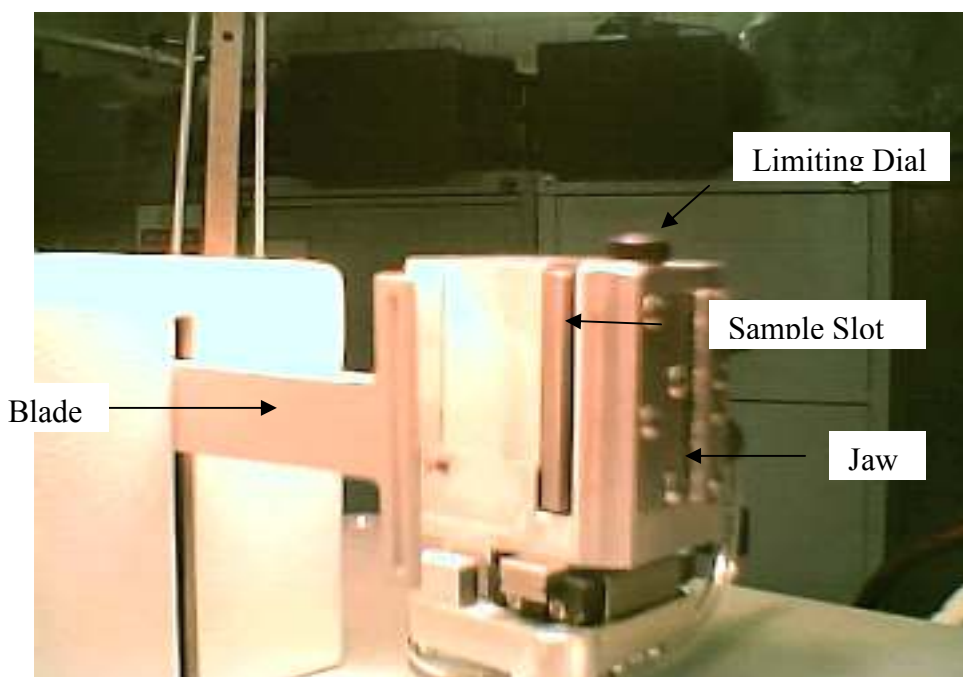
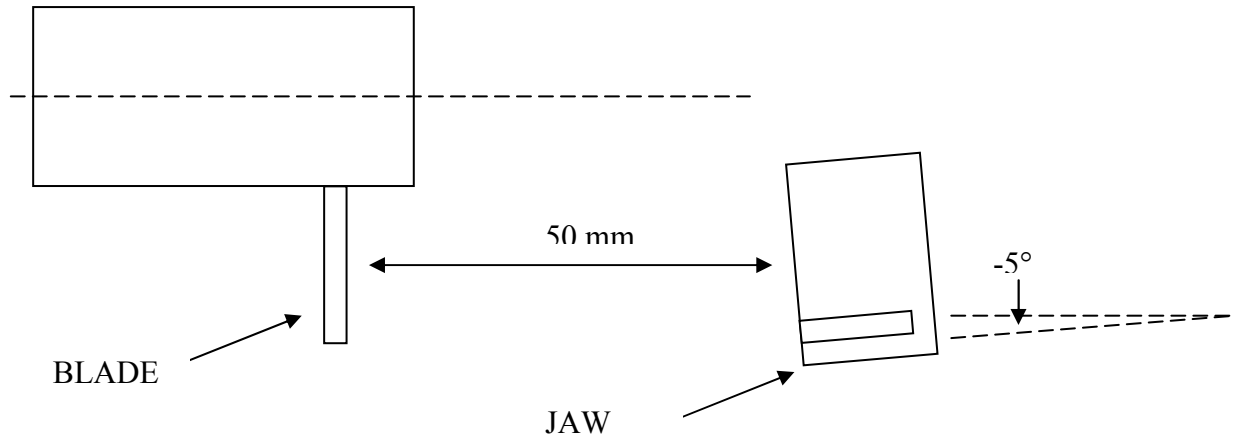


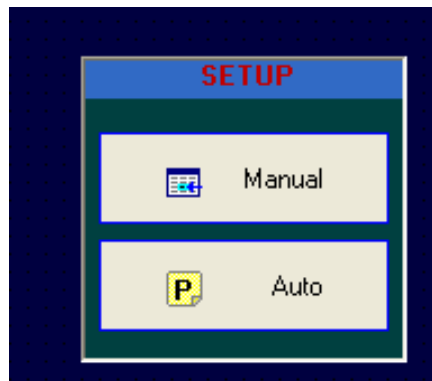
Figure 11

The following diagram shows the standard start position of a test; the blade is approximately 50 mm away from the jaw and the jaw is in the -5° position



**Figure 12**

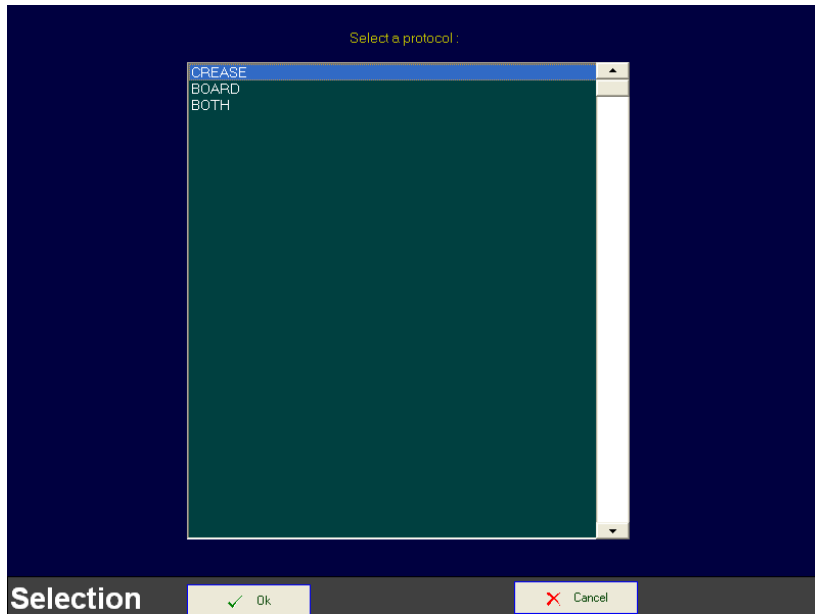
11.1.3 From Main Menu select "Auto" .



**Figure 13**



A screen will be displayed showing a list of Tests set up by the Level 1 Security user. Select the Test you would like to run and press “OK”.



**Figure 14**

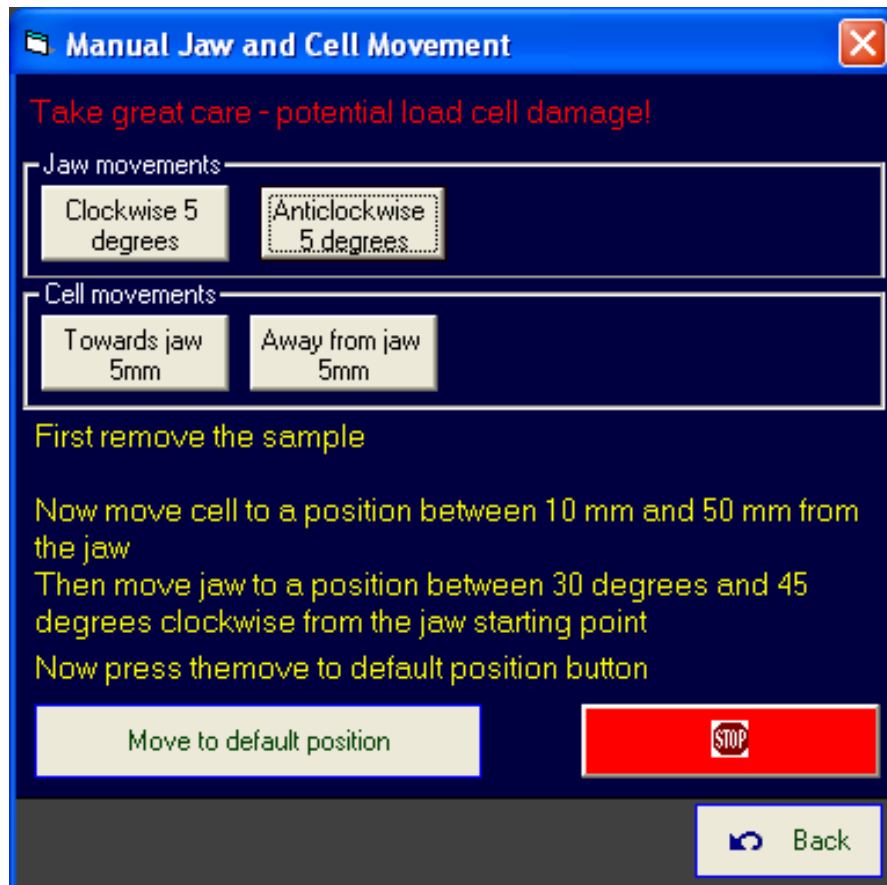
The parameters of the test will then be displayed.



**Figure 15**

If the incorrect Test is displayed, select “cancel” and return to “Auto” and select the correct test. If the correct Test is displayed, select “Run” to start a test.

When a test is started you are prompted to confirm that the blade and jaw are in the standard start position; blade 50mm away from the jaw and the jaw at -5° as per figure 12. If this is **not** the case, click NO and the following form is displayed to enable you to reset the position.



**Figure 16**

- 11.1.4 Follow the on screen instructions to reset the blade and the jaw to the default positions.
- 11.1.5 Once in the default position, return to test screen
- 11.1.6 Run Test
- 11.1.7 If tested OK, click OK (this may be hidden but is available if you hover over the left area of the message), change sample and run next test.
- 11.1.8 Repeat with the remaining samples.
- 11.1.9 When testing of each test type is complete, the graph button will be available.
- 11.1.10 View graph & data by toggling between the data and graph buttons
- 11.1.11 Run other test types by selecting the “Next” button but be aware that samples need to be placed in the jaw in different ways.

## 11.2 Testing Procedure for Board Stiffness

Testing is carried out in exactly the same way as for Crease/Reverse Flap testing except for inserting the sample.

11.2.1 Turn Limiting Dial on jaw until the 2 limiting pins protrude **inside** the jaw. This will stop the sample from reaching the back of the jaw. Insert sample lengthwise, with either right or wrong side facing operator.

11.2.2 Follow the testing instructions as for Crease Testing from points 11.1.1 to 11.1.11

## 12 Interpretation of results

The measurement of board stiffness is made on the Pira Crease and Board Stiffness Tester, generally as required by BS3748: 1964. The British Standard covering the measurement of crease stiffness is BS 6965 Part 1.

The quality of a crease for machine packing can initially be assessed by its appearance. Cracking of the liner or back of the board are obvious defects. An irregular crumpled appearance of the rib on the inside of the fold can also indicate a potentially unsatisfactory crease in carton erection and closure.

Even without these visual defects, creases can be too stiff for successful carton performance on the packing line. Studies by Pira and other Institutes have shown that the critical factor is the ratio of crease stiffness to board stiffness, both measurements being made in the same grain direction of the board.

Pira packaging line studies have shown that successful carton performance can be anticipated if this ratio of crease/board stiffness is in this range when measurements in g.cm and g are taken directly from the display.

Machine direction	1.5 to 3
Cross direction	3 to 7

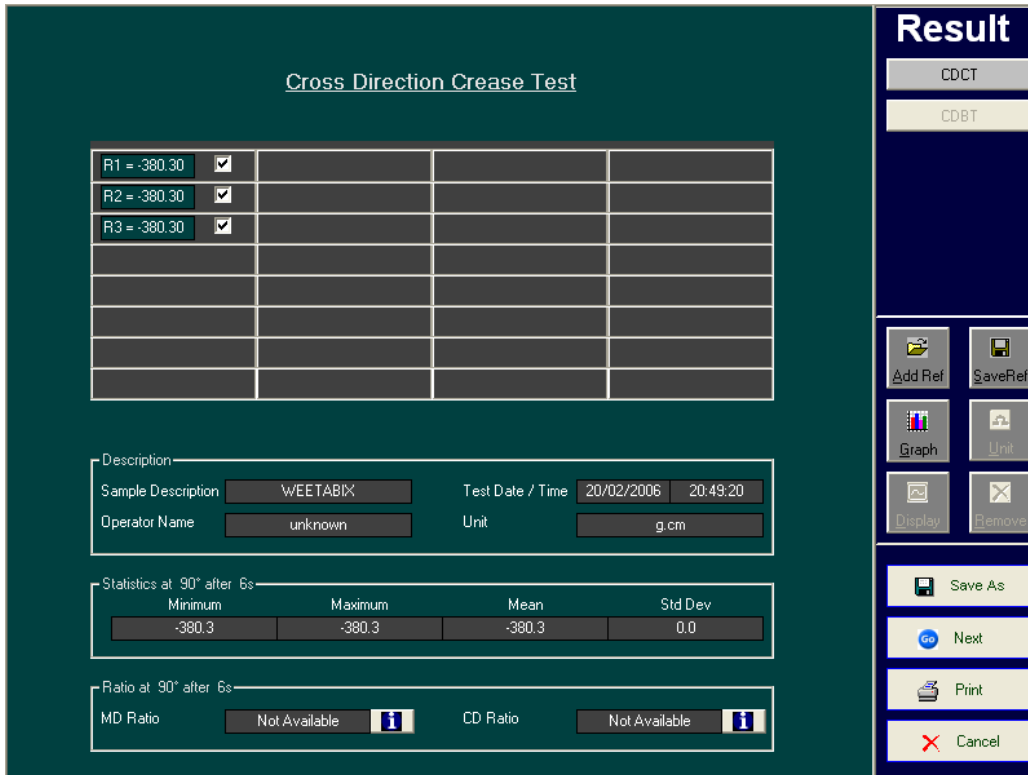
Packaging machine trials will enable suitable ranges for this ratio to be determined in other situations.

Both board and crease stiffness will change with variations in moisture content. Standard tests are conducted at 23°C. 50% rh. Board in equilibrium with high humidity must be expected to give lower readings.

Should it be necessary to reduce crease stiffness for a particular board, then an optimum crease width should be selected which avoids visual defects in the folds. At this groove width, deeper impressions will reduce crease stiffness.

## 13 Results

Once all tests are complete, select “Graph” and you will see the “Results” screen



**Figure 17**

### a) Function Buttons

**- Add Ref:**

Adds a reference Curve to the Graph as shown in figure 8. To add a reference curve, click “Add Ref” button and select required reference. Press “Open” button and the graph with the ref will be displayed. A Reference Curve is the curve that represents the best results to date for the samples tested.

**- Save Ref:**

Saves a Curve as a Reference. This Reference could then be selected at a later stage by using the “Add Ref” button, to compare current results with “Best Results”.

To save a reference, select the “Data” button and deselect all the curves (i.e. R1, R2) leaving only the curve (i.e.R3) you wish to be the reference curve. To do this, click on the  next to the curves you wish to deselect, then press “Save Ref” giving the reference an appropriate name (i.e. MDS 310106). To re-apply all the curves to the graph,

select the “Data” button and tick the required curves.

- *Graph/Data*: This button toggles between “Graph” and “Data”. If the Graph button is available, basic data and statistics are displayed after the Settling Time.

If the Display button is available, the Graph is displayed.

- *Unit*: Choose between 4 different units : g, N, g.cm and mN.cm

- *Display*: Select the sample (R1 or R2 etc) you want to display or hide. The maximum number of curves displayed is 10. Select Main to return to the main results screen.

- *Remove*: Select the sample you want to remove from the graph and the batch by clicking on the appropriate line on the graph.

This option can be useful in the case of a bad test caused by an external event such as bad positioning of the sample.

### c) Cursor Buttons

You can move along the displayed curve using the “Right” and “Left” Arrows. The “Up” or “Down” arrows allow the user to jump between different sample results. Every new position will update the statistics results.

### d) Statistics @ 15%

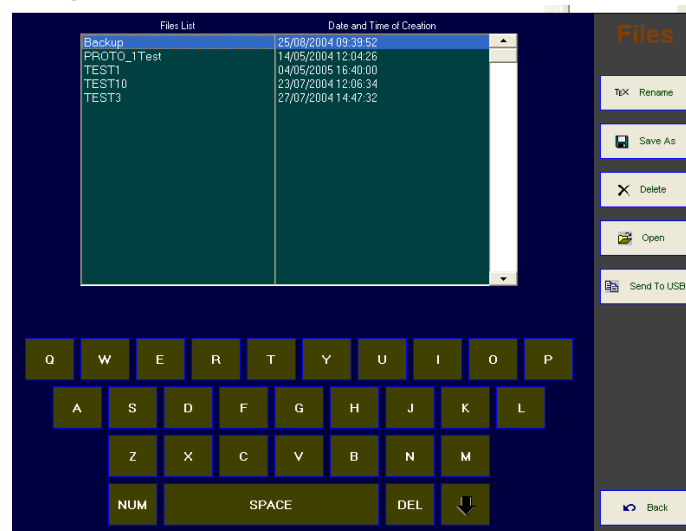
In the statistics results you have the AUC (Area Under Curve), the Mean, Standard Deviation, Maximum, Minimum values and the angle at maximum force. Some statistics will not be available until two or three samples have been tested.

### e) Ratio

**These statistics are only available if both Crease and Stiffness tests have been done.**

The ratio of (Crease / Board) stiffness is a key indicator of the folding quality of creases and their performance on automated packaging. BS 6965 pt 1 indicates maximum values of 3 and 7 for acceptable MD (body) and CD (end flap) creases respectively. The MD value is for creases without pre-fold. High speed and sensitive packaging machines may require lower maximum values. This information is only valid for g or mN Units.

## 14 File Management



**Figure 18**

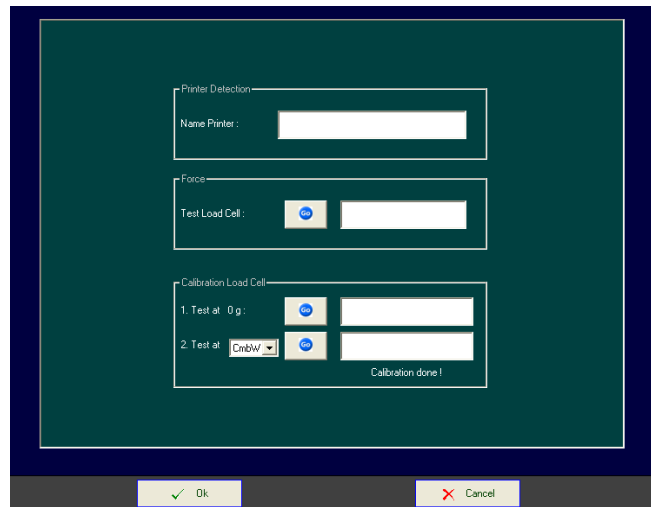
The Files are saved into 2 different Directories according to the contents.

“Results” directory if it is a test Result and “Reference” directory if it is a Reference Result. These directories are remotely accessible within the network.

- “Rename” button : Rename the File with the required name.
- “Save As” button : Save the File As the required name.
- “Delete” button : Delete the selected File from the “Results” directory.
- “Open” button : Open the selected File.
- “Send to USB” button : Select the required File and send it to the USB memory “pen”.

## 15 Diagnostics

From the Main Menu you can enter the Diagnostics via the “Utilities” button.



**Figure 19**

- “Printer Detection” indicates which Printer is set by Default.
- “Force” gives you a live reading of the load cell. Press “Go” button to start, and “Stop” button to stop.
- “Calibration Load Cell”. Hanatek has calibrated the Crease Stiffness tester and the results are based on those values.

**IMPORTANT** - the use of this menu is **strictly limited** to calibration companies. Unauthorised use of this menu will invalidate your calibration and your warranty if within the warranty period.



## 16 Calibration

The Hanatek Crease and Board Stiffness Tester will have been calibrated before despatch

Unless a fault, or mishandling, is suspected the accuracy of calibration need only be checked once per twelve months when the reading should lie within +/- 1% of the dead load used.

In the event of problems, please contact the manufacturers.

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## 17 Maintenance

The unit is a very robust and technically sound instrument and as such requires little maintenance.

**Care must be taken not to bend or damage the load cell as this is the most vulnerable component of the Instrument.**

Adjustment of the Zero is automatically done by the software before every test.

The instrument must be kept clean at all times.

Maintenance can be minimised by ensuring that the instrument is used in a reasonably clean and dust free environment. Excessive pressure on the load bar should be avoided.

## 18 Service

This can be done by the nearest agent.

The instrument should be serviced and calibrated once per year and will include the programme, load cell performance and free movement of jaws and clamps.

## **19     Warranty**

This Instrument carries a one year warranty from the date of delivery against failure to perform due to component failure or manufacturing defect. In this instance, it can be returned to Hanatek for a free of charge repair.

The address for instrument returns is:

**Hanatek Instruments  
Beeching Road  
Bexhill on Sea  
East Sussex, TN39 3LG, UK**

**Tel. No. +44 (0)1424 739623  
Fax No. +44 (0)1424 730600  
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[www.hanatekinstrumentns.com](http://www.hanatekinstrumentns.com)**

## **22 License for Use of Software for CBT3**

The license for use of this software is granted on the following conditions:

1. The software is for use only by the original purchaser of the test equipment with which it was supplied.
2. The software is for use only with the test machine with which it was supplied.
3. The software must not be copied
4. The software must not be distributed to other parties.
5. The software must not be modified.
6. Copyright for the software is held by Hanatek Ltd\*\*.
7. Use of the software is permitted only on full and unconditional acceptance of these conditions.

Requests for any concession on these license conditions must be made in writing to Hanatek Ltd\*\*.

In the event of unresolved problems please contact Hanatek\*\*.

- \* Windows refers to one of the family of Microsoft Windows operating systems and / or the features of the operating system.

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