CORRCHECK preliminary user manual v1.5.5.0

Introduction

Congratulations! You have just acquired the portable corrugated board analyzer CORRCHECK. This device is the optimum tool to control the manufacturing process of corrugated and the converting process of creasing. It measures the washboard effect, the flute profiles and the crease and score profiles in a fast and intuitive manner. The software automatically creates quality control reports.

Important: *This manual describes the current version of the CORRCHECK hardware and software. Future enhancements or modifications are reserved.*

Safety Instructions

Warning

For safety reasons it is absolutely necessary to read through the user's guide and all of the instructions it contains.
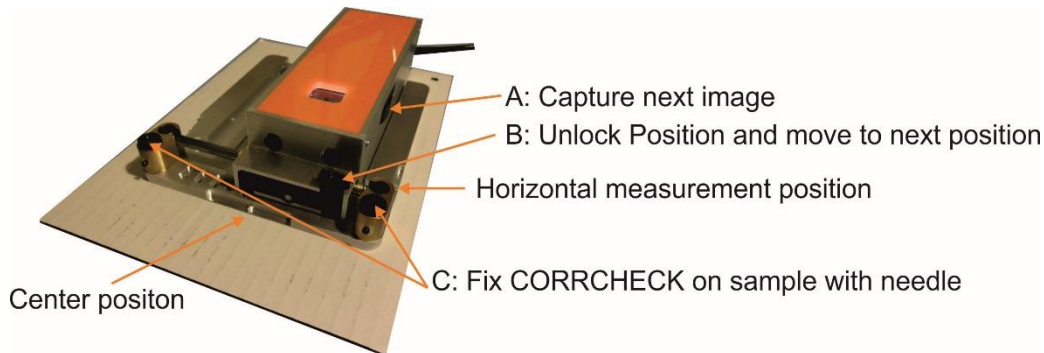
General safety rules

If the safety recommendations and instructions in this User Guide are not complied with, measurement errors or data loss or physical injury or property damage may result

- CORRCHECK is not intrinsically safe. Therefore the device cannot be used in an environment with explosive vapors where there is a risk of spark ignition.
- CORRCHECK may not be used in an area with strong electromagnetic fields.
- Use the CORRCHECK in ambient temperatures between 10°C (50° F) and 40°C (104°F), and do not expose the CORRCHECK to direct sun light.
- The CORRCHECK Sensor should never be opened as there are no user-serviceable parts. Doing so voids the guarantee. Contact your authorized dealer if repairs are necessary.
- To avoid incorrect handling, the CORRCHECK should only be used by trained personnel
- The CORRCHECK should only be used on dry measurement objects.
- The CORRCHECK should be protected against chemicals, corrosive vapors, strong mechanical vibrations and impacts.
- Use original spare parts and accessories only.
- Use the original packaging exclusively when transporting.
- The CORRCHECK casing can be cleaned with a dry cloth.

The CORRCHECK Device

CORRCHECK is high resolution measurement device to measure mechanical Washboard effect, flute profiles and creasing and scoring on corrugated card board. The CORRCHECK is composed of a sensor head that is connected via USB2.0 the CORRCHECK software running on Windows™ XP, Windows™ 7 or newer.

A: Capture next image
B: Unlock Position and move to next position
Horizontal measurement position
C: Fix CORRCHECK on sample with needle
Center positon

The CORRCHECK hardware is operated with 3 keys:

A: click this key to capture the next image
B: press this key to unlock the Sensor position and to move it to the next position
C: optionally you can press the needles down to fix the ruler onto the sample.

Indicators on the sensor body assist the operator in proper alignment and operation of the device.

Software and Driver Installation

Do not plug the USB cable in at this time.

Start your Computer and wait until all boot processes have terminated and your computer is ready to operate.

Plug the CORRCHECK USB Memory Stick into a free USB Port and wait until Windows has recognized and registered the USB Stick as a Mass storage Device.

Install the CORRCHECK software

The USB Memory stick contains a setup utility **'setup CORRCHECK.exe'**, which can be run to install the CORRCHECK Software on your PC.

Before termination the video driver installer will automatically be started. Click INSTALL.

Wait until the installation of the driver is finished.

Now connect the USB cable to a free USB2.0 port. Windows will automatically detect the driver and assign it to the device.
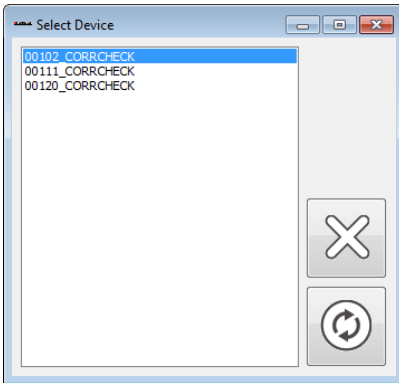
Run the application

- Launch the CORRCHECK.exe,
- Click the CORRCHECK Icon on your desktop or,

- Run the CORRCHECK from the Windows Start Menu

In case there have been installed more than one device on one single computer there will open a window prompting for device selection:
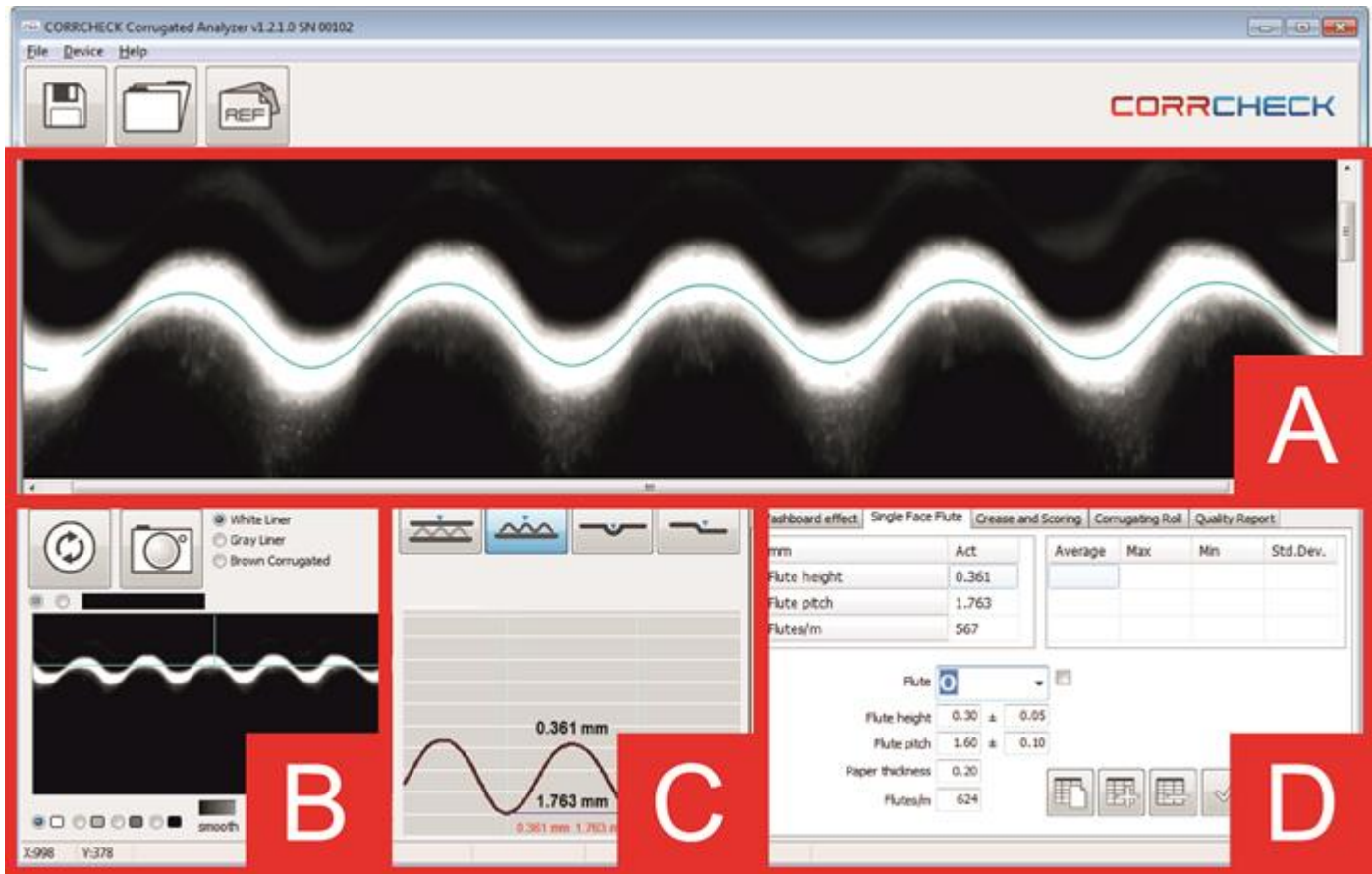

 Select the device connected and click the connect icon. All calibration data and settings will automatically be loaded.

 Click the CANCEL Icon to continue with the settings that have been used during the last session.

Main Window

A) Captured image for analysis
B) Live Image of camera and camera settings
C) Analysis types and graphical results
D) Numerical Results and Report preview

Main Window Icons

Main menu functions

Save Image.

Load image saved in CRR format.

Define reference values, select references, modify references.

Camera Functions

Preview

Capture

Statistics Functions

 Clear statistics. Be sure to save any existing data.

 Add most recent measurement and all future measurements to statistics automatically and re-calculate average, maximum, minimum and Standard Deviation. Click this icon again to stop adding measurements to statistics.
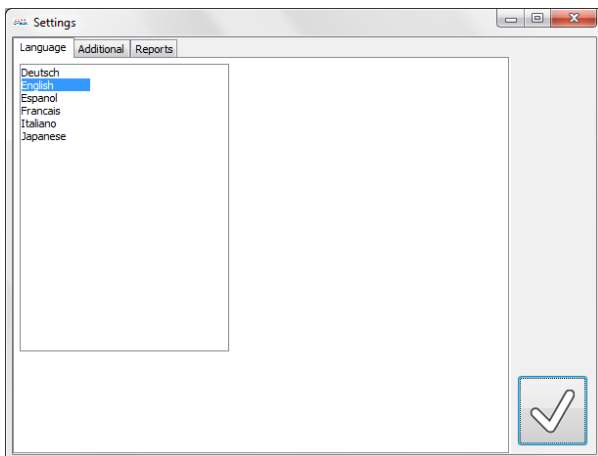
 Remove most recent measurement from Statistics.

 Accept and save data – create PDF report.

 Save data to text file.

Configure your installation

Select *Settings* from the file menu. Select your language from the *Language* page.


Select the *Additional* page
- Select the units of measure from metric system (mm) or Imperial (inch) system.
- Select the number of significant digits for measurement results.
- Select if the previous measurement should be displayed by a red line or the previous measurement is not displayed at all.
- Select if the captured image should be aligned horizontally before display such as the reference line is horizontal. Be aware, that this function will slow down the overall measurement procedure but not have any impact on measurement result calculations.
- Select if the warp of the corrugated board should be compensated during calculation of the washboard effect WBE.
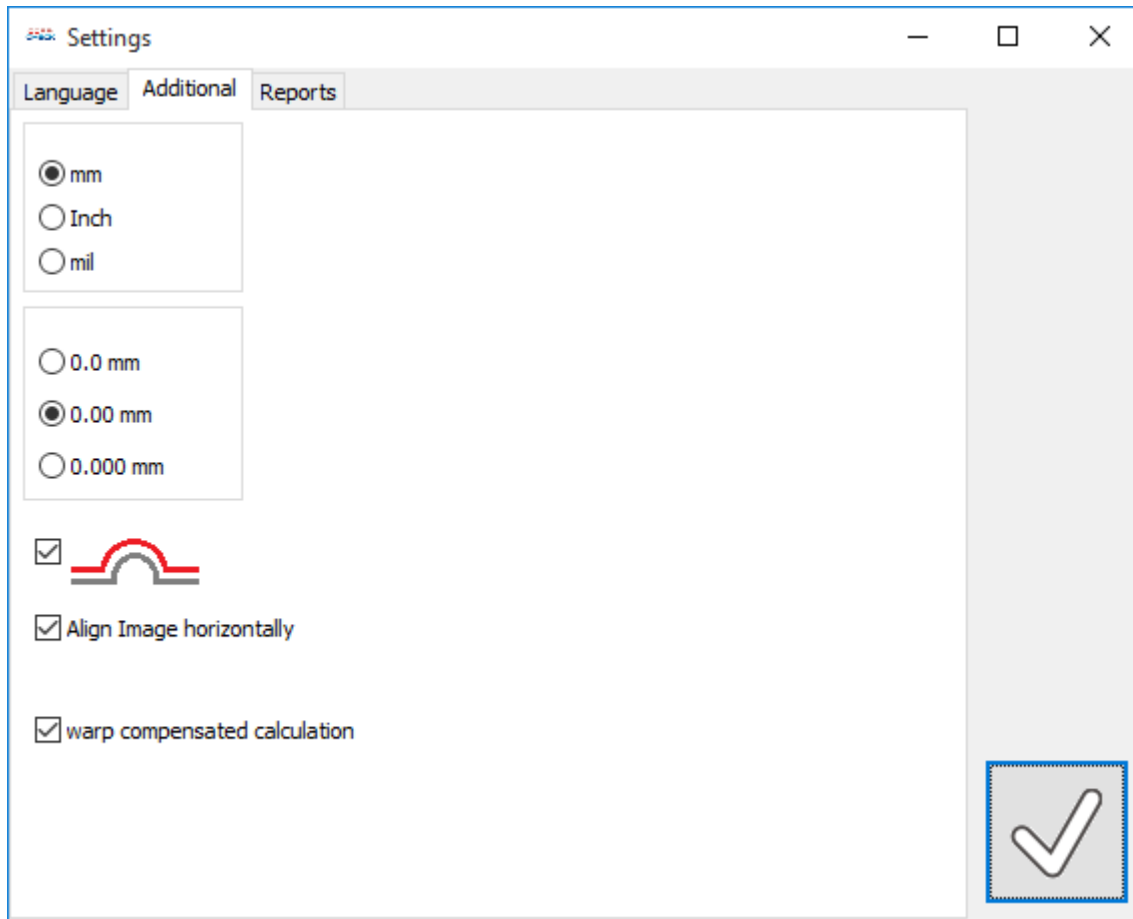
Select the *Reports* page

Load your company Logo that will be applied to your quality reports by clicking the File Open Icon. Insert your company details below as they will appear in the header of any report.

Select the details of the output format like decimal separator, if a header should be saved along with the data, etc.
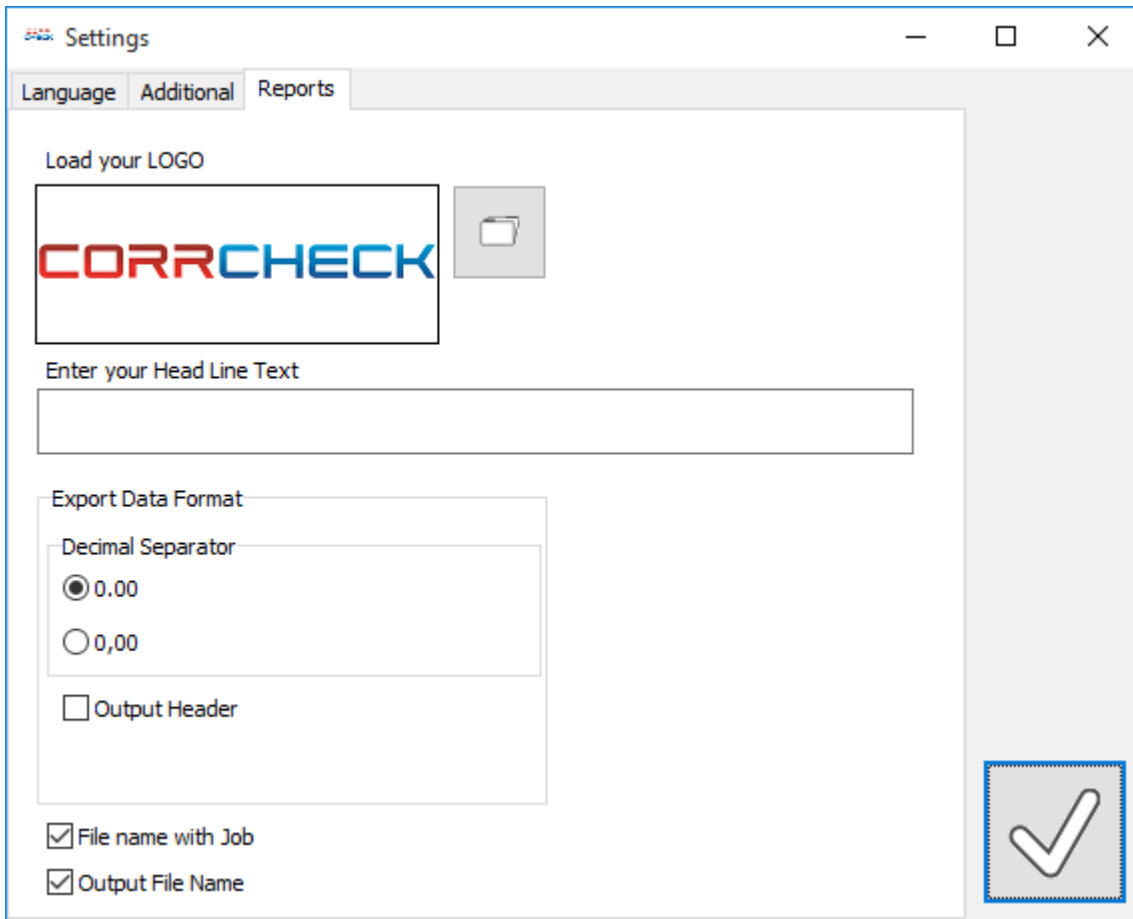
Define references in the reference database

 Open the Standards Database by clicking the REF symbol.

myrefnew.COR — Inch

Flute	Height	±	Pitch	±	M	Caliper	F/Ft.	Take-Up	WBE	+	Description
R/S/X	0.083	0.016	0.177	0.020	0.006	0.118	68	1.31	0.100	0.010	
E	0.046	0.004	0.138	0.010	0.004	0.063	87	1.28	0.050	0.005	
F	0.030	0.004	0.094	0.010	0.028	0.039	127	1.24	0.030	0.002	
G	0.022	0.002	0.071	0.004	0.020	0.031	169	1.22	0.020	0.002	
N	0.018	0.002	0.071	0.004	0.020	0.031	169	1.21	0.020	0.002	
O	0.012	0.002	0.063	0.004	0.008	0.024	190	1.21	0.015	0.002	

H: Flute height
M: Paper thickness
C: Caliper of corrugated board
P: Flute pitch
1/P: Flutes/Ft.
WBE: Washboard effect

DEFAULT   DIN55468-1

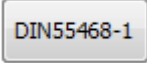 Open an existing Reference setting.

💾 Save actual values.

✓ Close Window and continue.

Create a new reference based on DIN values

`DIN55468-1` Click the DIN55468-1 Icon to compile the cells with DIN values

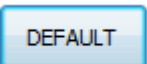### DIN55468_1   mm

Flute	Height	±	Pitch	±	M	Caliper	F/m	Take-Up	WBE	+
B	2.60	0.40	6.00	0.50			166			
D	2.00	0.10	4.30	0.50			230			
E	1.40	0.40	3.25	0.25			310			
F	0.75	0.05	2.25	0.35			440			
N*	0.60		1.80				560			
G	0.55		1.80				555			

Add the missing values according to your needs. You can also add up to a total of 100 Flute types.

💾 Click the SAVE Icon and give a name to your new reference.

`DEFAULT` Instead of DIN values you can also your CORRCHECK default values.

DEFAULT   mm

Flute	Height	±	Pitch	±	M	Caliper	F/m	Take-Up	WBE	+
R/S/X	2.10	0.40	4.50	0.50	0.15	3.00	222	1.31		
E	1.16	0.10	3.50	0.25	0.10	1.60	286	1.28		
F	0.75	0.10	2.40	0.25	0.70	1.00	417	1.24		
G	0.55	0.05	1.80	0.10	0.50	0.80	555	1.22		
N	0.45	0.05	1.80	0.10	0.50	0.80	555	1.21		
O	0.30	0.05	1.60	0.10	0.20	0.60	624	1.21		

Modify the values according to your requirements and click the SAVE Icon.

You can create as many standards as needed and reload a standard at any time.

Initialize the camera

🔄 Click Preview to start the Live Image of the camera

A flashing left dot shows that the camera is active. A steady right dot shows that the key at the device has been pressed, a new image has been captured, and the software is analyzing the image.

Select the material of the sample to pre-select camera settings and filter settings.

White Liner
Gray Liner
Brown Corrugated

Select the brightness type (white, gray, dark gray, black) of the substrate. Use the upper scroll bar to fine tune the brightness. Use the Filter scroll bar to apply a stronger or weaker filter to reduce the impact of paper fibers during measurement.
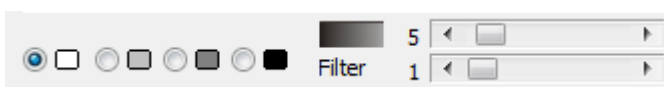
WASHBOARD EFFECT

Measure the Mechanical WASHBOARD Effect to improve the performance of boxes under load and to reduce the stripyness (fluting defect) in printing.

The Washboard effect is formed by the shrinkage of the glue in between liner and the fluting of corrugated board during drying. The Washboard effect depth is linearly related to the amount of glue applied.

The Washboard effect is highly dependent on the relative humidity of the environment and decreases linearly with increase of relative humidity.

Washboard effect is a deviation in height of a nearly flat surface. The deviation in height (or depth respectively) named **WBE** is calculated as follows:

$$WBE = \frac{3}{2n} \sum_{i=1}^{n} h_i$$
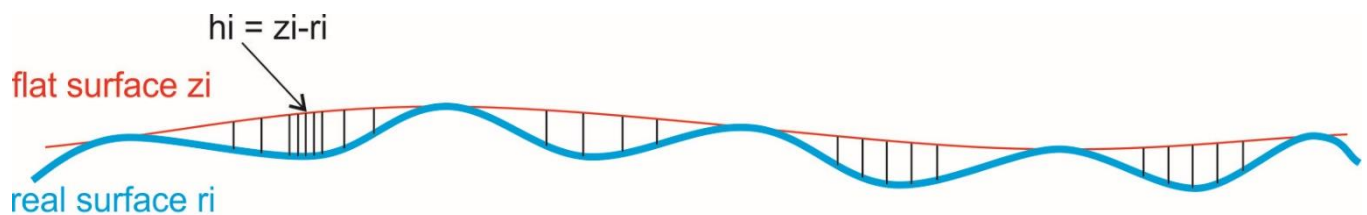
Corrugated card board samples sometimes are not perfectly flat. Therefore the theoretical surface z_i (red line) is calculated first. If WBE(1) is selected, this can be a warped line, if warp compensated calculation is not selected, a straight line is assumed. Within one measurement there are calculated approx. 6000 depths h_i as a difference between theoretical flat surface z_i and real surface r_i.

Calculating WBE requires extremely sensitive height measurement while accurate measurements of flatness and flute pitch requires a large area to be measured. These conflicting requirements are solved by the use of sequential image capture and stitching. The CORRCHECK captures 5 high resolution images and creates a compound image over 1.5 inches wide.
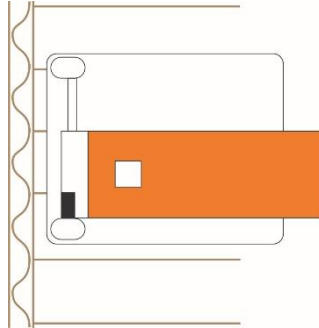
Select the WBE tool from the tools menu

Select the material of the sample to pre-select camera and filter settings.

○ White Liner
○ Gray Liner
○ Brown Corrugated

Position the CORRCHECK parallel to the flutes of the cardboard sample. Move the CORRCHECK sensor in its left most position.

Use your second hand to optionally press down the needle knobs. Press down the device with your hand and click the measurement key. The first picture will be captured and confirmed with a beep.

Now press the UNLOCK button and move the device to its next measurement position. Click the measurement button to capture the second image. Continue to move and capture until 5 images are captured. The CORRCHECK is now in its right most position. The software calculates and displays the WBE.
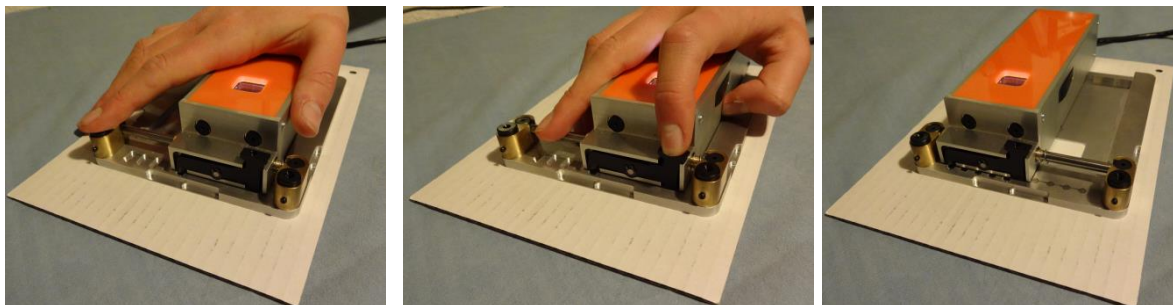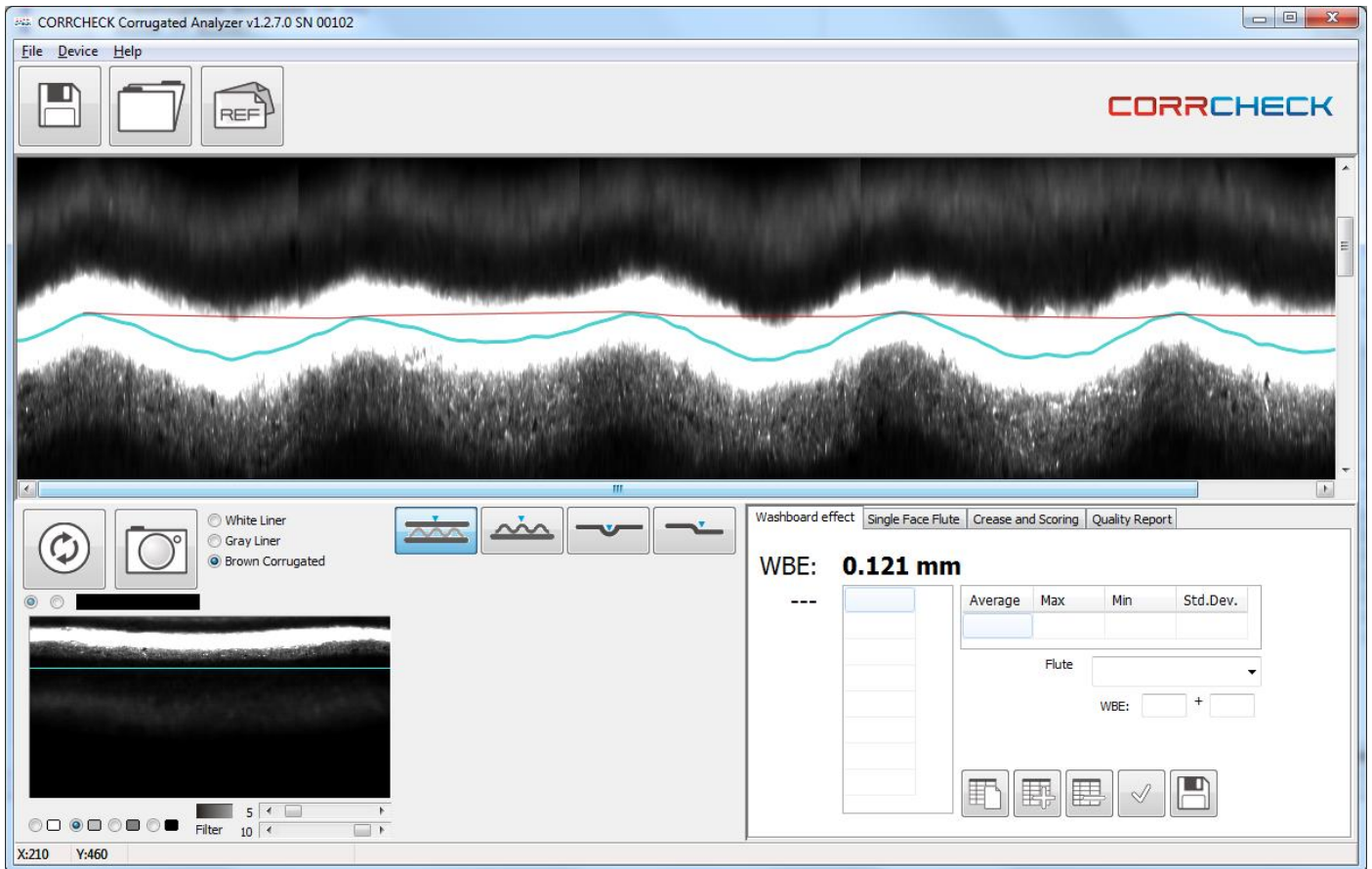
WASHBOARD EFFECT Statistics

Collect your WBE measurements in a table and calculate statistics.

 Clear statistics, start new statistics. Be sure to save any existing data.

Measure the first sample

 Add the first sample measurement to the statistics. All future measurements are automatically added to the statistics until this Icon is clicked again.

 Delete most recent measurement from the statistics.

 Click the OK Icon to create a PDF report of the current statistics. The report is automatically saved and can be printed.

 Export measurement data to a text file.

In order to compare actual readings with pre-defined standard requirements select the proper Flute type from the list.

WBE: **0.080 mm**

5	0.071		Average	Max	Min	Std.Dev.
	0.066		0.068	0.094	0.026	0.025
	0.026					
	0.094					
	0.080					

Flute E ▾

WBE: 0.070 + 0.020

Now measurements in tolerance will be displayed in black while readings out of tolerance will be highlighted in red.

FLUTE PROFILE measurement

In order to measure the WBE with high resolution there is a limitation in vertical field of view of the CORRCHECK device.

The CORRCHECK Device does support single flute measurement for flute types not higher than 2.10 mm

Measure the FLUTE PROFILE on single faced material to check the mechanical wear of the corrugating rolls, comparing Operator side (OS), Distant side (DS) and middle and the correct formation of the flutes. It does not require a carbon print, the result is immediate as you measure the end result.

Deviations in flute profile heights lead to uneven application of glue and poor mechanical performance.
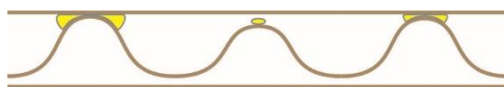

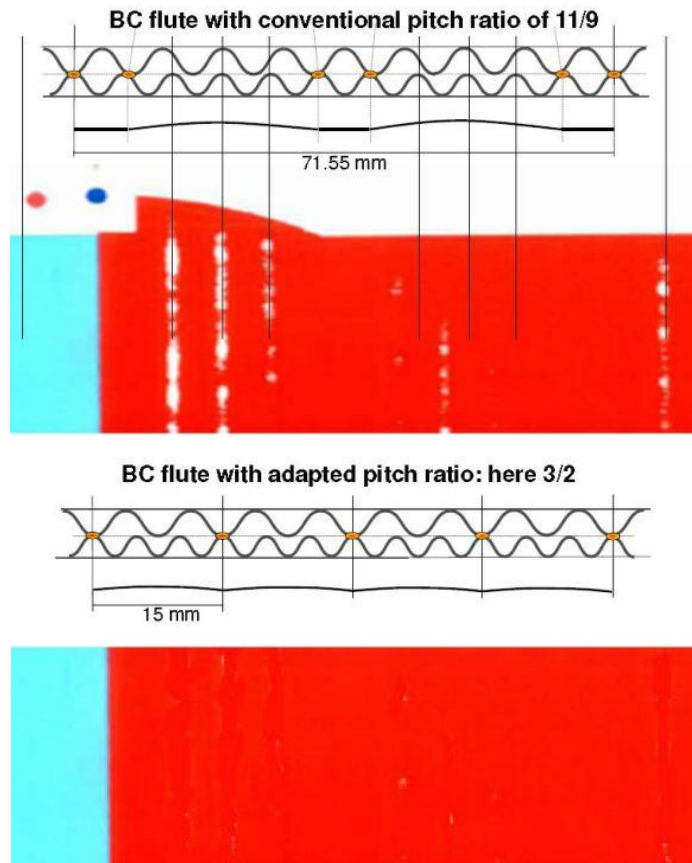Incorrect flute profiles are one of the primary causes for STRIPYNESS (fluting defects) in Flexo Post Print.
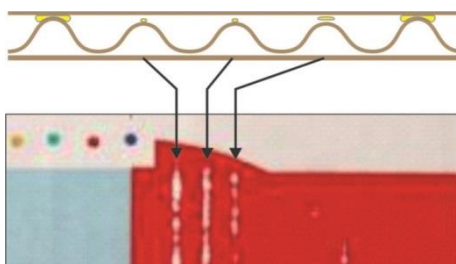
The CORRCHECK Flute Prolife measurement tool measures the Flute Height, the Flute Pitch and the Flutes/M (Flutes/Ft)

mm	Act
Flute height	0.498
Flute pitch	1.762
Flutes/M	567

Banded Stripyness (banded fluting): In double wall corrugated one can notice some repetitive bands on the board which are caused by the frequency differences between different flute types. i.e. BC flute.
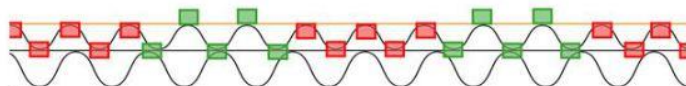
Please note that the flutes are sometimes supporting each other (green in the image) and sometimes not (red). This happens with any flute combination that has not been mathematically sequenced. One solution is to run for example EE. If the profile of the two E flutes is identical no banding will occur. Another solution is to adapt the flute profiles so they are a mathematical multiple of each other.

BC flute with conventional pitch ratio of 11/9

71.55 mm

BC flute with adapted pitch ratio: here 3/2

15 mm

CORRCHECK is an indispensable tool to control the single flute manufacturing process to make sure, height and pitch ratios are correct over the entire corrugated sheet.
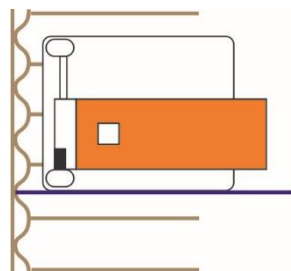
Select the Flute Profile Tool to measure Flute Height, Flute Pitch, and Flutes/M

Select the material of the sample to pre-select camera settings and filter settings.

- ◉ White Liner
- ◯ Gray Liner
- ◯ Brown Corrugated

Position the CORRCHECK parallel to the Flutes. Use a pencil and draw a line on your sample to simplify the positioning.

Press down the device with your hand and click the measurement key. The picture will be captured and confirmed with a beep. The Flute profile of the flute in the center of the image will be calculated and the measurement values will show up automatically.
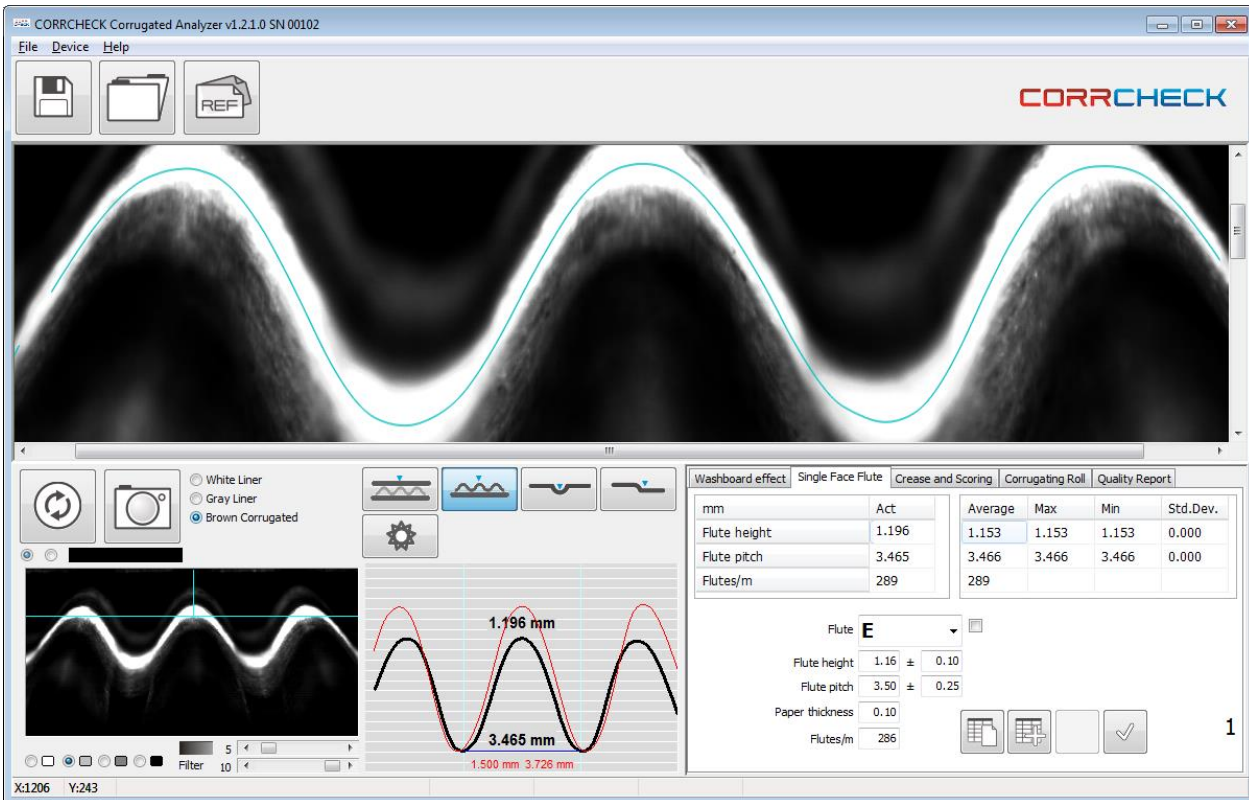
Measurements using a mechanical micrometer will show height information including the material thickness. In order to show comparable measurement values, you can input the material thickness (M) into the proper field during the standard definition.
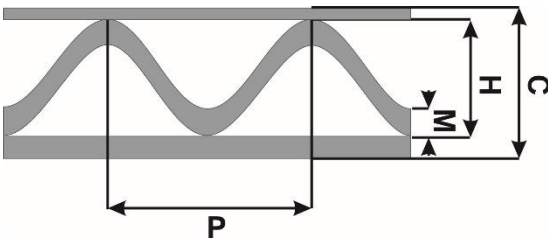
This value will be automatically added to the measured Flute height.

In order to compare the measurements with previously defined standards, select the proper flute type from the list. Now the measurements that are out of tolerance will be highlighted in red.

mm	Act		Average	Max	Min	Std.Dev.
Flute height	1.493					
Flute pitch	3.742					
Flutes/m	267					

Flute **E** ▼ ☐

|			
Flute height	1.16	±	0.10
Flute pitch	3.50	±	0.25
Paper thickness	0.10		
Flutes/m	286		

1

In order to automatically detect the closest flute type check the check box next to the flute list.

Flute **E** ▼ ☑

The software automatically compares the actual reading with the reference flute profile specifications and select the closest flute type.

Measure a second flute profile on a different location to see the difference graphically and numerically in the graphic display of the software.

0.498 mm

1.762 mm

0.465 mm 1.763 mm
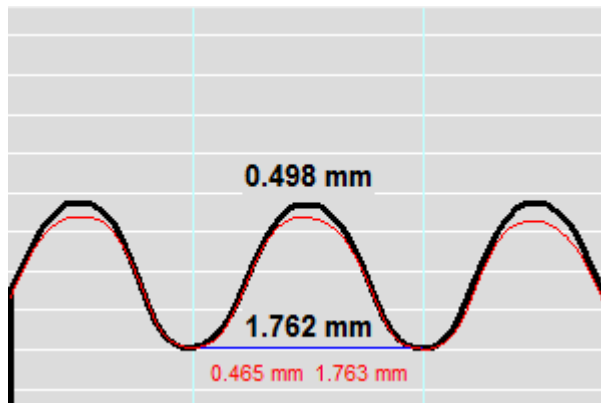
The actual measurement is displayed in black, while the previous measurement is displayed in red.

FLUTE PROFILE Statistics

Collect your Flute profile measurements in a table and calculate statistics.

 Clear statistics, start new statistics. Be sure to save any existing data.

Measure the first sample

 Add the first sample measurement to the statistics. All future measurements are automatically added to the statistics until this Icon is clicked again.

 Delete most recent measurement from the statistics.

 Click the OK Icon to create a PDF report of the actual statistics. The report is automatically saved and can be printed.

CREASING and SCORING

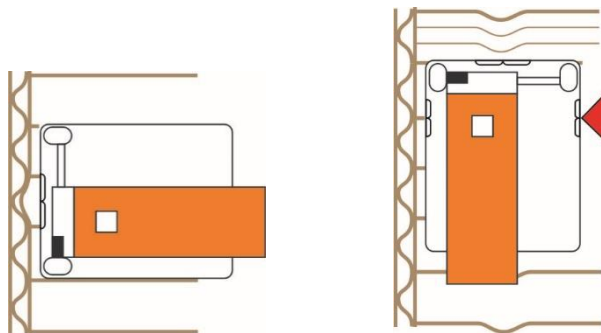Creasing and scoring are critical steps in the box forming process.

Select the Crease Tool to measure creasing and scoring

Select the material of the sample to pre-select camera settings and filter settings.

Position the CORRCHECK in parallel to the Crease Line such as the center arrow of the device is centered to the crease line.


In case of a crease perpendicular to the flutes make sure you always measure on top of a flute or between two flutes. The crease profile might be different depending on the position. Use the indicators on the left and right side of the CORRCHECK to set the proper position.

Move the CORRCHECK sensor to its left-most position.

Use your second hand to optionally press down the needle knobs. Press down the device with your hand and click the measurement key. The first picture will be captured and confirmed with a beep.

Now press the UNLOCK button and move the device to its next measurement position. Click the measurement button to capture the second image. Continue to move and capture until 5 images are captured. The CORRCHECK is now in its right-most position. The software calculates and displays the CREASE and SCORE Profile measurement values.
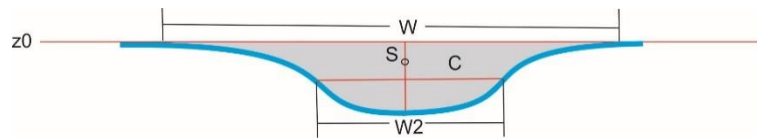
The crease depth is measured as an average depth in the close neighborhood of the center of gravity of the open cross section of the crease (gray Area)

The crease width (W) is the maximum opening of the crease on the corrugated surface. As crease lines typically are ending quite smoothly, this value can vary from measurement location to measurement location. To have a more stable measurement the Crease with 2 is measured at approximately half depth of the crease.
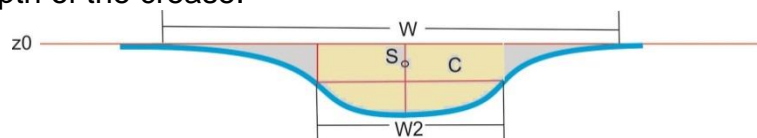

As on uneven crease lines the depth itself might not be a representative value for the quality of the crease, also the Cavity is measured. The Cavity is the brown area of above image limited to a width of W2 expressed in mm².

The Symmetry tells you more about how precise the folding will be in the folding machine.

mm	Act		Average	Max	Min	Std.Dev.
Crease depth	0.324		0.324	0.324	0.324	0.000
Crease width	24.5		24.5	24.5	24.5	0.00
Crease width 2	15.1		15.1	15.1	15.1	0.00
Symmetry	-0.130		-0.130	0.000	-0.130	0.000
Cavity	4.79		4.79	4.79	4.79	0.000
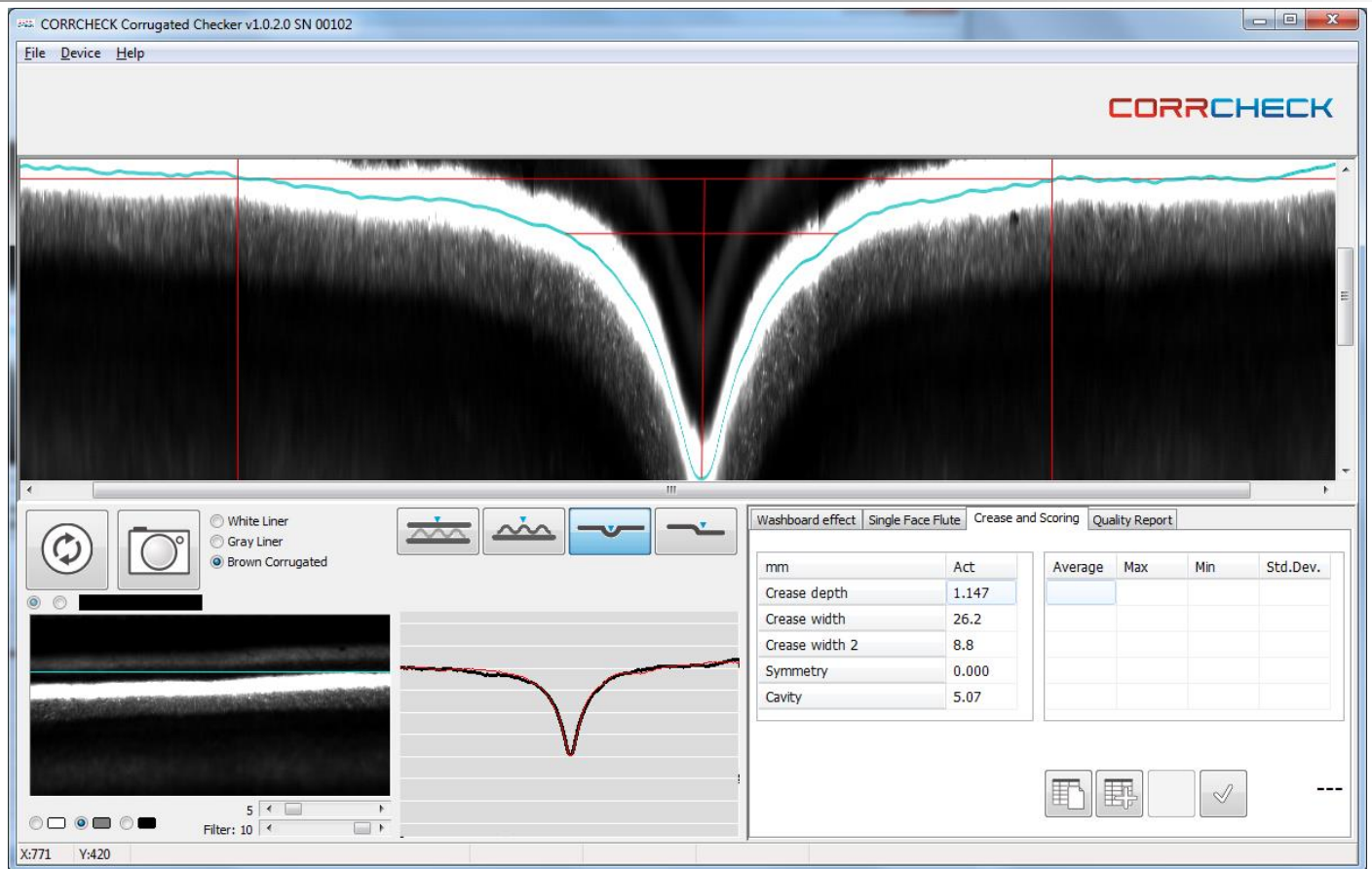
Creasing and Scoring Statistics

Collect your crease profile measurements in a table and calculate statistics.

 Clear statistics, start new statistics. Be sure to save any existing data.

Measure the first sample

 Add the first sample measurement to the statistics. All future measurements are automatically added to the statistics until this Icon is clicked again.

 Delete most recent measurement from the statistics.

 Click the OK Icon to create a PDF report of the actual statistics. The report is automatically saved and can be printed.

Manual Depth Measurement

Select the Depth measurement Tool from the Toolbar. Capture an image. Move the mouse across the Analysis Window (A). There will be drawn a horizontal line in real time.

Position the horizontal line on top of one level (f.e. surface). Press the left mouse button and keep it depressed.

Now move the horizontal line by moving the mouse with left mouse button depressed to the second level (f.e. de-bossed area). Release the left mouse button to show the result. The actual depth will also be displayed in real time in the status bar on bottom of the window.
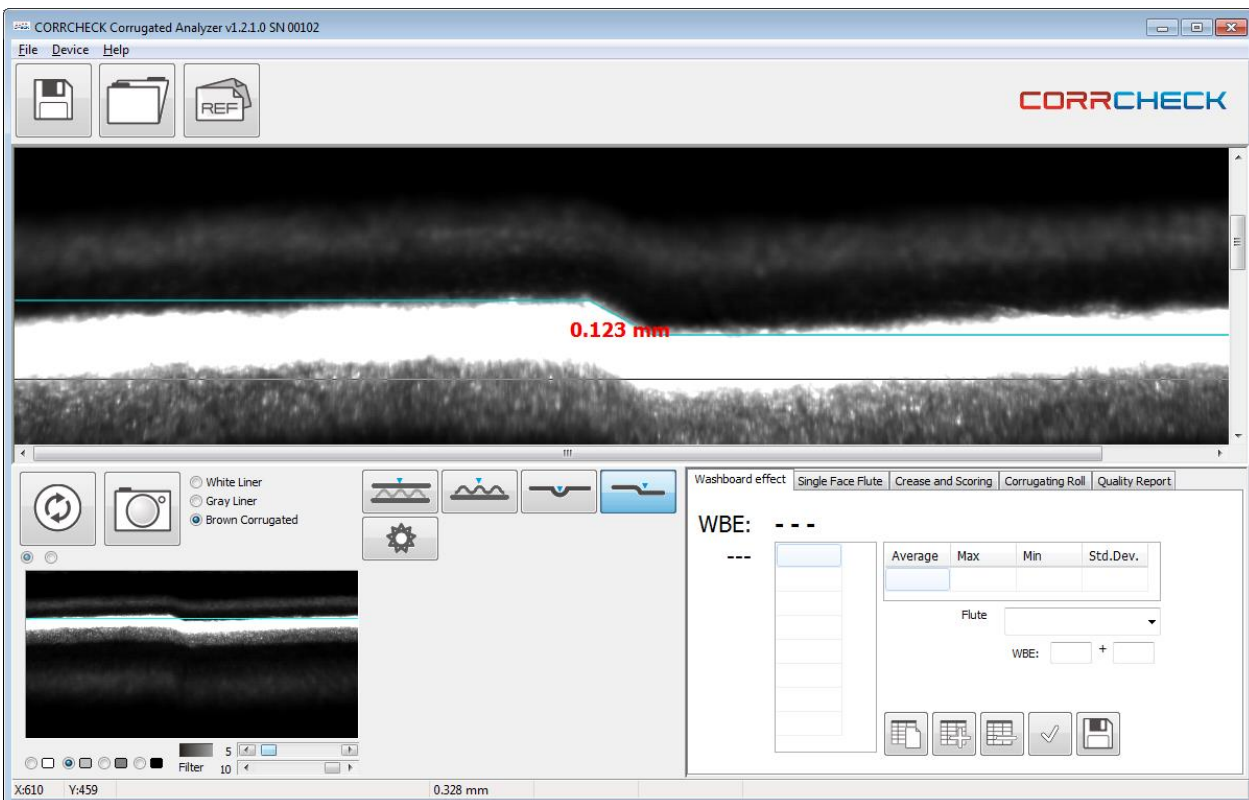
Full Screen Display.

Press the function key F8 on your keyboard to display the analysis image in full screen mode.

Press ENTER or ESC to close the full screen function.

CORRCHECK Verification

The CORRCHECK comes with the CORRCHECK target reference plaque that can be used for internal Device verification.

Open the Verification Tool by selecting the Verify Menu Item from the Device menu.

Type the reference number written on the reference plaque into the proper edit field for verification

Position the device on the the plaque and press the measurement button.

 If the measurement is in tolerance, you can create a PDF report and print the report using the PDF functions on bottom.