



MAD vision

User Manual

The Easiest Way for Accurate Measurement

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General Description

Thank you, for using **MAD vision software**, in this document we will try to help you using the software easily.

The **MAD vision** software is a friendly Machine Vi3sion platform used for generation of Inspection and Metrology applications for 2D and 3D.

Moreover, micro stepping motors control is fully integrated in the system to enable complete Machine Vision functions implementation.

Using of STIL Confocal Chromatic probe or Brosch laser triangulation enable you to perform 3D measurements.

Creating your own Inspection Application requires minimal Machine Vision Theory knowledge and no programming knowledge at all.

The **MAD vision** Instruction Set helps you to build multi-function Inspection Program in a very quick, efficient and easy manner.

MAD vision app is divided into two main screens:

Programming screen:

A screen in which we program the measurement plan according to the technical drawing requirement of the product, by placing tools and analysis, each program receives a number according to the programmer's decision and at the end is "locked" and no access to changes by the operator, QC or any other professionals in the plant / company.

Operator screen:

Intended for the working floor and is operational only, the operator has no principle access to the program structure and parameters set in it, but the most simple process he chooses a program by name / number puts the product under the instructions and performs measurement.

The measurement process takes between 0.8 - 3 Sec' depending on the measurement plan, the longer the program is or the chain is connected, the longer the test time.

Each test is recorded on an Excel file to issue various information analyzes according to the customer's needs.

"Father / sons" Buttons in programming screen:

Note: Buttons with green color are measurement tools; usually such a button is full of tools and / or additional options that allow you to use a task-specific measurement tool.

The following is a list of the tools and measurement buttons that are grouped by subject. Clicking on "Parental Control" opens a window with family controls.

No'	"Father"	"Sons"				
1						
	<i>Grab Image</i>	<i>Grab Image</i>	<i>Live Video</i>	<i>Load Image</i>	<i>Grab 3D</i>	
						
		<i>Z Scan</i>	<i>Refresh Image</i>	<i>Recorder</i>	<i>Copy Image</i>	<i>Display</i>
2						
	<i>Navigator</i>	<i>Navigator</i>	<i>cords' System</i>	<i>Clear Alignment</i>		
3						
	<i>Metrology</i>	<i>Arc Detection</i>	<i>Box Detection</i>	<i>Corners</i>	<i>Line Detection</i>	<i>Line Width</i>
						
		<i>Gear</i>	<i>Plygon</i>	<i>Comparator</i>	<i>Manual Point</i>	<i>Locate Pattern</i>
						
		<i>Laser Scan</i>	<i>Point CL Scan</i>	<i>Saw Tooth</i>		
4						
	<i>Datoms'</i>	<i>Line Datum</i>	<i>Circle Datum</i>	<i>inter Section</i>	<i>Line to Circle</i>	<i>Draw</i>
5						
		<i>busy</i>	<i>Clear Display</i>	<i>Call Recipe</i>	<i>Camera Test</i>	<i>Delay</i>
	<i>Programing</i>					
	<i>End loop</i>	<i>File</i>	<i>Get Comm</i>	<i>Frame Homogeneous</i>	<i>Move XY</i>	

						
	<i>Rest Move XY</i>	<i>Reset results counter</i>	<i>Send</i>	<i>Start Loop</i>	<i>Synchronization</i>	
						
	<i>Show results</i>	<i>Save Image</i>	<i>Send Comm</i>	<i>Time stamp</i>		
6						
	Preprocessing	<i>Bolbs</i>	<i>Binarization</i>	<i>Color Filtering</i>	<i>Invert</i>	<i>Special filter</i>
						
	<i>Edge Extraction</i>	<i>Histogram</i>	<i>Histogram Equ</i>	<i>Mask</i>	<i>Morphology</i>	
						
	<i>Projection</i>	<i>Smooth</i>				
7						
	Motion	<i>Lock target</i>	<i>Move</i>			
8						
	I/O	<i>Set output</i>	<i>Rest output</i>			
9						
	Geometry	<i>Rotate</i>				
10						
	Defect	<i>Defect</i>				
11						

	AV	<i>Assembly Verification</i>
12		
	Favorites	<i>Favorites</i>

Operation screen Buttons:



Data to Excel setting Switch between screens



Select a file Zoom In Zoom Out

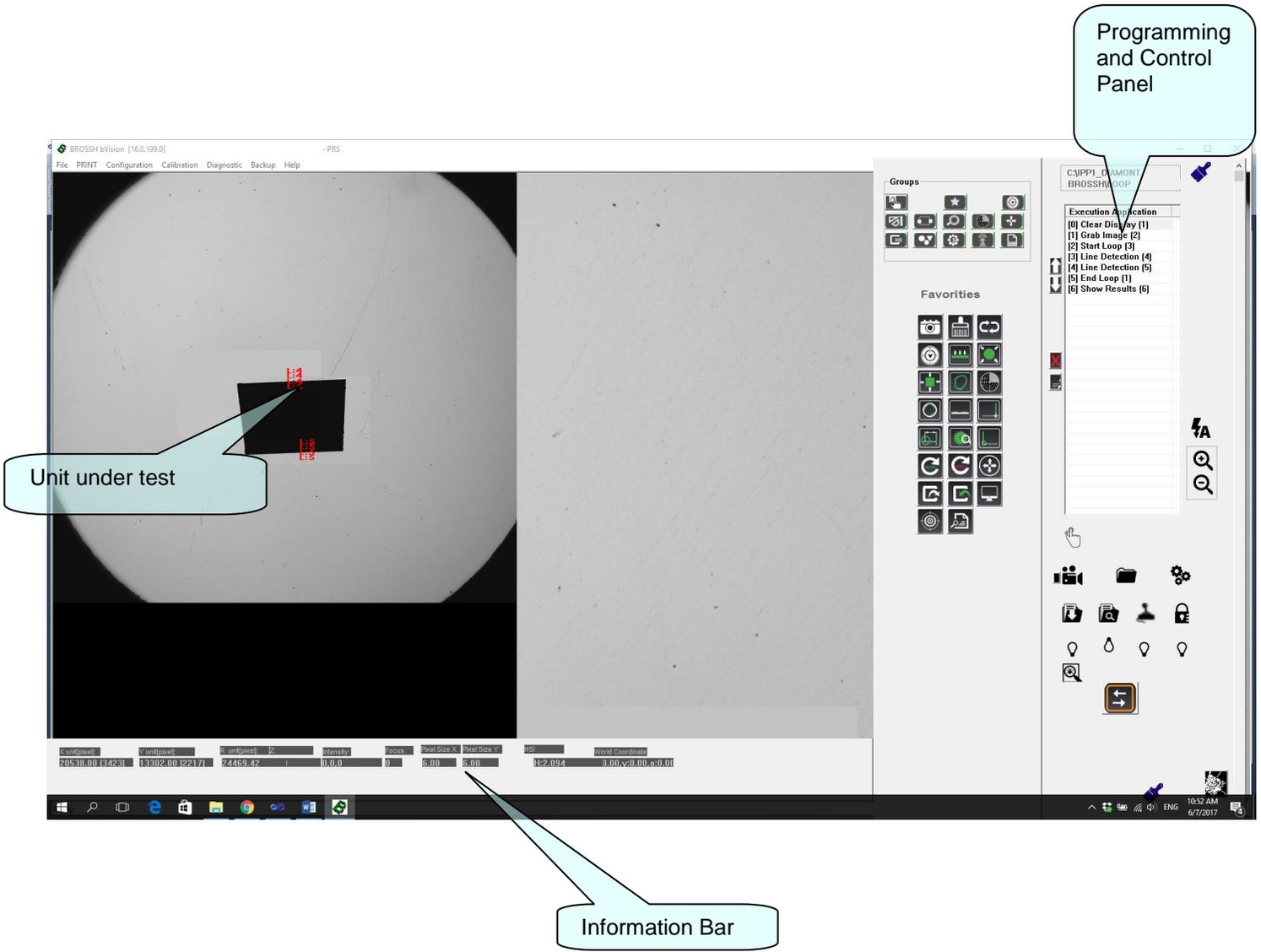


Measure button Exit / Close Software

MAD vision Graphics User Interface (GUI)

The friendly GUI allows you to build Inspection Program by several mouse clicks.

The **MAD vision** GUI is organized as a single screen main panel with several sub-panels:



Programming and control Panel:

The Dialog Box is used to generate new recipes and run stored ones.

Unit Under test

Displays the current "unit under test" image and graphic information of the measurement progress.

Information Bar:

Helps to perform manual (mouse) measurements as follows:

X :

Shows the current X position of the Mouse relative the Top Left corner of the screen.

Y:

Shows the current Y position of the Mouse relative the Top Left corner of the screen.

Rv:

Shows the current vector length between the mouse position and the Top Left corner of the screen.

Intensity:

Displays the Red, Green and Blue intensity values (0-most dark to 255-most bright).

X Pix Size:

Indicate the current X direction pixel size.

Y Pix Size:

Indicate the current Y direction pixel size.

Machine Configuration Screen:

This screen appears once after start-up of the **MAD vision** application. It allows you to set some parameters to define the system configuration.

Machine Configuration X

Software Version 16.0.199.0 14/04/2017 - 05:02:43UTC

Ca...	Camera...	Ch...	SN	Gra...	Exist	Video Format
0		-1		Vga		

Delete Cameras

Servo Motor

IMS Com#

TML Com#

GALIL Ip: Port

Height Sensor

Still

Com#

Micro Epsilon

Ip:

Operation

Minimize Panel

Autofocus

Debug

Show Results in the end

Enhanced GUI

Illuminator

Exist

Com#

Automation

Automatic SPC Save

Run last product on start

I/O

Advantech

OnTrak

Paralel Port

Numato Lab

Tcp/Ip

TcpIp Enable

Ip:

Port

Customer:

Recipies:

Spc Folder:

LANGUAGE

Optional Cameras:

Clicking on the Cameras list to get the following cameras and frame grabber selection.

Dialog

Camera Name: c1 Camera SN:

Frame Grabber

- JPLY
- Pixelink Fire Wire
- Web Camera (640X480 Image Size)
- uEye USB Camera
- VGA (no camera connected)
- Falcon
- Point Gray

Camera Channel: -1

Image Size

- Automatic
- x Image Size: 2208
- y Image Size: 3000
- 320x240
- 640x480
- 752x480
- 1280x1024
- 2560x1920
- 2208x3000
- 3840x2748

Mirror Image 90 Degrees

Detected cameras

#	SerNum.	Type
---	---------	------

You can choose multiple cameras and frame grabbers in the same application.

Optional Video Formats:

Ntsc
NtscY
Pal
RS170
PalYc
Ccir

CHR

Check this box if STIL CHR are integrated in the system. This interface supports the chr 150 (contact us for other models) that is connected to the RS232 PC port. In this section you have to assign the Com-Port to which the CHR is connected.

Motors

Check this box if motors are integrated in the system. This interface support the new IMS mDrive stepping motors connected to the RS232 PC port. In this section you have to assign the Com-Port to which the motors are connected.

Operation:

Minimize Panel- Check this box to start with minimized control panel.

Illumination:

The MAD vision supports the "SCHOTT DCR 3 PLUS" Illuminator. This illuminator is controlled by RS232 (the port should be assigned).

Automation:

Check this box if automatic results saving is required (manual saving is possible after every program run).

Results units:

Select the desired (microns or millimeters) result unit.

Distances between two elements may be displayed as relative or absolute numbers (in relative mode the sign may be + or -).

Tcp/Ip:

Use this option to communicate with external computers, robots and Controllers.

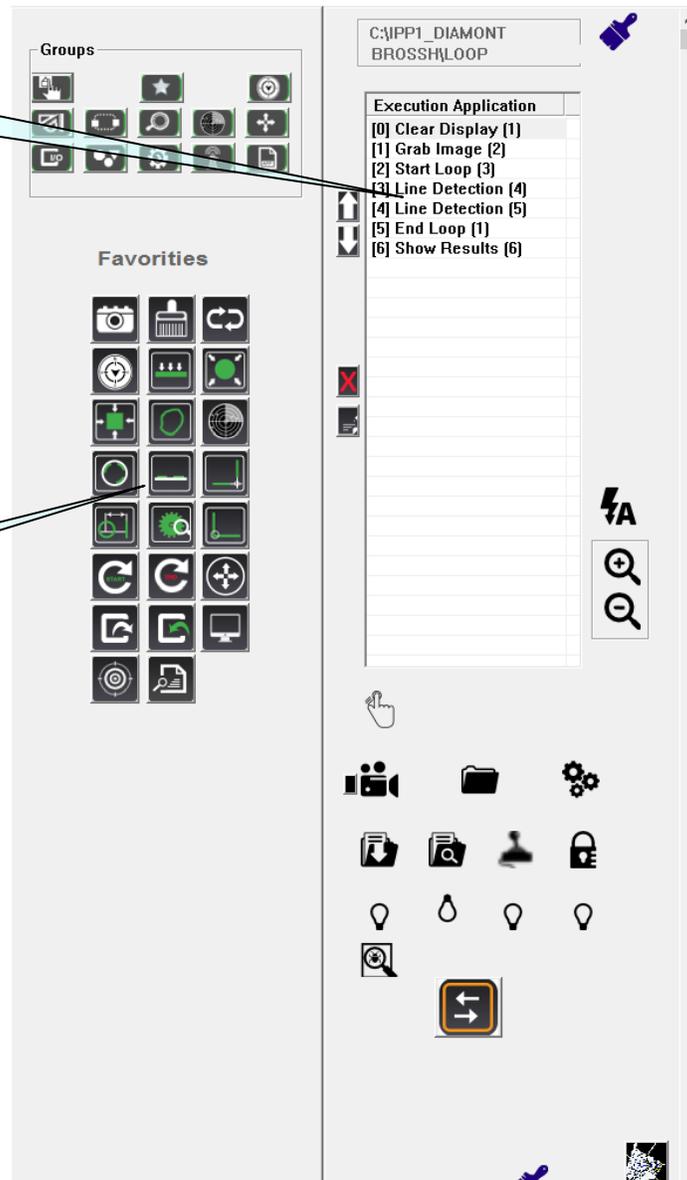
The application will open communication as a Server.

IO:

Use this option to communicate with external IO boxes.

Main Panel

Executable recipe Window



Instruction Bank

The main screen enables you to generate your recipe by selecting an instruction from the "instruction bank", which will then be copied into the "Executable recipe window". The "instruction bank" is divided into few instruction sub-groups according to their subjects.

Live Video



On/Off live video

Execute Recipe



Execute the selected recipe, the Instructions in the Executable recipe Window will be executed automatically.

Show Results



A "Results Window" will be opened.

The same "Results Window" will be displayed when the "Show Results" command will be selected from the instruction bank.

Adjust Pixel Size



The pixel size can be set for each magnification.

The following dialog will pop up:

The Pixel Size may be set either manually by typing it or automatically by the “Manual Learn” procedure. In this procedure you’ll be required to put a pre-measured object under the camera lens, point on two different points of the object image and type in the known distance between them. The system will automatically calculate the pixel size for you.

Temporary clear pixel size

That option's purpose is that when you define a pixel size, and you want to temporary use another pixel size without erasing the current one, you press on the box near the command, so it will be signed with a V. now define the new size, and when you press again on that box, that size will be erased and you will back using the old one.

Magnifications

As you can see, there are 5 magnifications. When you use more than 1 camera in the same time while executing a project, sometimes it's required to define a pixel size to one camera which is different than the other camera's pixel size. We provide you the option of using more than 1 magnification as a way to solve that problem. When you define a pixel size, it will be saved as the magnification you chose (for example- magnification 1) . Then you choose another pixel size on magnification #2, and you define that magnification on the settings of the second camera you use. (look for the instructions of the "Grabe image" command).

Global light (exposures)

A common problem in using lamps is that after a while it starts to lose it's power and being less affective.

Most of the applications we use in the MAD vision program based on precise light's amount, and you design your program based on the information you have. When that data changes, it will interrupt your program's reliability and maybe even make it totally useless, and even if you switch lamps, it will not help because even if you use the same lamp, It probably won't have the precise same power.

What can we do about that?

When you install a new lamp, we recommend you to put a blank page under the lamp, in the same distance you use for your programs, and check the green level (look for "Histogram"). Let's say for example that we measured under our old lamp a green level of 120. Now, after we switched lamp, we measure 100. We can change the exposure on every program, but it takes a lot of time. Instead you can use the "global light" command. You want to fit the light to the lamp you used when you designed it, and the difference is 20. Write 20 in the box near exposure 1, 2, 3 or 4, and you solved that problem. Of course You can define 4 different exposure's levels.

Note! Everything we wrote about exposure can be done by:

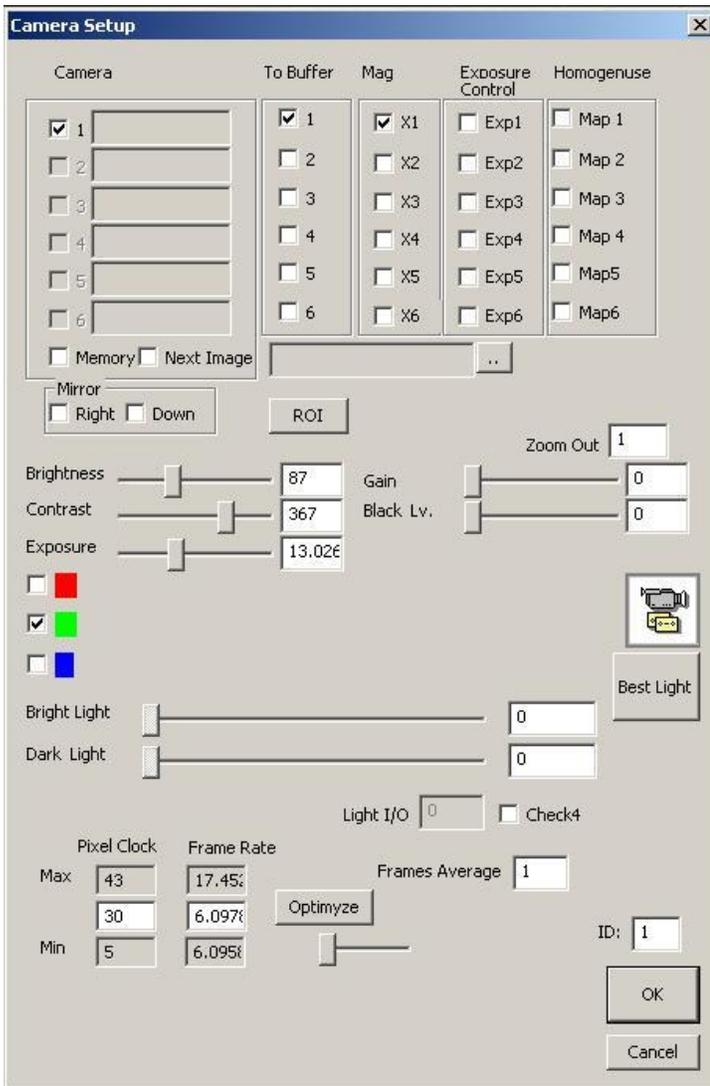
- Mechanically lenses shutter.
- External illumination (dark illumination and bright illumination).

CHR

Use the stage control to learn the distance between the camera lens and the optical sensor.

- Use edge detection: when using a calibration tool with sharp edges, the system will try to detect these edges to improve the offset accuracy.

Set Camera and Light Parameters



Camera parameters:

You can set the Brightness, Contrast and Exposure time.
The Red, Green or Blue channels might be selected as well.
A color correction can be used for IDS / Point grey cameras.

Light parameters

Bright and Dark lights level can be adjusted.

Best Light

This can be used for IDS / Point grey camera to automatically set the optimum combination of brightness, contrast and exposure time.

R G B

Switches on and Off the base colors- red, green and blue.

Create New Recipe

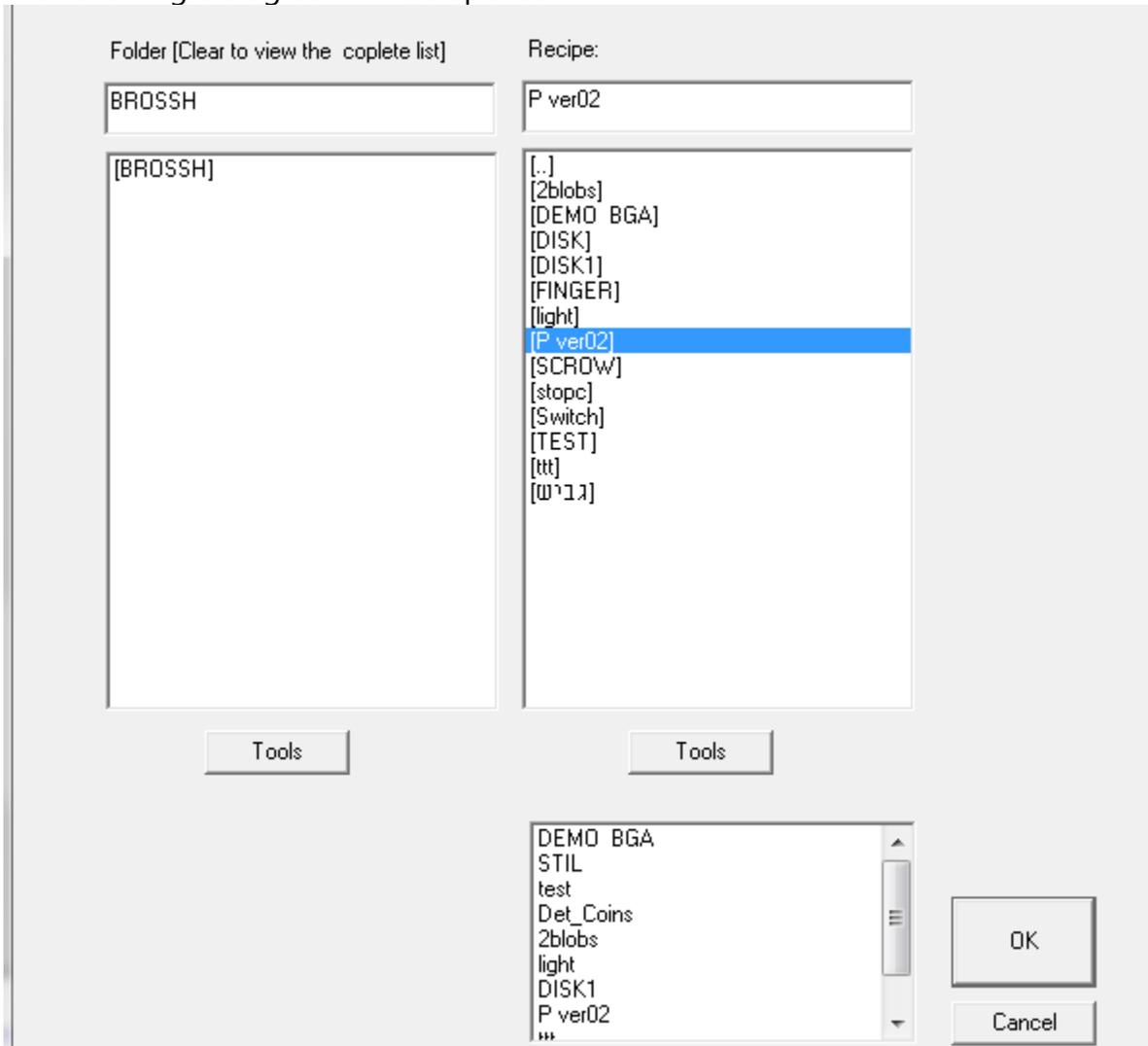


In this dialog you can generate a new recipe (inspection program), copy and delete existing ones.

Open an Existing Recipe



The following dialog box will be opened:



In this dialog you can open, copy and delete existing recipes.

Product List



The inspection recipe can be initiated from PRODUCT NAME SHELL. Several PRODUCTS may be assigned to the same RECIPE.

In this dialog you can define a new PRODUCT and link it to a certain existing recipe.

You can also insert the operator name, lot number and an arbitrary comment.

The measurement count will be incremented automatically after every run of the same product (can be set to any initial number).

The screenshot displays the BROSSH Inspection Systems software interface. On the left, there is a table with the following data:

Name	Low		High	Result	
WIDTH	68.5	[-----@-----]	56.0	62.2	PASS
HIGHT	68.6	[-----@-----]	56.1	62.3	PASS
a1	0.050	[-----@-----]	0.041	0.045	PASS
a2	0.123	[-----@-----]	0.101	0.112	PASS

Below the table is a form for entering product and operator information:

Product: DEMO1
Lot #: 1
Operator: L1700047
S/N: 1234
Measurement: 2
Comment1: W2056.00
Comment2:

On the right side of the interface, there is a camera view showing a grid of components on a PCB. A red box highlights a specific component with the text "1.10" and "12.846".

The interface also includes a power button icon and an EXIT button.

Choose Product

BRDSSH Inspection Systems

High Result

Name	Low	High	Result
WIDTH	68.5		
HIGHT	68.6		
a1	0.050		
a2	0.123		

PRODUCT Enter product name here

New Product Recipes Explorer

#	Product	Repeat	#	Recipe
0	DEMO1			
1	ttt			

Left mouse click for deleting an item
* Left Mouse Double Click for repeat

Send Results to Excel

OK Cancel

Product DEMO1
Lot # 1
Operator L1700047
S/N 1234
Measurement 2
Comment1 W2056.00
Comment2

EXIT

11:00 AM 6/7/2017

Save Image:



Save the current image to the disk.

Open Image:



Open image from the disk and display it on the main screen.

Stage and I/O Control:



Motors

	Current Position			Speed [%]	Trigger Div
X <input type="checkbox"/>	0	Move To Location ==>>>:	<input type="checkbox"/> Abs Motion <input checked="" type="checkbox"/> Is to wait	62500.000	0
Y <input type="checkbox"/>	0	Move To Location ==>>>:	<input checked="" type="checkbox"/> Abs Motion <input checked="" type="checkbox"/> Is to wait	62500.000	0
Z <input type="checkbox"/>	0	Move Delta from Current:	<input type="checkbox"/> Abs Motion <input checked="" type="checkbox"/> Is to wait	62500.000	0
T <input type="checkbox"/>	0	Move To Location ==>>>:	<input checked="" type="checkbox"/> Abs Motion <input checked="" type="checkbox"/> Is to wait	62500.000	0
M2 <input type="checkbox"/>	0	Move To Location ==>>>:	<input checked="" type="checkbox"/> Abs Motion <input checked="" type="checkbox"/> Is to wait	62500.000	0
M3 <input type="checkbox"/>	0	Move To Location ==>>>:	<input checked="" type="checkbox"/> Abs Motion <input checked="" type="checkbox"/> Is to wait	62500.000	0
M4 <input type="checkbox"/>	0	Move To Location ==>>>:	<input checked="" type="checkbox"/> Abs Motion <input checked="" type="checkbox"/> Is to wait	62500.000	0
M5 <input type="checkbox"/>	0	Move To Location ==>>>:	<input checked="" type="checkbox"/> Abs Motion <input checked="" type="checkbox"/> Is to wait	62500.000	0

Copy Current to Destinations

Reset Destinations

ID: 17

OK

Cancel

The following functions can be selected:

Choose motor:

You can select one of the 8 pre-defined motors for the operation to run.

What to do?

Select "Move to" in order to move the motor to an absolute location as per the "How Much to move" value.

Select the "Move Relative" to move the motor delta distance from the current location (delta is defined as per the "How Much to move" value).

Check the "Wait for end of motion" box when a new image has to be grabbed after the motor motion (this box is checked by default).

Motor Calibration:

This operation will cause the motors to move to their zero positions.

Stage Control:

In this mode live video will be displayed and you can use the mouse to move the object under the lens using the motors. This is done by clicking the mouse at the desired location on the screen, which will then cause the stage to move so the clicked point will be shifted to the center of the screen.

Read Motor:

This field shows the I/O states and the current selected motor position.

Open Calculator

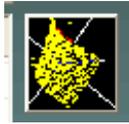
The default Microsoft calculator will pop up for your convenience.

Color Control

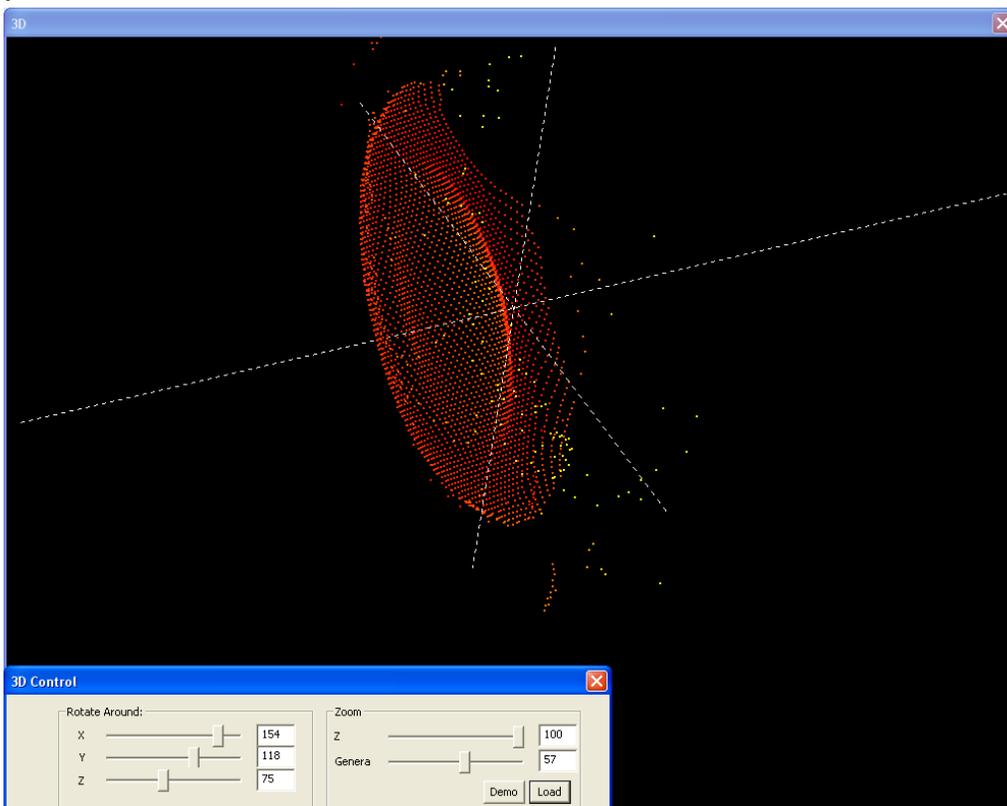


You can filter out each of the 3 RGB colors; this may sometimes help to get better images of the part under test.

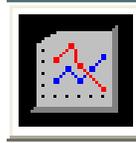
3D Viewer



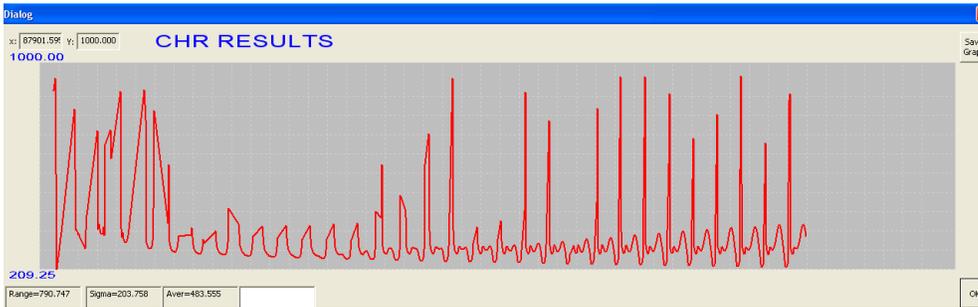
In here can view you 3d scan.
You can load previous scan and rotate the view point around the axis



Graph analyzer



This is a simple graph analyzer for testing your line scans. The y represents the height.



Executable Program

The executable program will be shown on this screen section. The instructions will be listed in the order of their execution.

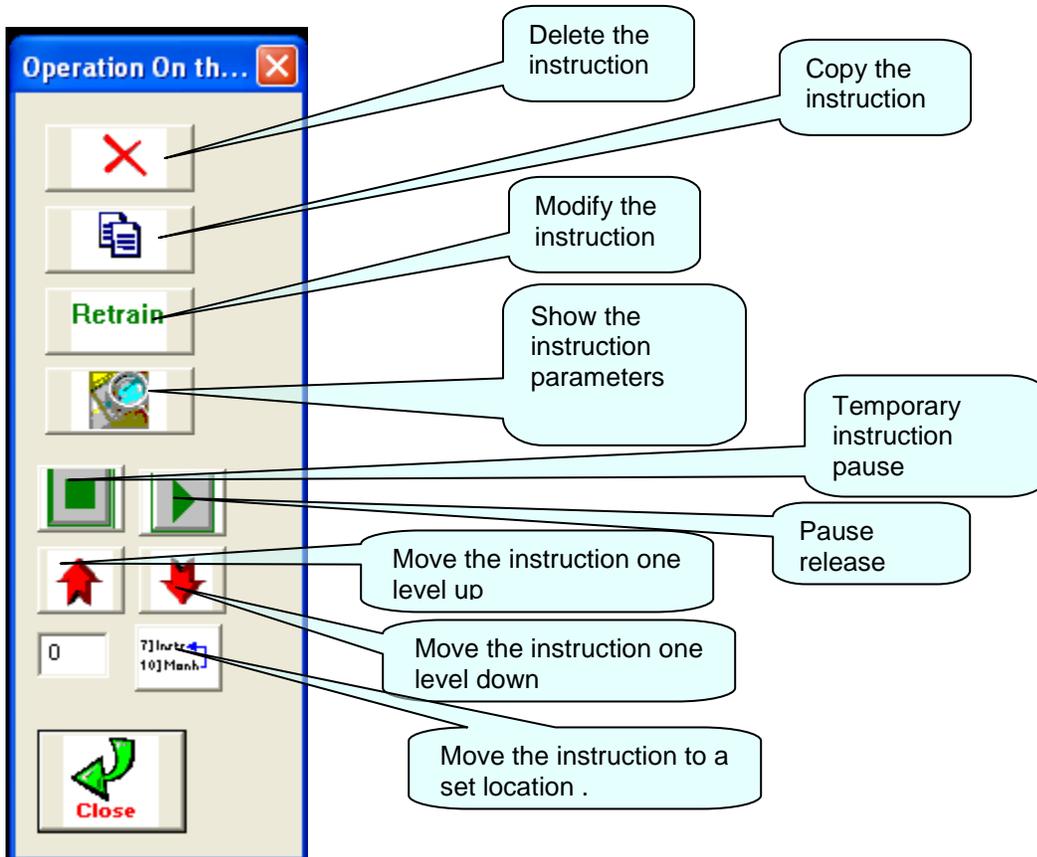
Double Click on single instruction will cause the instruction to be executed; this option is very useful for debug.

Instruction Bank

This screen section contains the full instruction set; double click on an instruction will copy it to the executable screen section.

Instruction Editing Window:

Clicking the right button of the mouse on an instruction in the EXECUTABLE PROGRAM window will open the editing dialog:



This section provides a set of instruction editing controls:

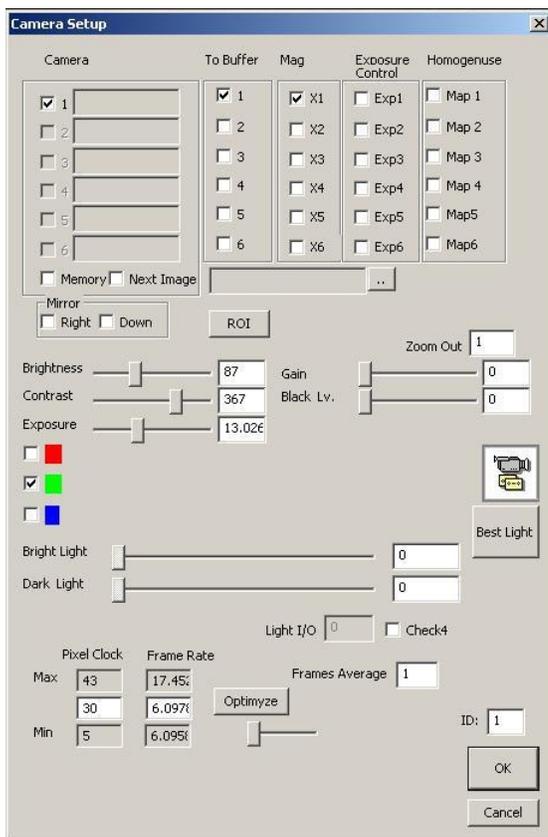
- Delete (X)- Clicking this icon will cause the selected instruction to be deleted from the executable recipe.
- Move Up (▲) – this will cause the selected instruction to move one line up in the recipe order.
- Move Down (▼) – this will cause the selected instruction to move one line down in the recipe order.
- Pause / Resume (■/ ►) – this will put the selected instruction on inactive state (pause) or release it back to be active.

Instruction Bank Description

GRABBING: 

Grab Image: 

Selection of this instruction will open a dialog box that will enable the optimum setting of the Camera & Light parameters. Those parameters will be restored every time the recipe will be executed.



Camera

You can choose the number of the camera you want to grab the picture with (according to your definition of which number related to which camera).

If you want to load an image from your computer's memory, than instead of clicking a camera number, click on the "memory" option, and each time the "grab image" command will be executed in that specific recipe, you will be able to choose an image restored on your computer.

Buffer

You have 6 buffers. Every buffer contains an image. You can choose a buffer to restore the image in. there are some commands in the program that has a "buffer" option, that allow you to choose which image your command relate to.

Magnifications

Look for "adjust pixel size"

Exposure control

Look for "adjust pixel size"

Homogenous

That option helps when the lightning is non-uniformed. In that case you can take an image of a white pepper and save it to one of the maps (each camera has it's map- map 1 related to camera 1 and so it goes). Than the program fixes the lightning's non uniformity.

Best light

Look for "Set Camera and Light Parameters"

Load Image from File

This instruction will call an image from the hard disk according to your selection.

Live Video

This will switch on/off the Live-video state.

Refresh Image

This will bring the grabbed image back to the active state. This is useful after "destructive" instruction like Binarization or Edge Extraction.

ALIGNMENT:

The alignment procedure is one of the most advanced MAD vision features that allow the system to inspect the parts in different locations and angles. In other words, the part under test does not have to be fixed at a highly accurate location, i.e. a highly accurate handling system.

The following steps will be taken prior to every measurement:

First Pattern recognition - for spatial (x, y) locate.

Line detection – for angle detection.

Images rotate – for orthogonal measurement.

Second Pattern Recognition to provide the accurate location after zeroing the angle.

In case there is no change in the angle positioning a single alignment mode can be used. In this mode just single pattern recognition will be performed to locate the part. This mode provides faster cycle time.

The following screen will pop up during the first training of the Alignment instruction:

Pattern Recognition Parameters

Pass Criteria [0.0 - 1.0] 0.4

Recognition Speed

Fast

Normal

Slow

Recognition Method

2 D Correlation

Projections

With Edge Extraction

2 Lines Inter section

Manual Pointing

Locat Using Blobs

Alignment with Angle Correct to Zezo Degree

Wait For success recognition

Wait

On Camera# 0

Delay Between Recognitions: 0 [Milli Secons]

ID: 6

Search with Motors

Choos Motor

Move Increment 0

Search Distance 0

Continue Train

Just Parameters

Cancel

Pass Criteria

This number represents the Matching level of the pre-trained template and the one of the part under test. 1.0 means that the matching level should be 100%; which will naturally cause lots of failures. 0.0 means that every close template might be confirmed and that will cause lots of false recognitions. The default number is 0.55 and should be usually proper. In case of large process variation this number can be decreased, in case of false alignments it should be increased.

Recognition Speed

The default setting is NORMAL. FAST will shorten the alignment process but at the same time will reduce its accuracy. SLOW will be much more accurate but will extend the process time.

Recognition Method

- 2D Correlation
 - For most of the cases this default method is recommended.
- Projection
 - For high process variation this method help to “average the variations” resulting better recognition stability.
- Edge extraction
 - In case the process variation is mainly color variation, the algorithm can ignore the colors and recognize only the object edges.

Alignment with angle

If this option is selected, the system will align the object image for X and Y shifts, as well as for rotation ones.

Wait for success recognition

This option enables continues iterations of recognition attempts before announcing Alignment Failure. A useful example for this option is when objects are being transported on a conveyor and have to be recognized on the run. This option performs an object search and will start the analysis of the image after successful recognition.

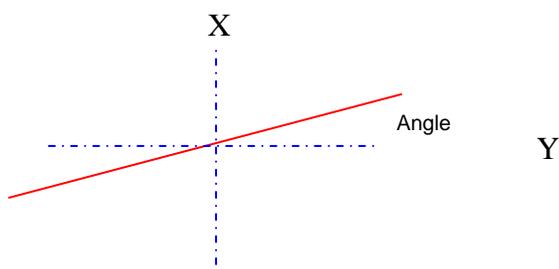
Search with motors

This option is similar to the previous one except the object (or the camera) is being moved by the motor which by itself is controlled by the system. The object will be scanned along the “search distance” range until the alignment (recognition) will be successful.

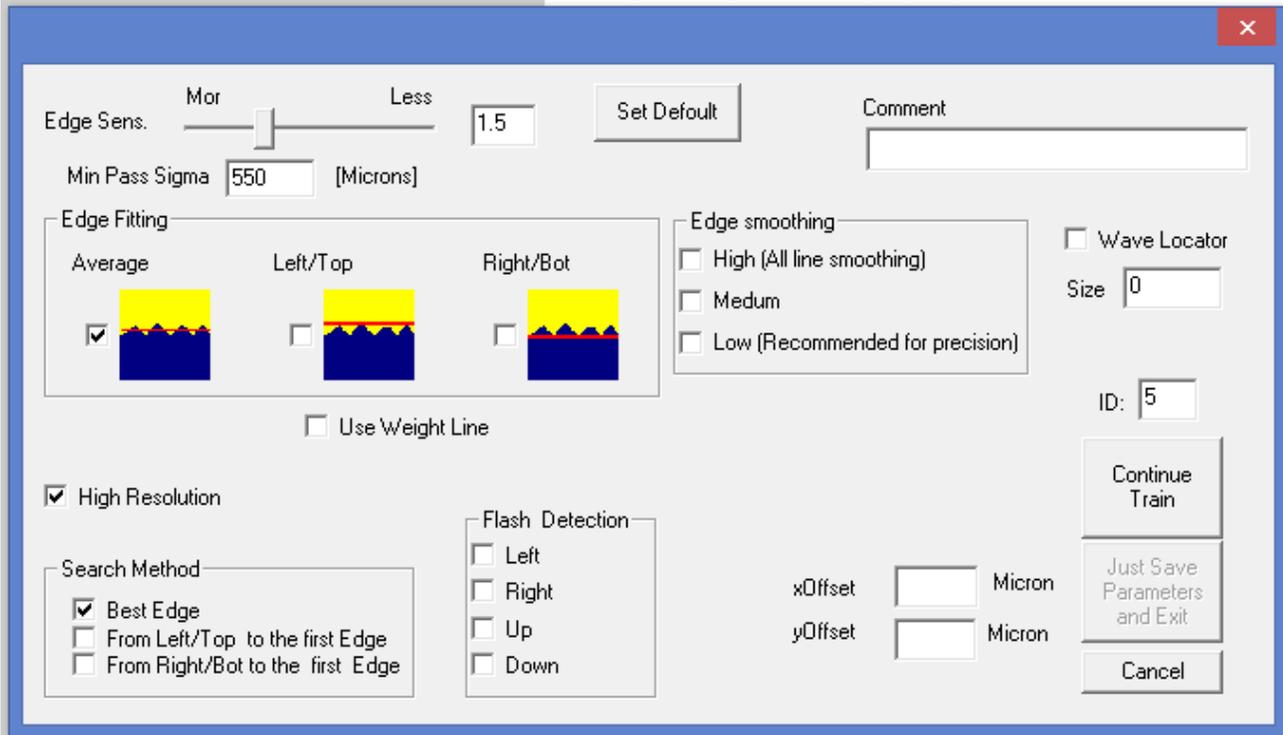
DETECTION:

The DETECTION group contains several geometrical detection features which will be described hereafter.

Line Detection:



When this instruction is selected the following dialog box will pop up:

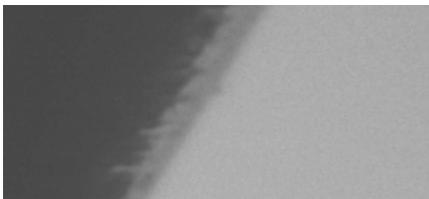


Edge Fitting

In cases where the repetition result (measurement stability) is not sufficient, it is possible to select the edge that we should be lock on.

Search Method

Sometime the part under measure has a noise in the edge as the following example:



In this case the "best edge" can be found on the inner line , so we can ask the machine to search the line from the right and to stop when the first edge will be accrue.

Best Edge- The machine search for best edge within the search area.

From Left/Top- The machine search the first edge starting from the Top/Left

From Right/bot- The machine search the first edge starting from the Right/bottom

Continue Train:

Lead you to define the cross section of the line under measurement and the search area of interest.

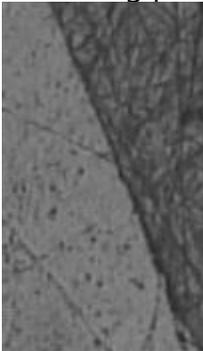
Just Parameters and Exit:

Lead you to define only the search Area of interest.

Edge smoothing (not in use)

In cases where the background of the Object-Under-Test is grainy, the outline of the Line-to-be-Detected may not be clear enough. This feature will perform a pixel-averaging along the line and will filter out the grainy background.

The following picture is the example when this feature may be helpful.



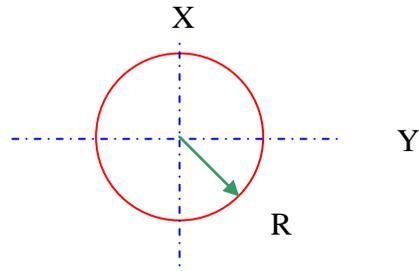
Flash Detection

This feature enables the detection of flashes along the detected line. A flash is like a spark along the line. The search for flashes can be applied to certain orientations relative to the detected line.

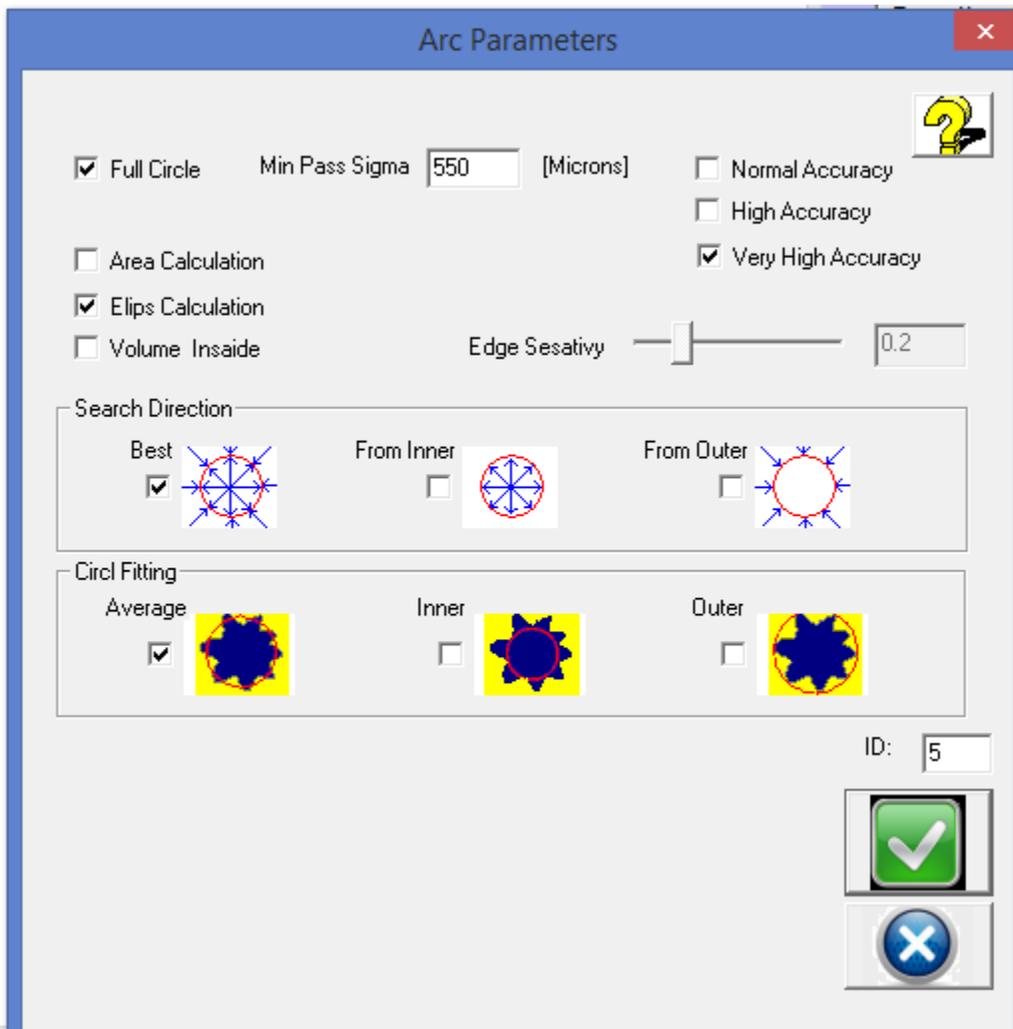
Binary Filter (not in use)

This is a special feature that can be used when an object silhouette is to be inspected. The binary filter enables the sharp differentiation between a line-pixel and a background-pixel. Please advise our support center for explanations.

Arc Detection:



When this instruction is selected the following dialog box will pop up:



Full Circle

When searching for a circle you need to indicate whether full or partial (arc) circle is to be identified. If set then a full circle will be analyzed, otherwise a pre-defined arc will be analyzed (you'll have to point the Arc Start, Middle and End points).

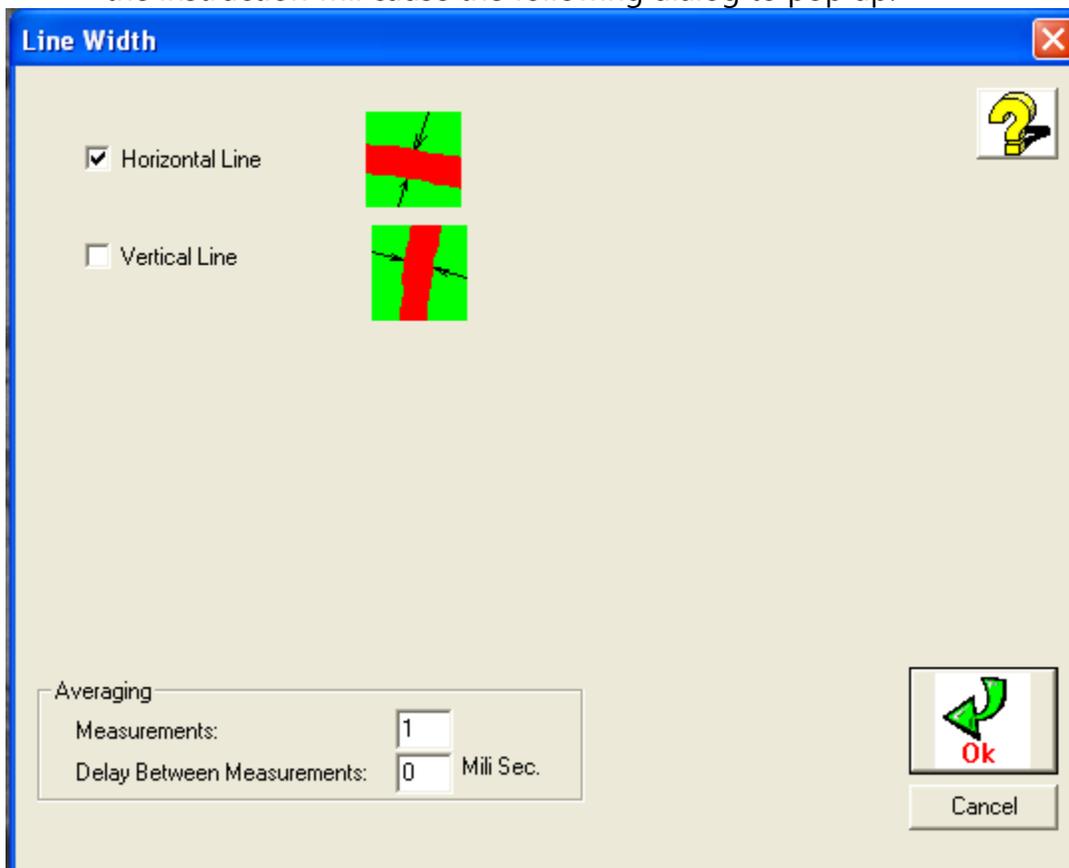
- The other parameters work the same as in line detection.

Box Detection:

This instruction will search for quadrangle geometrics, similar to circle detection.

Line Width:

This instruction is useful when the thickness (width) of a line have to be measured. Selecting the instruction will cause the following dialog to pop up:



Manual Measurement

This is a special instruction that enables to perform manual measurements on the image frame. It is useful in cases where the distinctness of the geometry is not sufficient for the automatic algorithm and human eyes could make the judgment. During the execution of the program there will be a pause and the operator will be asked to point the requested measurement locations. The pointed spots will be recorded and displayed in the final results later on.

Locate Pattern

This instruction performs a search for a predefined pattern. It is useful for automatic parts counting where either the camera is scanning the area containing the parts or they travel under the camera on a conveyor. Selecting this pattern will cause a pop up of a dialog window that is similar to the Alignment dialog screen.



SURFACE DEFECT:

Surface Defects

This instruction performs surface homogeneity inspection. It can be applied for non-patterned surfaces and will look for exceptions in the uniform surface.

The following dialog will be displayed after the instruction will be selected:

The screenshot shows a dialog box titled "Surface Defect Setup" with a blue header and a close button (X) in the top right corner. The dialog contains several settings:

- Defect Color:** A group box containing three radio buttons: "Don't Care" (checked), "Brighter", and "Darker".
- Check options:** Three checkboxes labeled "Check2", "Check3", and "Check4", all of which are currently unchecked.
- Cell Size and Overlap:** Four input fields: "X Cell Size [Pixels]" (50), "Y Cell Size [Pixels]" (50), "X Cell Overlap [%]" (10), and "Y Cell Overlap [%]" (10).
- Sensitivity:** A slider control labeled "Sensitivity [0.0 to 1.0]" with a value of 0.45. The slider has "More" on the left and "Less" on the right.
- Global Area:** A checkbox labeled "Global Area" which is currently unchecked.
- Buttons:** A "Simulate" button is located to the right of the cell size fields. At the bottom right, there are "OK" and "Cancel" buttons.

Defect Color:

Select the defect shade relative to the inspected area (brighter, darker or both).

Cell Size:

The surface image frame will be divided into cells and the search for defects will be performed on cells level. This parameter will set the cells sizes and overlaps.

Sensitivity:

This parameter defines the severity threshold of the defect to be detected.

Global Area:

If set then the cell will be compared to the entire region of interest. In cases where stains that are larger than the cell size have to be detected, it will be useful to select this option. For small defects with high contrast relative to their background, the preferable option is not select the Global Area feature.

DATUM:

Line Datum:

This instruction will allow you to draw a virtual line relative to any other pre-detected line or between any two line intersections points.

Between points

Connect to Cross Sections or Circle Centers

Center ID 1: -1

Center ID 2: -1

Static

Parallel to Line

Line ID: -1

Center Line Between 2 Lines

Center Between 2 lines

Line ID 1: 0

Line ID 2: 0

Length: 100 [Pixels]

Line Width

Connect to line width between Max width

Line Width ID: -1

ID: 4

Connect to line width between Max width

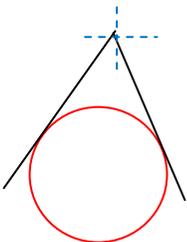
Line Width ID: -1

O.K.

Cancel

Circle Datum:

Circle to V block – you can fit theoretical circle between two lines that create the V shape (you need first to build the cross section between the two lines.).



Intersection

This instruction will calculate and mark a cross at the intersection point between two (non-parallel) lines. This may be a theoretical intersection since its coordinates might be out of the screen.

GEOMETRY:

Translate Image

Move the acquired image by X/Y pixels to X and Y directions.

Rotate Image:

Rotate the acquired image by the set degrees.

PROGRAMMING:

This set of Instructions helps to control the program flow.

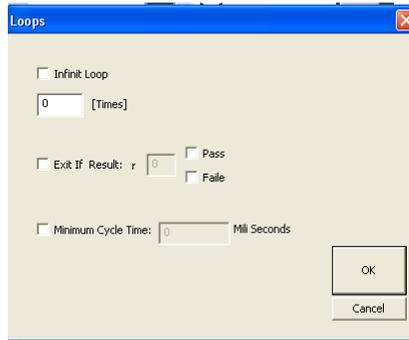
Delay:

Insert a delay between two consecutive instructions the set Milliseconds. This could be useful when you need to make sure that a certain process has to be completed before the execution of the following instruction.



Start Loop:

This instruction enables a repetition of a group of instructions for the set number of times. The repeated group starts from the following instruction and ends at the End Loop preceded instruction. The following screen will pop up when this instruction is selected:

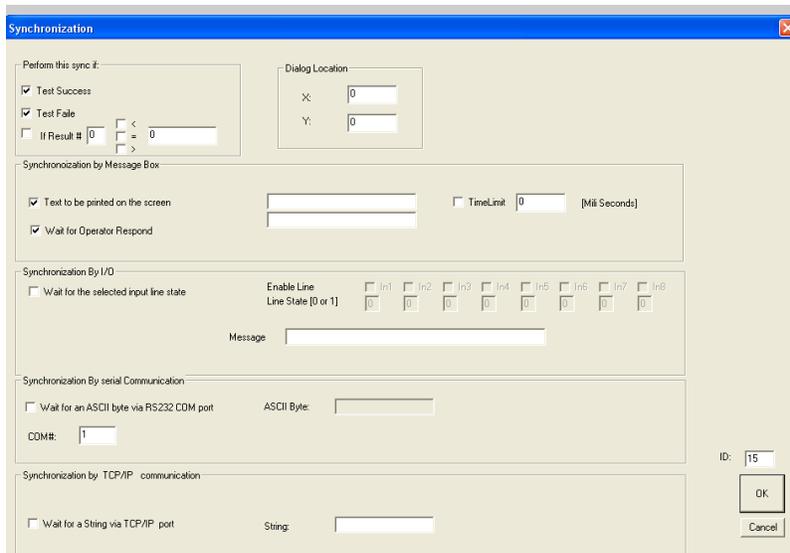


End Loop:

This is the closing loop instruction. See above.

Synchronization:

The Synchronization instructions enable the execution of the program to be synchronized with variety of external events. The following dialog screen will be shown when this instruction is selected:



There are four types of available synchronization modes:

Wait for operator

The selection of this mode will cause the program flow to pause every time it reaches this instruction. During the pause time the selected text message will be printed on the screen and the operator will be asked to confirm the message and click the continue button.

Wait for input state

The selection of this mode will cause the program flow to pause every time it reaches this instruction. The program will then wait for the selected external signal before continuing with the program flow.

Wait for RS232

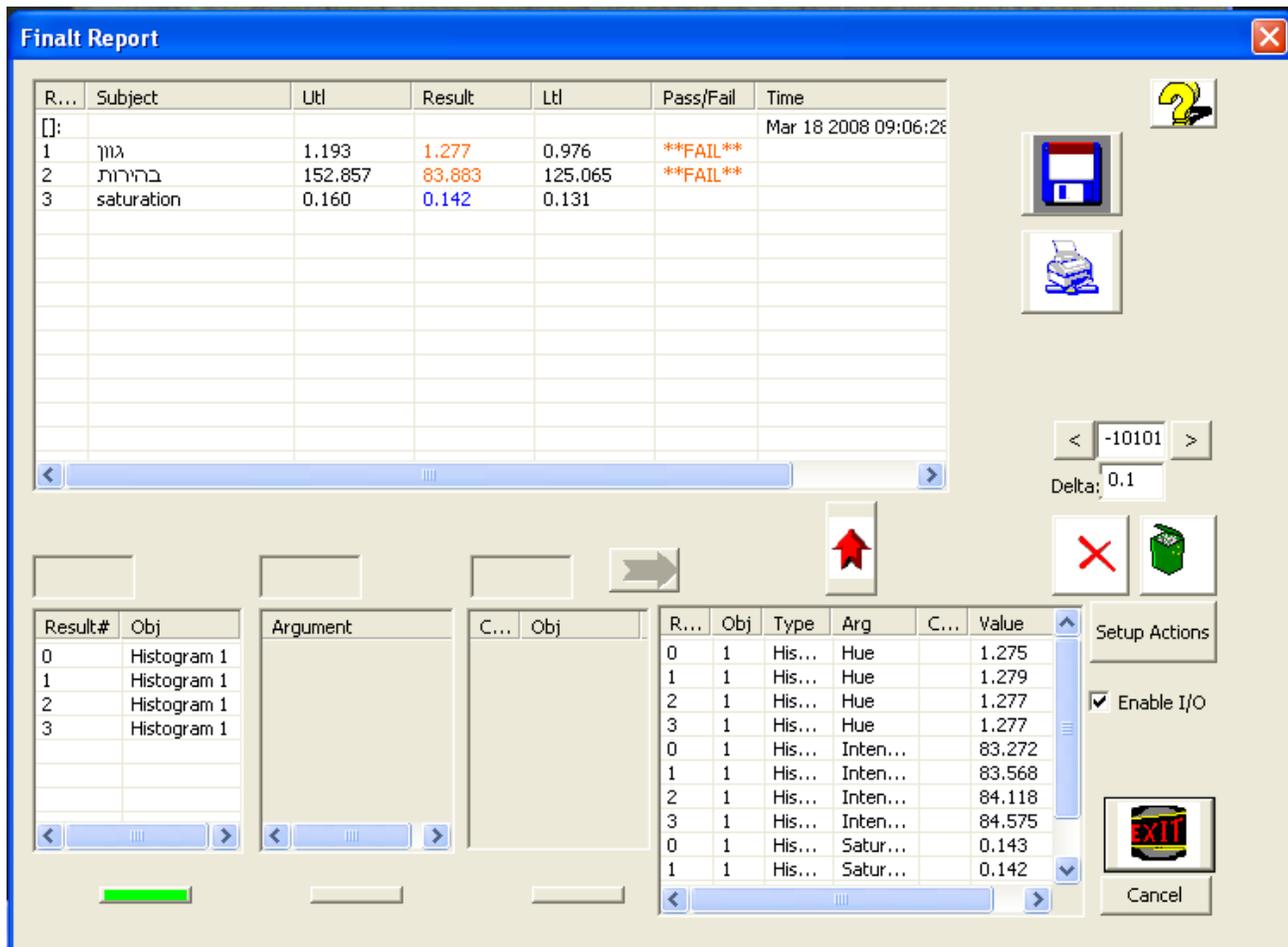
The selection of this mode will cause the program flow to pause every time it reaches this instruction. The program will then wait for the selected communication ASCII character to be received before continuing with the program flow.

Wait for Tcp /Ip

The selection of this mode will cause the program flow to pause every time it reaches this instruction. The program will then wait for the selected communication string to be received before continuing with the program flow.

Show results:

This instruction will cause the inspection results to be displayed on the screen at the end of the program run. When you first setup the program you'll be able to define the type of results you're interested in by using the following dialog screen:



R...	Subject	Utl	Result	Ltl	Pass/Fail	Time
[]:						Mar 18 2008 09:06:26
1	גוון	1.193	1.277	0.976	**FAIL**	
2	בהירות	152.857	83.883	125.065	**FAIL**	
3	saturation	0.160	0.142	0.131		

Result#	Obj	Argument	C...	Obj	R...	Obj	Type	Arg	C...	Value
0	Histogram 1				0	1	His...	Hue		1.275
1	Histogram 1				1	1	His...	Hue		1.279
2	Histogram 1				2	1	His...	Hue		1.277
3	Histogram 1				3	1	His...	Hue		1.277
0					0	1	His...	Inten...		83.272
1					1	1	His...	Inten...		83.568
2					2	1	His...	Inten...		84.118
3					3	1	His...	Inten...		84.575
0					0	1	His...	Satur...		0.143
1					1	1	His...	Satur...		0.142

In the above dialog screen you can generate the inspection report including all the required objects results, inter-objects geometrics and arithmetic's as well as tolerances and pass/fail criteria.

- The upper left screen displays the raw results; the ones that are direct derivatives of the measurements taken from the program instructions list.
- Double click on particular result object will select the measured object.
- Ones you selected an object result, the neighboring Argument List will be enabled for you to select the desired argument (action) to be applied on the selected object result. See below the description of the available arguments.

- When the selected arguments requires another result object (distance or angle between to lines, vector between two points etc.) you'll be asked to select the second object from the "Connect To" list. This list is actually a copy of the raw results list.
- After selecting the object and argument, click on the "chosen results" arrow to add it to the list.
- Repeat the above actions to add as many results as you wish.

Arguments Options

X

Select this argument when you need to measure the distance in the X axis between two elements from the raw results list.

Y

Same like the above but for Y axis.

Angle

Select this argument when you need to measure the angle between two elements (lines) from the raw results list.

RV

Select this argument when you need to measure the distance between two elements from the raw results list. This is useful for measuring center to center distance between two circles, center of masses etc.

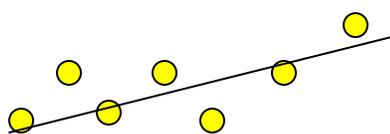
Flash

Select this argument when you need to count and mark the flashes along a selected line from the raw results list.

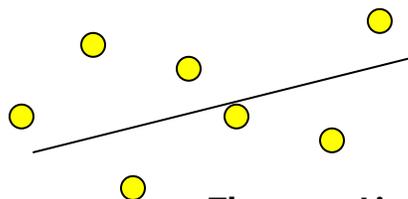
Score and Sigma results

Score number represents the object "detection quality". Since the system will detect the "best fit" for the desired geometry (line or circle), it will mark the detection success according to the match level between the actual detection and the best fit results. Value of 1.0 represents the best match while 0.0 represents the worst match.

Sigma number represents the variation level of the pixels along the "best fit" geometry. See example below:



Line object with low



The same Line object with higher

Final Results

Once you are done with filling the "chosen results" list, you may select the final results, set the pass/fail tolerances and define the arithmetic and logical inter-relations between them. Each "Final Results" item may comprise of a single or multiple "chosen results" selection. Once you made your selection and clicked the "move down" arrow, the following dialog box will pop up:

The dialog box is titled "Dialog" and contains the following elements:

- Players:** A text box containing the number "3".
- Subject:** A text box and a checkbox labeled "Show".
- Group Operation:** A group of checkboxes: "Average" (checked), "Average For Largest" (with a small box containing "0" next to it), "Max", "Min", "Sigma", and "Vector".
- Two Players Operation:** A group of checkboxes: "+", "-", "x", "1/2", and "2/1".
- Result:** A section with a formula editor showing "0 x 1 + 0 = 0" and a "Set" button below it.
- Tolerance:** A section with three input fields labeled "Upper Tolerance:", "Nominal", and "Lower Tolerance:", and a "Set Tolerance" button to the right.
- Buttons:** "OK" and "Cancel" buttons at the bottom right.

In this dialog box you'll be asked to fill and select the following:

- Type in the result name in the subject field. This name will be used in the final results table and print.
- Perform arithmetic operations on the group of results.
- Set the pass/fail tolerances of the results.
- Set the severity level (critical failure) for every result failure. Critical failures will cause a halt of the program and an intervention of the operator.

Group operation

- When using the option loops in the program, that option allowed you to combine all the scores you got in the loop into one score.

Mark the scores you want to combine and then you can choose the average score, sigma, max score or min score

- When extracting the xy data of two objects you can calculate the vector by ordering them in X1
Y1
X2
Y2
And select "vector" from the list.

Show and print the results

Clicking on the "printer" icon in the "show results" screen will open the following dialog box:



Print Report

Part #: pp123 Comment: my comment
Lot: 1123 Operator: Micha Geffen
Date: Jul 04 2006 16:21:26

www.brooks.com
972-43988185

Raw	Subject	Result	Pass/Fail	Max	Min	Utl	Ltl
[11]:							
1	D1	-81.288				-73.159	-89.416
2	Arc Diameter	222.388				244.627	200.149
[12]:							
1	D1	-81.288				-73.159	-89.416
2	Arc Diameter	222.388				244.627	200.149
[13]:							
1	D1	-92.368	**FAIL**			-73.159	-89.416
2	Arc Diameter	96.081	**FAIL**			244.627	200.149

Show Dates

✖

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Here you can do the following:

- Clear a selected line
- Clear the whole result list
- Print the displayed results



Save Image:

This instruction will save the current image into the hard disk. When you call the instruction for the first time it will ask you to define the saved file name and location. The system will automatically assign an incremental index to the file name every time you'll repeat the run of the program.

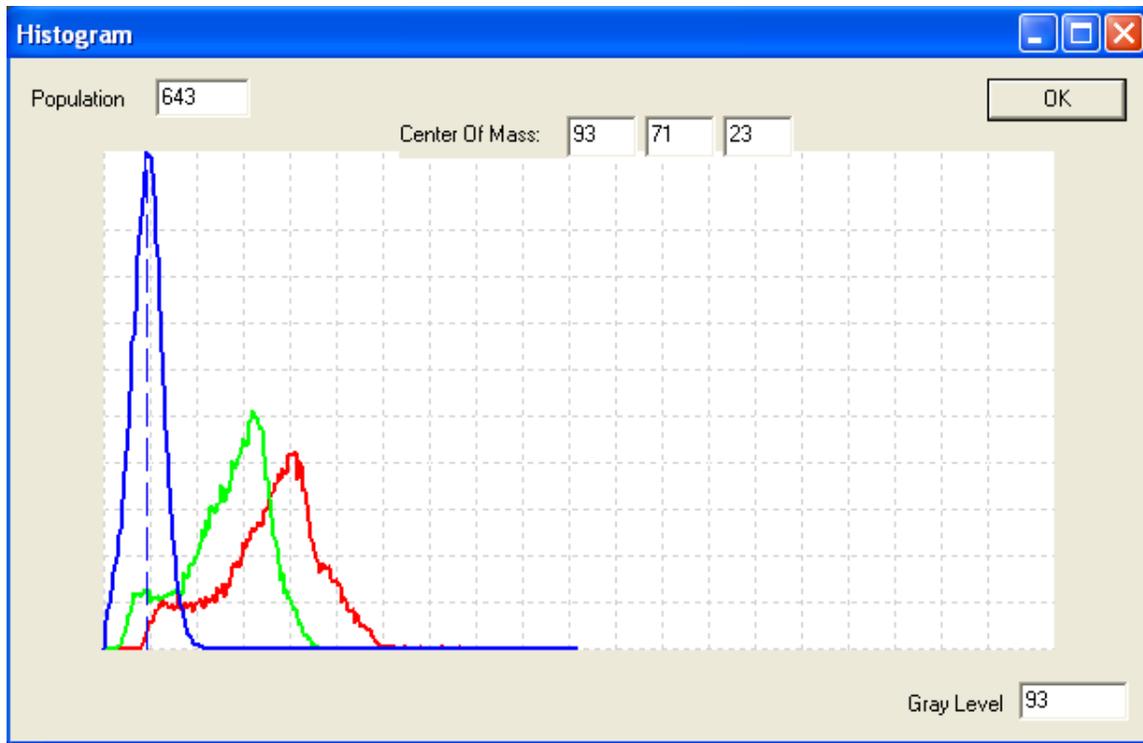
PRE PROCESSING:

Smooth:

This instruction will smooth the acquired image by using a spatial average filter.

Histogram:

This instruction will generate a gray level histogram of the selected area pixels. The following graph will be shown:



Histogram Equalization:



Not implement yet

Edge Extraction:



This instruction will transform the acquired image into an image with contour display only. This feature may be helpful in cases where the original image is too “noisy” and it would be easier to apply the DETECTION instructions on the modified image.

Blobs:



The BLOBS instruction will detect all kind of blob shapes in the acquired image. You’ll be able to set the detection level in terms of brightness, contrast and sizes of the blobs. The following dialog window will be displayed when the BLOBS instruction will be selected:

C	Area	Av I...	Ma...	Min...	Xc	Yc	Peri
192	1...	81...	89...	68...	369...	99...	0.00C
358	...	81...	89...	70...	286...	114...	0.00C
396	1...	83...	89...	74...	312...	115...	0.00C
417	...	82...	89...	68...	372...	114...	0.00C
630	...	84...	89...	72...	347...	133...	0.00C
632	2...	83...	89...	71...	401...	135...	0.00C
889	1...	85...	89...	73...	528...	150...	0.00C
1...	...	79...	89...	56...	775...	153...	0.00C
1...	1...	81...	89...	72...	292...	154...	0.00C
1...	...	83...	89...	76...	437...	156...	0.00C
1...	...	83...	89...	70...	484...	157...	0.00C
1...	1...	83...	89...	71...	420...	158...	0.00C
1...	...	86...	89...	82...	377...	167...	0.00C
1		84	89	79	368	166	0.00C

Threshold

Set the threshold level to adjust the contrast level for the blobs to be detected. This is also considered as the “binarization” level.

Perform Blob

Switch the blob calculation on and off.

View binary Image

Switch the binarization display on and off.

Blob Parameter

- * Select the type (dark or bright) of blobs you are interested in.
- * To detect unclose contour shape you will need to add virtual "wall" that allow you to detect the shape
For example: this is unclose contour shape, to detect it you will need to add 2 walls, one on the top and one on the bottom



Blob List Table

The table displays the list of the detected blobs and their following parameters:

Area

Average Intensity

Max Intensity

Min Intensity

X center of mass

Y center of mass

Double click on a specific blob in the table to see its location on the image.

Projection

This instruction will average a selected part of the image by summing the rows or columns (according to the X or Y selection) of the selected part. This feature may be useful to enhance lines in cases where the line to be detected is not clear enough compared to its surrounding. Select the Y projection to enhance horizontal lines and X projection to enhance vertical lines.

MOTION: 

Move: 

This instruction will enable you to control any motor in the system as part of the inspection program. You'll be asked to define the motor and its movement parameters. This is useful when you need to scan the inspected unit.

Valve State

Not defined yet.

Stil Scan:

Tree basic operations Mode:

- 1- Point measurement
- 2- Line (Cross Section) Scan
- 3- Area Scan

During the train you can choose multiple Points measurement commands , the points locations are relative to the automatic navigation (pattern recognition) .

The following dialog window will be displayed when the STILSCAN instruction will be selected:

The dialog window is titled "STILSCAN" and is divided into several sections:

- Motion Parameters:** Contains input fields for Step X (10 [Microns]), Step Y (10 [Microns]), Speed (0 [Microns/Sec.]), and a green gear icon.
- Scan Mode:** Includes checkboxes for Point, Cross Section (checked), and Area. It also has a Thikness checkbox, a Sample Average field (1), a Dealy Before Measure field (0 [Milicsec]), and a Wait for Motor checkbox.
- References:** Contains checkboxes for Subtract best line and Subtract reference line, and a Step field (0 [Microns]).
- Graph:** Includes checkboxes for Show and Auto Scale (checked), and Min (0) and Max (1000) fields.
- Motor:** An ID field containing the value 15.
- Buttons:** An "O.K" button with a red checkmark and a "Cancel" button with a red X.
- Save On:** A text field containing "C:\CrossCHR.csv".

Motor parameters: define the step size (resolution) for each motor and the general scanning speed.

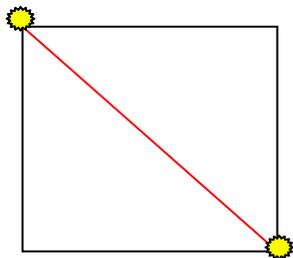
If you select "cross section" or "area" you will be asked to select two points. Click on the green wheel to start pointing.

In this mode live video will be displayed and you can use the mouse to move the object under the lens using the motors. This is done by clicking the mouse at the desired location on the screen, which will then cause the stage to move so the clicked point will be shifted to the center of the screen.

Click "continue" to select the second point.

Scan Mode:

- Point: scan to only one point.
- Cross Section: the line between two points.
 - o You can view your scan with the graph viewer.
- Area scan: scan the area between two points that create a diagonal line.



- o Your data will be saving as two files: raster and raw data.
- o You can view your scan with the 3d viewer.
- Thickness: use the chr thickness option.
- Sample average: this method help to average the results to get better recognition stability.
- Delay before measure: add delay before each measurement, use for improving the scan in high speed scans.
- Wait for motor: select this option when you don't have encoders.

References: (Enable in cross section mode)

- Normalize the results with a reference line when tilted surface used.
- Subtract line best : find the best line and subtract it from the results
- Subtract Reference Line: after selecting the scan line you will be asked to select a second line on a smooth area to use as reference line.
- Fill in the step size to use you when scanning the reference line.

Graph: (Enable in cross section mode)

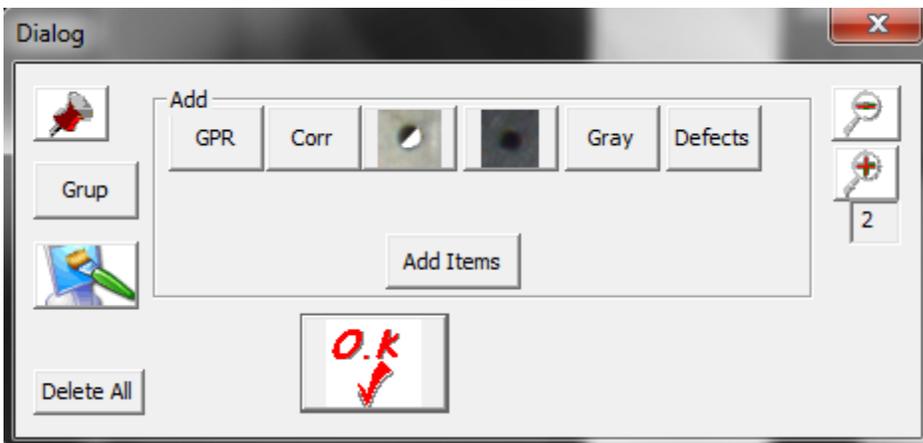
- Show: in the end of the scan load the Graph viewer.
- Auto Scale: auto scale the graph.
- Min\Max: set the graph Y axis limits, useful for filtering the results.

Save on (Enable in cross section mode)

- Save the results in a user define location.
- This instruction is currently in develop; more features will be available in the next versions.

Grid Verification

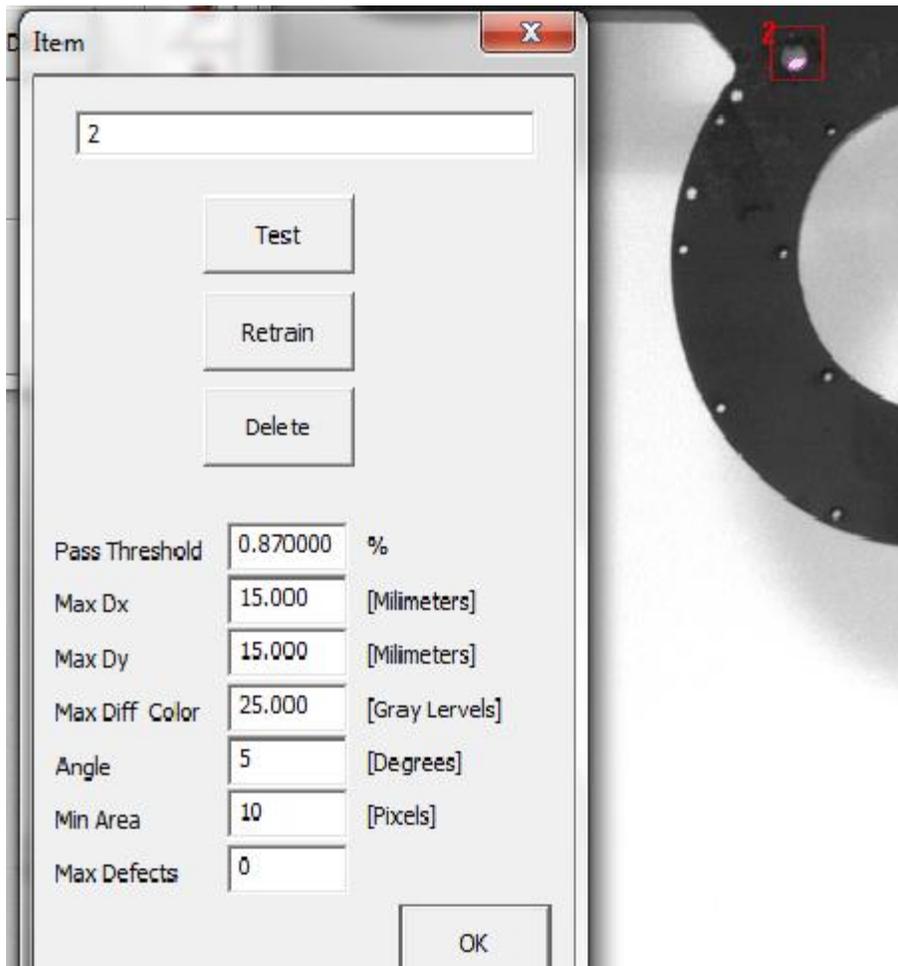
The following dialog will be shown:



In the add section you can find six bottoms for the following Inspection tools:

- GRR – to learn the geometric shape
- Corr – to learn pattern
- White hole- to learn hole in which the background of the hole is darker than the hole
- Dark hole- learn hole in which the background of the hole is brighter than the hole
- Gray- learn the intensity of the spot
- Defect- to find a defect in a clear area

Double click on feature (2 un this example) the following form will be shown:



The following options can be performed:

- Change the feature name from 2 to other text (for example "Upper Hole")
- Test the feature
- Retrain the feature
- Delete the feature
- Edit feature parameters:
 - Pass threshold is relevant for Corr. option, the best recognition will be 1, since there is some variation between parts, and this number should be less than 1.
 - Max Dx Dy , the max distance that the current feature found relative the trained.
 - Max Diff color, relevant for Gray option, is the max gray level variation allowed.
 - Min area , relevant for GPR
 - Max Defects ,relevant for defect inspection, the maximum defect allowed

SPC:

in the Machine Configuration screen (the first screen) you can define:

1- SPC folder.

2- Check the "Automatic SPC Save" , the results will be saved automatically for every measurement.

The SPC will be saved in the folder: SPC folder\Product Name.

In the Result form, check the "Show" for each result that will be saved to the SPC file.

For Manual saving:

Uncheck the "Automatic SPC Save" in the Machine Configuration screen.

Check the "Live SPC" in the Product Screen.