

# AKI Probe Sample Software Overview

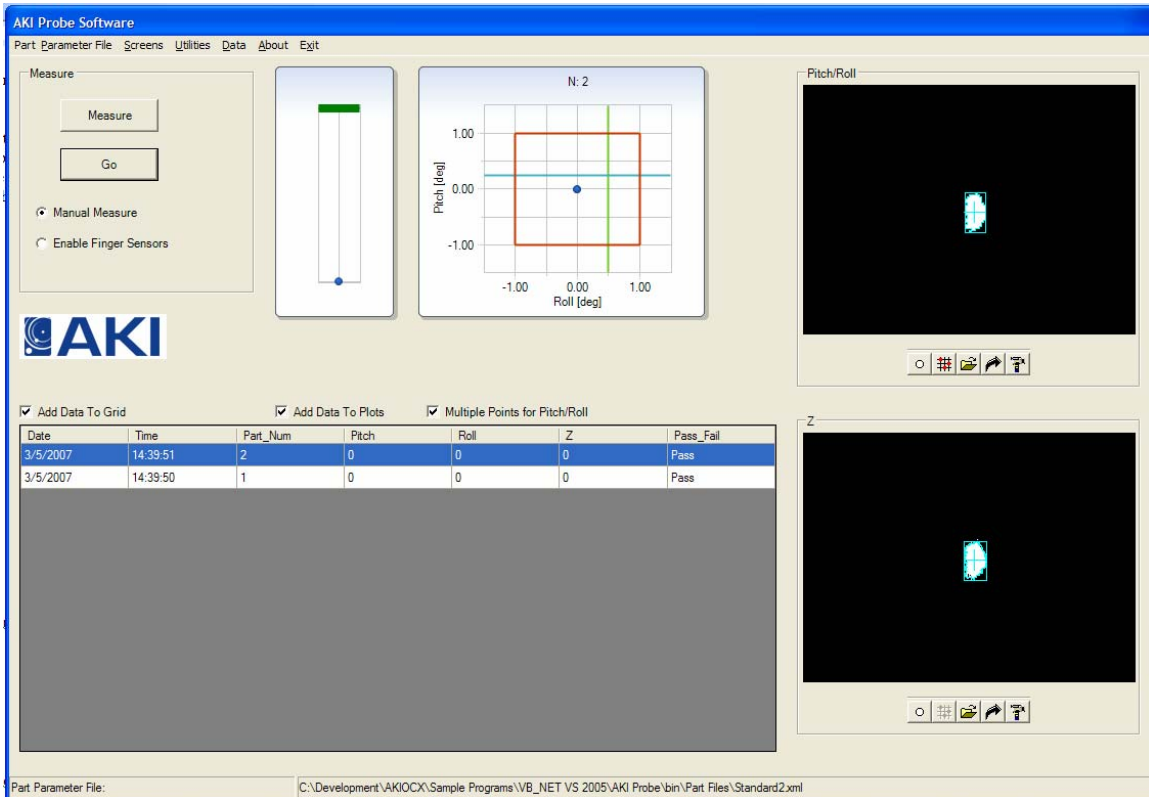
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### AKI Probe Program Quick Start/Definitions

#### Probe Software Overview

This manual gives basic definitions and parameters suggestions. Of course, parameters vary depending on the parts being measured etc.

This probe has been designed to measure static attitude angles on both conventional suspensions and Head Gimbal Assemblies. The probe parameters should be optimized for each specific material type in order to achieve adequate measurement results. A thorough explanation of each of the available probe parameters is detailed in the “AKI DLL Software Reference”.

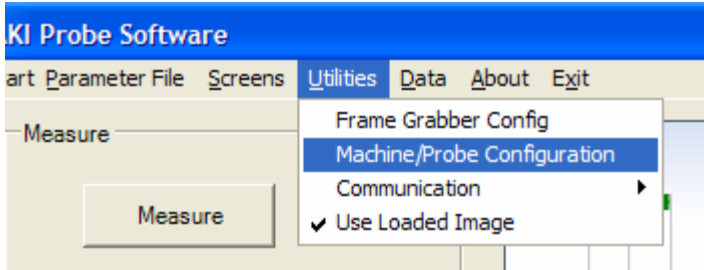


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### Probe Calibration

All Values in this screen are Machine Specific, NOT Part Specific. This means they do NOT change when you load different Part Parameter Files. These should only change when you recalibrate the machine, replace the probe, etc. They will be the same for a part types on this machine.



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Machine and Probe Config

Exit

Machine Configuration

Probe Only

Probe On Satis

Probe Configuration

Calibration Date

IDEMA Convention

Calibration

	Reference	Slope	Set Zero Ref	Spot Parameters
Pitch	<input type="text" value="3.9680"/>	<input type="text" value="0.012000"/>	<input type="button" value="Zero Pitch"/>	
Roll	<input type="text" value="2.9430"/>	<input type="text" value="0.012000"/>	<input type="button" value="Zero Roll"/>	
Z	<input type="text" value="78.0020"/>	<input type="text" value="0.236000"/>	<input type="button" value="Zero Z"/>	

### **Calibration Date:**

The text string will be written to the data file.

### **IDEMA Convention:**

This text string will be written to the data file.  
No functional use of this is made.

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### Machine Configuration:

1. If you are using this probe on any other machine besides a Veeco Satis machine, select “Probe Only”
2. If you have this computer connected to a Veeco Satis machine and would like to control it with this software, select “Probe on Satis”. This will activate additional windows and functions that let you control the Satis.

### Calibration

These parameters MUST be setup before using the probe.

#### Slopes:

You may enter in the slope values provided by AKI, or you may perform your own Slope calculations:

**NOTE: whatever units you type in for the [units]/pixel ratios, you must match these SAME units when entering the Specifications and Correlation parameters.**

1. Manually Enter in AKI Parameters:

Simply type in the slope values into the correct fields.

For example: a typical V8 probe may have the following:

- Pitch Slope = 0.012 degrees/pixel
- Roll Slope = 0.012 degrees/pixel
- Z Slope = 0.236 mils/pixel (or 0.006 mm/pixel)

2. Calculate Slopes:

Customer may have their own method for doing this, but here is a standard method: This example is for Pitch but applies to Roll and Z as well.

- Set the Correlation Slope in the Part Parameter Screen to 1.
- Set the Correlation Bias in the Part Parameter Screen to 0.
- Type in “0” (zero) for the Calibration Reference.
- Take a measurement of a zero surface. Record the Pixel Value reported by the measurement in the “Pitch” column of the data grid.
- Put in a known angle block or wedge prism (for example: 2 degrees).
- Take a measurement of this surface (make sure the entire range of the angle block is in the pitch direction: i.e. turn the camera on live and rotate the block until 100% of the angle component is in the pitch direction and there is no component in the roll direction). Record this Pixel Measurement.
- Calculate the Slope by  $(2' - 0') / (\text{Pixel}_2 - \text{Pixel}_1)$ . This is your Pitch Slope.
- Repeat for Roll and Z.

#### References:

The reference value is simply the negative of the measurement taken on the Zero Reference surface. This will result in a value of 0 when a measurement is taken

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on the Zero Reference Surface. You may do this manually, or use the button labeled “Zero Pitch” (or Roll, Z).

To use the button: (this example is for Pitch)

1. Put a Zero Reference Surface under the Probe.
2. Click the “Zero Pitch” button. This will:
  - a. Zero the Calibration Reference.
  - b. Zero the Correlation Reference.
  - c. Take a measurement using the slope that was already entered. It will then take the negative of the result and put it in the Reference box.
3. Repeat for Roll and Z.
4. If done correctly, you should be able to go out to the main Screen and select “Measure” and get a value of 0.00 for the parameter you zeroed.

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### Part Parameter File

The user can make a “Part Parameter File” for each part type they would like. The Part Parameter File has the following parameters:

- To open and new Part Parameter File, select “Part Parameter File – Open”, from the main menu bar.
- To save the currently loaded file to a different name, select “Part Parameter – Save As” from the main menu bar
- To edit parameters for the currently loaded file, select “Part Parameter File – Edit” from the main menu bar.

Part Parameters for Part Name: C:\Development\AKIOCX\Sample Programs\VB\_NET VS 2005\AKI Probe\bin\Part Files\Standard2.xml

Exit

Save

Specifications

	Nominal	USL	LSL
Pitch	0.25	1.00	-1.00
Roll	0.50	1.00	-1.00
Z	29.500	29.750	29.250

Use Pitch Compensation    0.0000 deg/z\_unit

Correlation

	Slope	Bias
Pitch	1.000	0.000
Roll	1.000	0.000
Z	1.000	0.000

Pitch/Roll Parameters

Brightness: 96

Contrast: 96

Exposure: 4 msec

Threshold Type:  Absolute  Percent

Low Tail: 0

High Tail: 0

Threshold: 50

Min Area: 4

Use Smoothing:

Smooth Value: 4

Z Parameters

Brightness: 96

Contrast: 96

Exposure: 4 msec

Threshold Type:  Absolute  Percent

Low Tail: 0

High Tail: 0

Threshold: 50

Min Area: 4

Use Smoothing:

Smooth Value: 4

#### **Specifications:**

These values are used for the following:

1. Plotting the graphs.
2. Determining the Pass/Fail status of a part.
3. Plotting the grids (if the grid option is selected) on the Spot Display.

#### **Correlation:**

These values can be used by the customer to fine tune correlation between the machine running this program and a Gold Measurement machine. These parameters are optional

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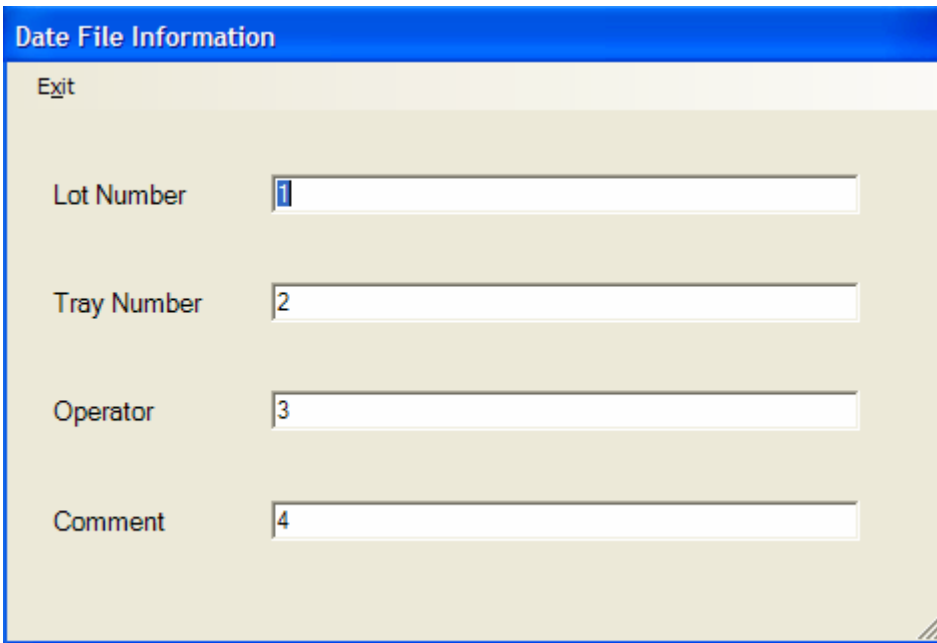
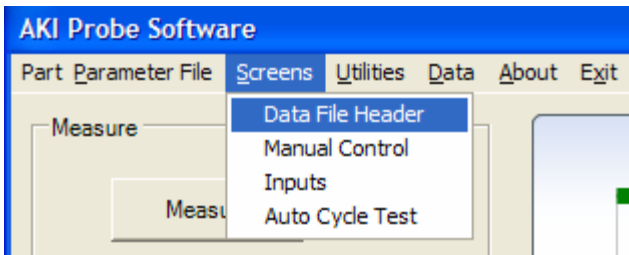
and do not have to be used. Many times just the Calibration parameters are enough (see Calibration Parameters section in this manual). If you choose not to use these parameters, you MUST set the Slopes to “1” and the Biases to “0”.

### Spot Parameters:

For explanations of the Spot Parameter for Pitch, Roll and Z, see Appendix A. You can modify the Spot Parameters here, however it is easier to modify them by clicking the “open folder” tool icon below the Display Window for either Pitch/Roll or Z. By doing this you can change a parameter, then click the “Quick Measurement” button next to the “parameters” icon and see the change in the spot processing real time.

## Data File Header

You may change the data file header before you write the data:

A screenshot of the "Date File Information" dialog box. It has a blue title bar and an "Exit" button in the top left corner. Below the title bar are four text input fields, each with a label to its left and a small number in a box to its right:

- Lot Number: [1]
- Tray Number: [2]
- Operator: [3]
- Comment: [4]

You may enter anything you like into these fields. They will be written to the data file as part of the header information.

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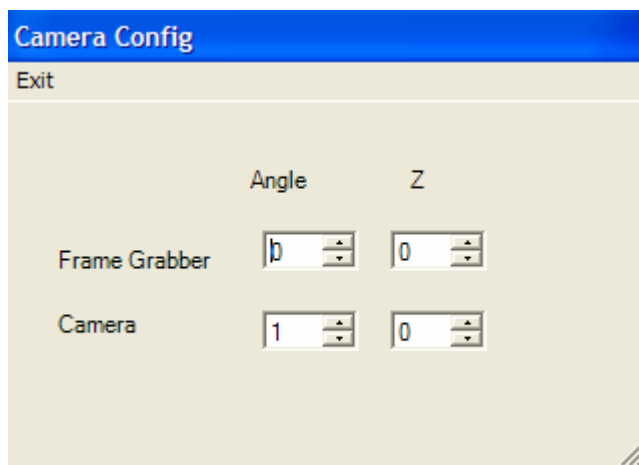
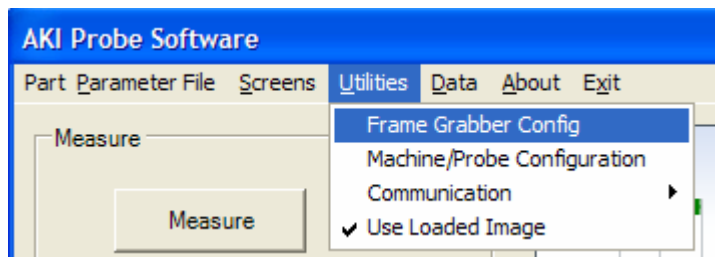
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You may also change the titles of each field by double clicking on them.

To Save data after taking measurements, select “Data – Save As”. This will save the data as a text file with comma delimiters.

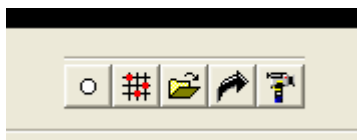
## Setup Frame Grabber and Camera Ports

You need to set the correct frame grabber and camera ports for the Pitch/Roll channel and Z channel.



Usually you will only have one frame grabber, so set both Angle and Z to “0”.

Now set the Angle camera and the Z camera to the correct cameras. You can do this easily by turning one of the cameras (for example Pitch/Roll) to live by clicking on the Camera button:





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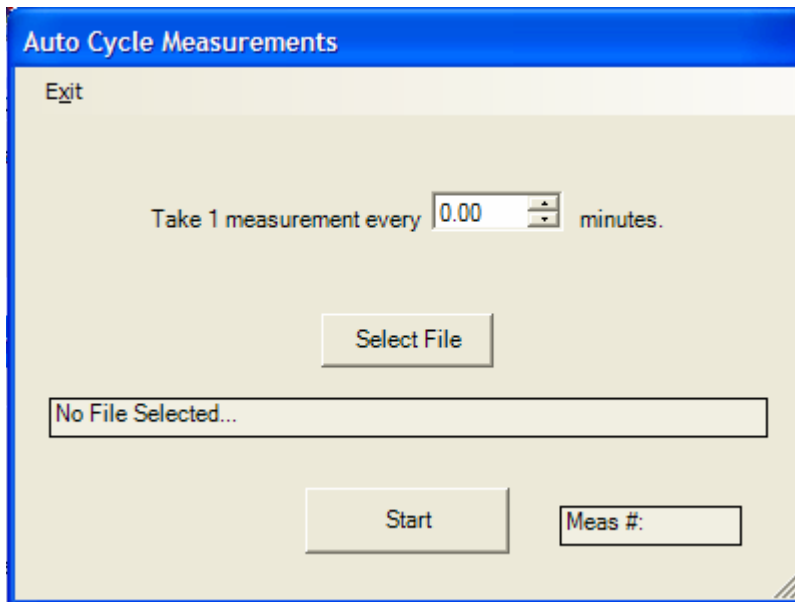
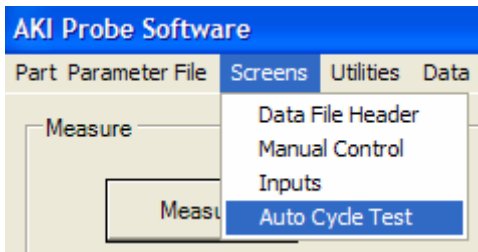
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With it on live, get a spot in the FOV, then just move a pencil back and forth and make sure this is the correct camera. If you do not see what you expect, change the camera and try again.

NOTE: it is best to not turn on live for both cameras at the same time. You may do this if you want: the only problem is a potential lock up. This depends on the quality of your video card and computer.

## Tools/Options

There is an “Auto Cycle Test” you can use to collect data automatically.



You can select a frequency, file name and then let the test run as long as you like.

## Appendix A: Spot Parameters

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### Contrast:

Range: 0 to 100.

Specifies the contrast of the image to be acquired. 0 (low contrast) and 100 (high contrast).

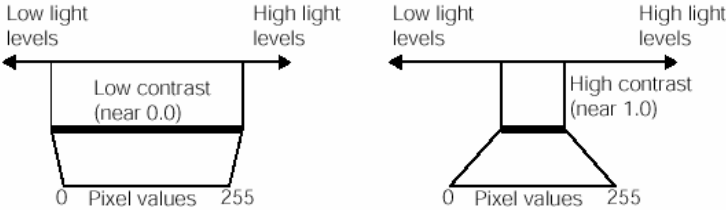
### Brightness:

Range: 0 to 100.

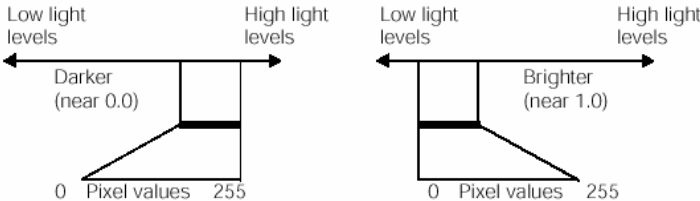
Specifies the brightness of the image to be acquired. 0 (dark) and 100 (bright).

The Contrast and Brightness values control how different light levels are mapped to pixel values. All the light levels entering the camera must be mapped to a pixel value from 0 to 255 (for an 8 bit image).

Contrast determines how the light levels are mapped to the 256 light levels. A low value closer to 0 maps more light values to the pixel range. A high value closer to 100 maps fewer light values to the pixel value range. Light values that are below or above the contrast threshold are mapped to the lowest and highest pixel values, respectively.



Brightness determines where the center of the contrast mapping window falls relative to the range of light levels. Brightness values closer to 0 place the center of the mapping window toward the higher light levels, resulting in a darker image. Brightness values closer to 100 place the window toward the lower light levels, resulting in a brighter image.



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### ***Exposure Time:***

Units are msec. You may use a fraction of a millisecond. (i.e. a standard value is 0.2 msec).

Do not confuse this with the **Brightness** variable. This will give a brighter image, but not for the same reason. (see the description on brightness). This is how long the CCD is imaged: shutter time.

If the camera is not a shuttered camera (such as a Sony HR 70, then this value is ignored; just send in a 0.00)

### ***Threshold Type:***

#### **Absolute Thresholding:**

The simplest technique for segmenting an image is to pick an absolute threshold pixel value. All pixels with grey-scale values (0 to 254 range) below the threshold are assigned as background pixels, while all pixels with values above the threshold are assigned as object pixels. During analysis, background pixels are ignored and object pixels are analyzed.

#### **Percentage Thresholding:**

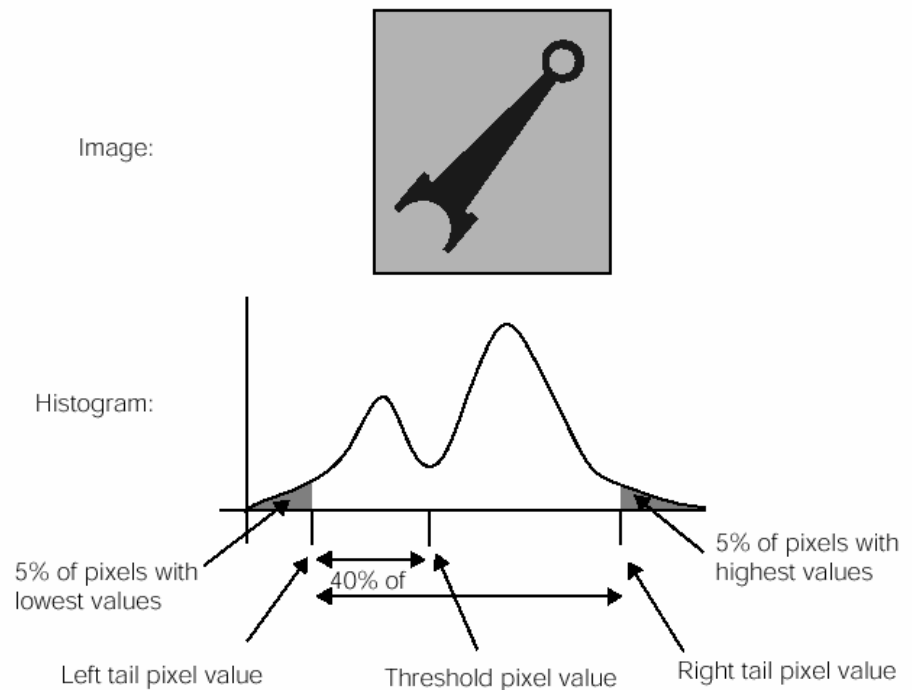
The absolute thresholding technique requires that you determine the appropriate value for the segmentation threshold. The most common method is trial and error. However, if the images used by your application contain image-to-image variations in brightness, then a static threshold value does not segment the variety of different images correctly.

A percentage threshold is specified using two sets of parameters. First, you specify the percentage of the pixels within the image that you want the tool to treat as tail pixels. Tail pixels are those pixels within the image that have the lowest and the highest values. In a histogram plot of pixel values, the tail pixels appear at the left and right sides of the histogram. The vision tool determines the pixel values above and below which the percentages of pixels that you specify lie. These pixel values are called the right tail pixel value and the left tail pixel value. The second parameter you specify for a percentage threshold is the threshold percentage (1 to 100 range). The vision tool determines the pixel value that lies at the specified percentage of the distance between the two tail pixel values, and the tool uses this pixel value as the threshold pixel value. The following figure shows how the Blob tool computes a percentage threshold. In this example the following values were used:

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Low Tail: 5 %  
High Tail: 5 %  
Threshold: 40 %



Note that when using Percentage Thresholding, the Contrast and Brightness can really influence the outcome. For example, you may have the contrast too high, and it will seem as if the percentage thresholding routine is not working (it might be selecting the entire field of view as the spot). In fact it is working, you just need to use “trial and error” to determine the correct Contrast and Brightness values.

### **Threshold Value:**

0 to 254 for Absolute Thresholding

1 to 100 for Percentage Thresholding

This is the Threshold Value. See the explanation on “Threshold Type” for a description of how this value is used for both “Absolute Thresholding” and “Percentage Thresholding”.

### **Low Tail:**

The percentage of low-value pixels to exclude as tail pixels. See the explanation on “Threshold Type” for a description of how this value is used for “Percentage Thresholding”.

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### **High Tail:**

The percentage of high-value pixels to exclude as tail pixels. See the explanation on “Threshold type” for a description of how this value is used for “Percentage Thresholding”.

### **Min Area:**

Specify the minimum size, in pixels, for a spot. Only features with a number of pixels greater than or equal to the value you specify are considered as spots.

### **Smoothing:**

True: A Gaussian sampling tool will be applied to the image before Analysis.

False: The acquired image will be analyzed.

Using this option can help analyze a spot that has areas of small pixel noise around it or within it.

The Gaussian Sample Tool will smooth the image with a process of removing or attenuating high spatial frequency information (i.e. features 1 or 2 pixels in size).

The smoothness value (SmoothPixelSize) should correspond to the feature size, in pixels, below which you wish to attenuate features.

In general, you should start with a smoothing value of 1 or 2 and increase it until you obtain the desired smoothing.

### **Smooth Pixel Size:**

Range: 0 to 20

When using the “Smoothing” option, the smoothness value (SmoothPixelSize) should correspond to the feature size, in pixels, below which you wish to attenuate features.

See the “Smoothing” explanation for more information on Smoothing.

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### ***Area Output:***

This is the output value for the Z or Angle area. The value will be in pixels.

This is an area measurement of the detected spot. Normally, this is used in conjunction with the "Percentage Thresholding" option in order to ensure that a "real" spot was found. For example, if the area is very large, the parameters (eg contrast) may not be set correctly and a large, dark area is being analyzed instead of the real spot.

### ***Height Output:***

This is the output value for the height of the Spot. This can be used in conjunction with the Width value to detect erroneous or bad spots. The value will be in pixels.

### ***Width Output:***

This is the output value for the width of the Spot. This can be used in conjunction with the Height value to detect erroneous or bad spots. The value will be in pixels.