SCORPION
VISION SOFTWARE®

# Getting Started Tutorial

## *Part 4 - Product Variants and Data Input Pages*

Tordivel AS • Storgata 20, N-0184 OSLO, Norway • Phone: +47 2315 8700 • Fax: +47 2315 8701 • office@tordivel.com • www.scorpionvision.com
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# Goals of this Tutorial

- Developing an 'Advanced Washer Inspection System with User Data Inputs' using Scorpion Vision Software and seeing it in action.
- The inspection set consists of a few small washers and a few large washers, each group (or class) of washers has an expected inner diameter and an expected ovality of the inner circle. The 'Advanced Washer Inspection System' first detects the washers, classifies the detected washer as 'Small' or 'Large' and then inspects the washer for 'minimum inner diameter' and 'minimum ovality of inner circle', and per values typed by the user on the 'User Data Input' page.
- Washers which have an 'inner diameter' or 'ovality of inner circle' higher than the user specified values are 'OK' and the others are 'FAIL'.

# Before Starting the Tutorial

- Scorpion Vision Software version 7.2 or higher needs to be installed on the test machine and the license should be activated
- An actual camera is not needed since you will be using the 'simulator' feature available in Scorpion Vision Software
- The data files available with this tutorial should be copied to the test machine:
  (1) 'GettingStartedTutorial_Part4_ProductVariantsAndDataInputPages.zip' which is a pre-configured profile
- It is assumed that the 'Getting Started Tutorial Part 3 – Gauging' is already completed. This tutorial ('Getting Started Tutorial Part 4 – ProductVariantsAndDataInputPages') uses the Scorpion Vision Software profile from 'Getting Started Tutorial Part 3 – Gauging', as a starting point.


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# *Advanced Washer Inspection System with User Data Inputs*

In this tutorial, we will be creating an 'Advanced Washer Inspection System with User Data Inputs' using the powerful, flexible, and easy to use Scorpion Vision Software. The 'Advanced Washer Inspection System with User Data Inputs' will have the following features:

- A user interface for users to type the expected values of 'minimum inner circle ovality for all washers', 'minimum inner diameter for small washers' and 'minimum inner diameter for large washers'.
- Please note that these values are not set up as part of the configuration, but are exposed to users, so that users can change them quickly from the user interface, without needing changes in core configuration.
- Periodically reviews of the image captures from the camera (or simulator image in case of this tutorial).
- Analyzes the image to understand washer presence or absence in the captured image.
- If a washer is present in the captured image, it is classified as 'Small' or 'Large'.
- A detected 'Small' washer is inspected against 'minimum inner diameter for small washers' and 'minimum ovality of inner circle'. Defective washers are those which have either the 'inner diameter' or the 'ovality of inner circle' lower than the user defined thresholds.
- A detected 'Large' washer is inspected against the 'minimum inner diameter for large washers' and tthe 'minimum ovality of inner circle'. Defective washers are those which have either the 'inner diameter' or the 'ovality of inner circle' lower than the user defined thresholds..
- Displays the inspection result to the user and generates statistical data.

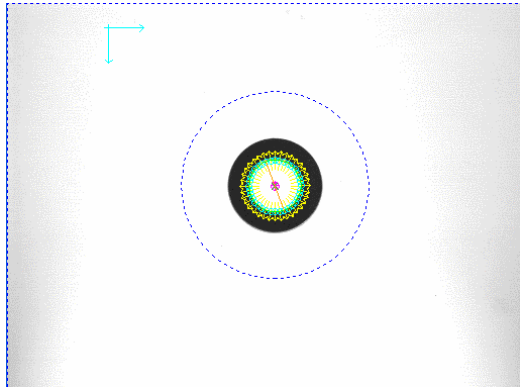

Figure 1: Image with good washer

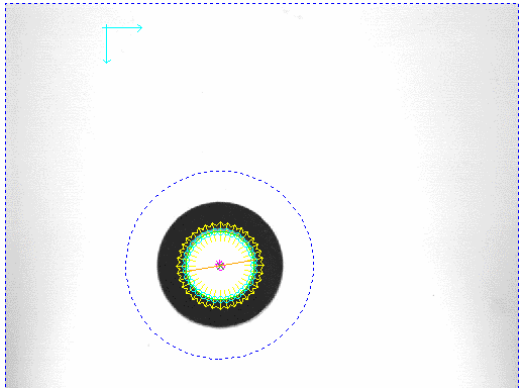

Figure 2: Image with defective washer

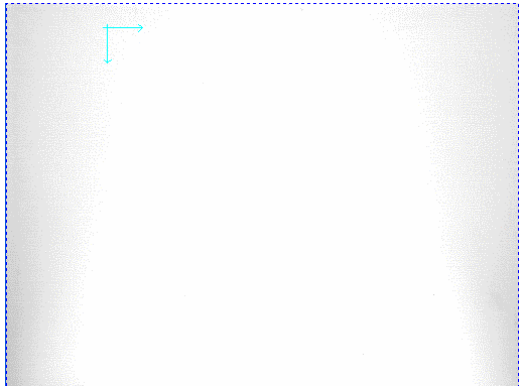

Figure 3: Image with no washer

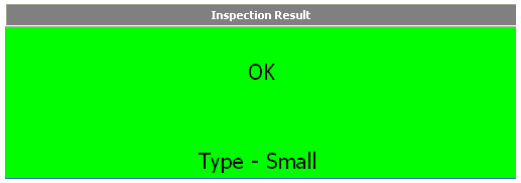


Figure 4: 'OK' is the expected result after inspection by the system

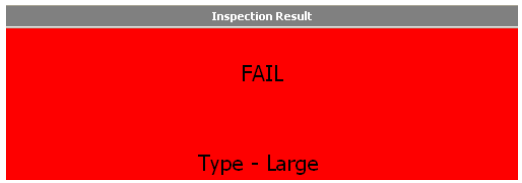


Figure 5: 'FAIL' is the expected result after inspection by the system

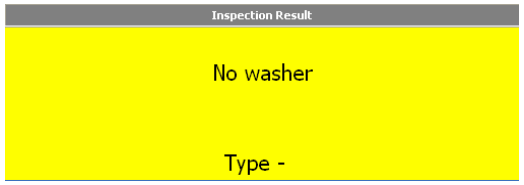


Figure 6: 'No washer' is the expected result after inspection by the system


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In this inspection, the difference between a 'good washer' and 'defective washer' is so small, that a necked eye may not be able to distinguish between them. Scorpion is able to identify these differences and inspect washers properly.

Inspection set we have has small washers with expected inner diameter 10.5 mm. It also has large washers with expected inner diameter 14.5 mm. Ovality of inner circles of all washers is expected to be above 0.95 (1.00 ovality indicates perfect circle).

We have set up 'Calibrator' tool (in previous tutorials and continuing same in this tutorial), which uses reference image to understand conversion between image pixels to mm. So all inspection settings in Scorpion can be done in 'mm' units, instead of using 'pixel' units. This makes configuration in Scorpion very easy, since information about physical units of parts under inspection is always available from manufacturing specifications.


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# *Table of Contents*


| | | |
|---|---|---|
| 1. | Pre-Configured Profile | 6 |
| 2. | Trying out the Pre-Configured Profile | 7 |
| 3. | Creating a New Profile and Copying Configurations | 12 |
| 4. | Setting the ExternalData Tool | 15 |
| 5. | Setting the PythonScript Tool | 20 |
| 6. | Updating LogicTool for Checking the Minimum Inner Diameter | 23 |
| 7. | Updating LogicTool for Checking Ovality | 25 |
| 8. | Setting up User Data Input | 27 |
| 9. | Setting up Curves | 35 |
| 10. | Running the System | 38 |
| 11. | Measurements on the Displayed Image | 40 |
| 12. | Tutorial Summary | 44 |




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# 1. *Pre-Configured Profile*

- The GettingStartedTutorial_Part4_ProductVariantsAndDataInputPages.zip available with this tutorial is a pre-configured profile for the 'Advanced Washer Inspection System with User Data Inputs'
- This can be used on any computer to see the 'Washer Inspection with User Data Inputs' in action, without needing any additional changes.
- We will first try this pre-configured profile and see it in action
- Then later in this tutorial, we will create this same profile by making a few updates to the profile we have created in 'GettingStartedTutorial_Part3_Gauging'.


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# 2. Trying out the Pre-Configured Profile

Launch Scorpion Vision software from '**Start->All Programs->Tordivel Vision Solutions->Scorpion 7->Scorpion 7.2**'

Right click on the application window and select the '**Restore**' sub-menu. This will pop up the zip file selection dialog.

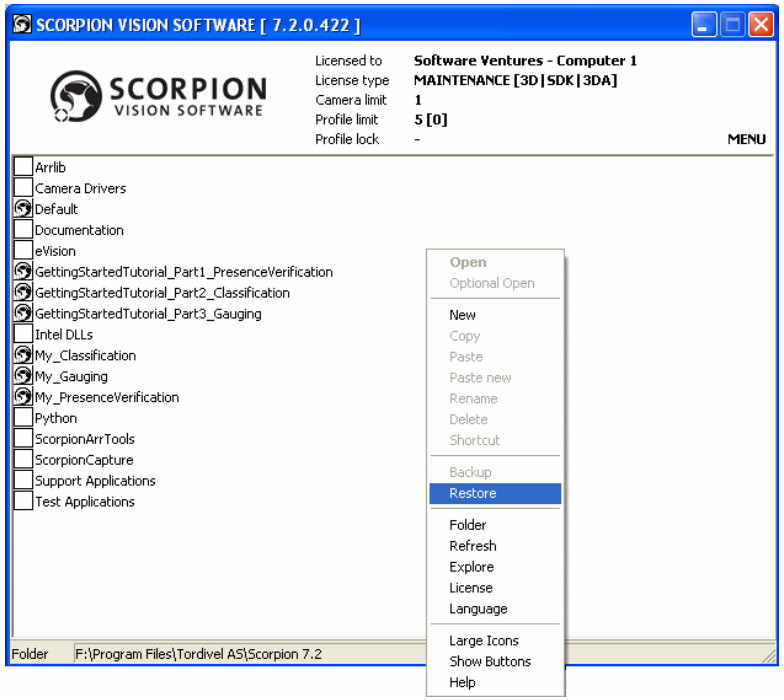


*Figure 7: Restore Profile*

Navigate to the directory where GettingStartedTutorial_Part4_ProductVariantsAndDataInputPages.zip is available, select it and click on '**Open**' button. Scorpion will restore the profile and it will be added to the available list of profiles.

Right click on the new profile '**GettingStartedTutorial_Part4_ProductVariantsAndDataInputPages**' and click on '**Open**' sub-menu to launch Scorpion Vision Software with this profile loaded.

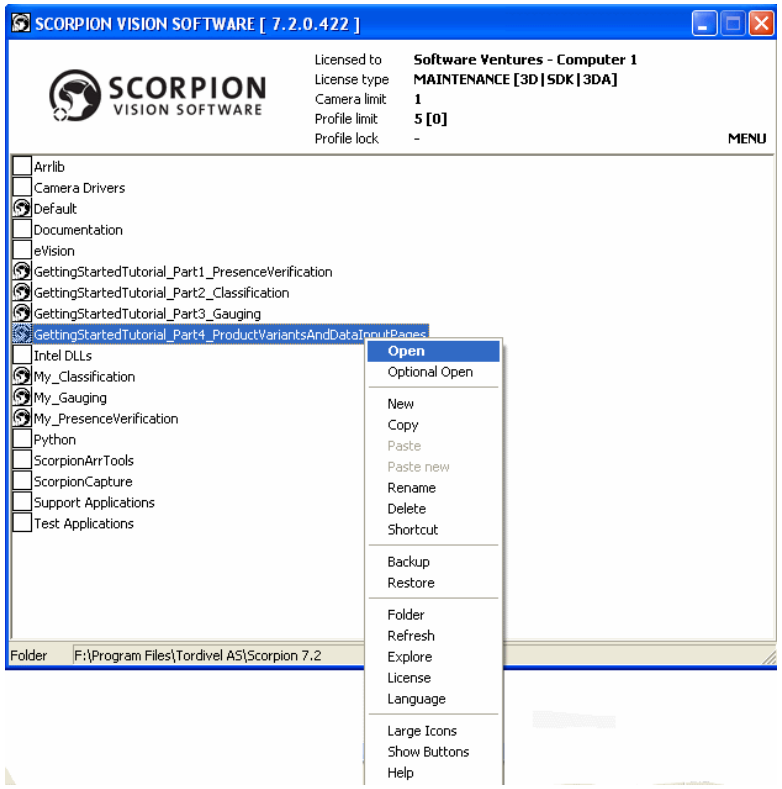


*Figure 8: Open Profile*

Scorpion has a toolbar available at the top for quick navigation to various commonly used features.


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Click on the '**Start**' button on the toolbar to start the inspection. Scorpion starts capturing images (from simulator configured in this profile) after every 1000 milliseconds, processes them and generates the results.

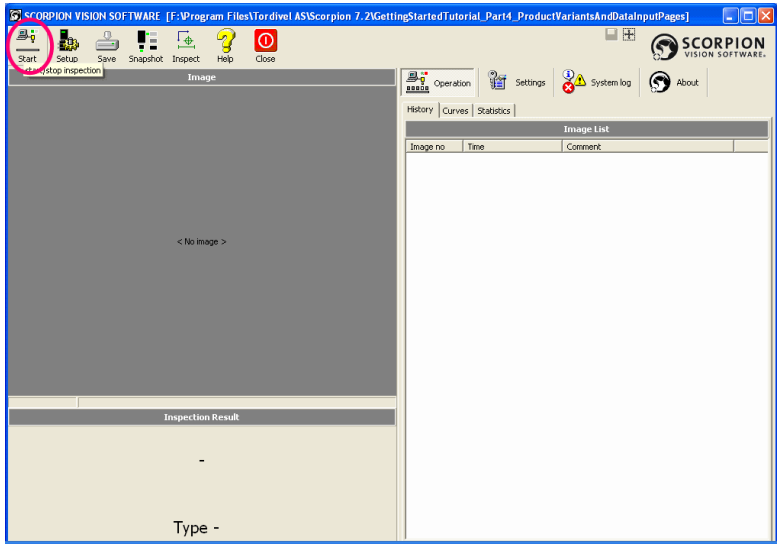


*Figure 9: Start the inspection*

There are some captured images which have good washers present, some captured images which have defective washers present and a few captured images which do not have any washer.

Scorpion analyses each captured frame and updates the result as '**OK**' or '**FAIL**' or '**No washer**', and also updates the classification result as '**Small**' or '**Large**', in the inspection result panel visible in left bottom corner. The color of the inspection result panel also changes to green for '**OK**' , red for '**FAIL**' and yellow for '**No washer**' results.

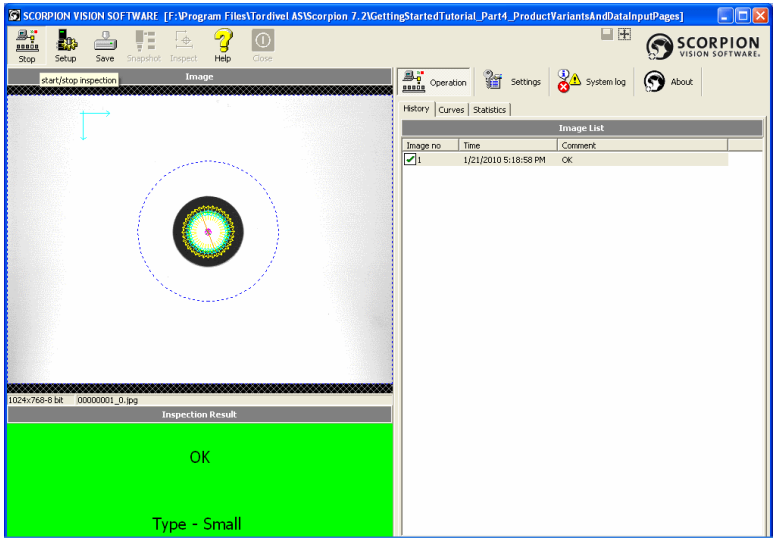


*Figure 10: Result 'OK'*

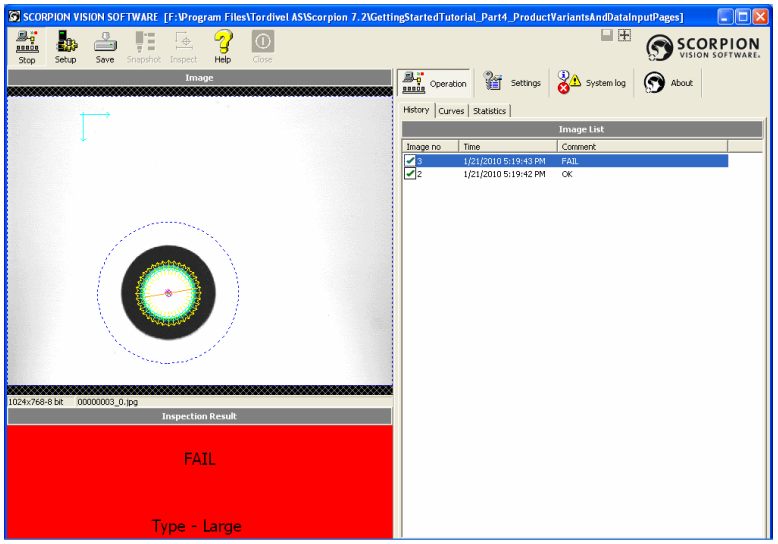


*Figure 11: Result 'FAIL'*


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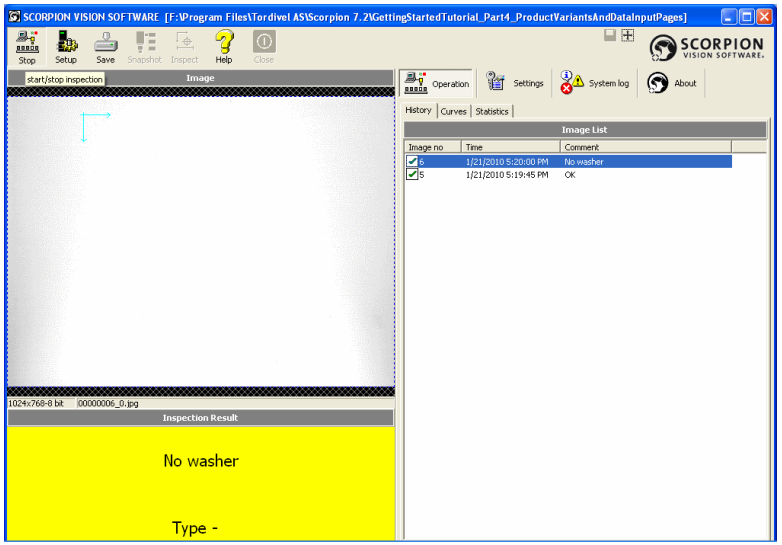


*Figure 12: Result 'No washer'*

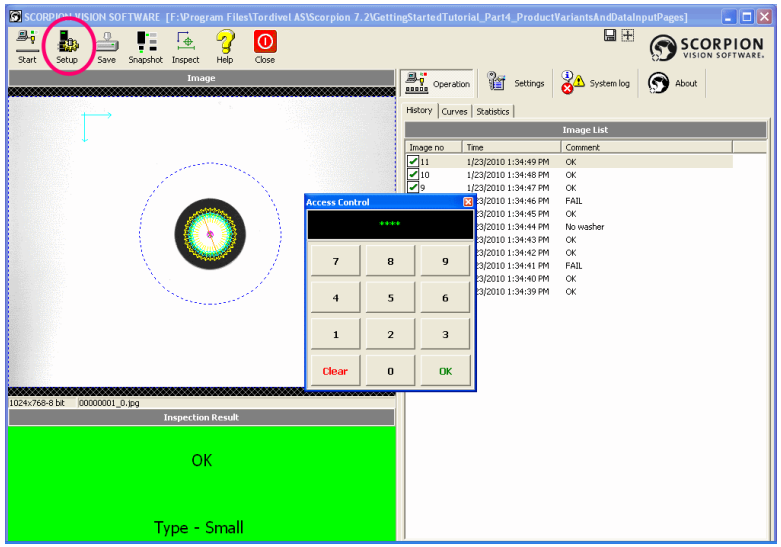


*Figure 13: Switch to 'Settings' Mode*

Click on the '**Stop**' toolbar button (previously available 'Start' button is changed to 'Stop' now) to stop the inspection.

Click on the '**Setup**' tool bar button. This will pop up the '**Access Control**' dialog box. Type password **1234** using the keys on the dialog box. Click on the '**OK**' button to close the '**Access Control**' dialog box.

We are now in '**Settings**' mode, which has lesser privileges than the full '**Setup**' mode. However this '**Settings**' mode is sufficient for changing inspection parameters from the user data input page.

Click on '**Settings**' mode available on the right hand side.

Select the '**Tolerance data**' page. It has a user interface for '**Ovality Minimum value**', '**Minimum diameter of Small washer**' and '**Minimum diameter of Large washer**'.

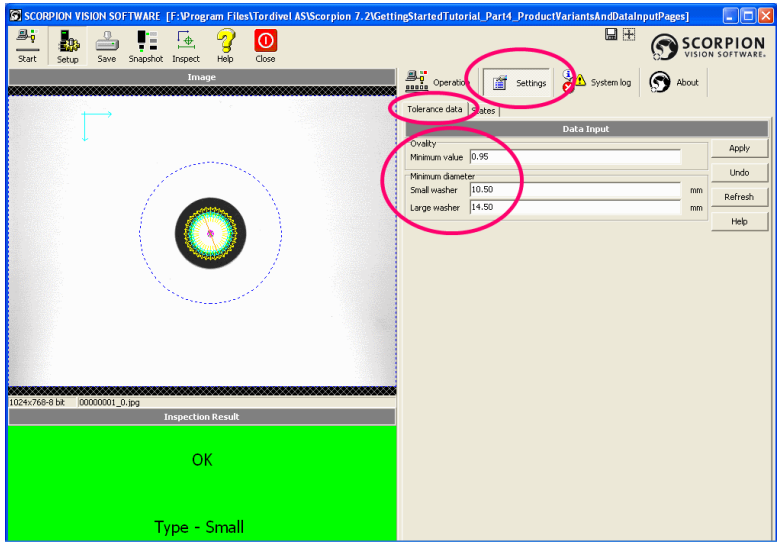


*Figure 14: 'Settings' Mode*


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Change '**Minimum diameter of Small washer**' to 15.00 mm from the originally available 10.50 mm. Click on the '**Apply**' button.

Click on the '**Start**' toolbar button to start the inspection with the new user data values.

All 'Small' washers will now show the 'FAIL' state, since they are expected to have an inner diameter 10.5 mm and we have set up the 'minimum diameter for small washers' as 15.00 mm.

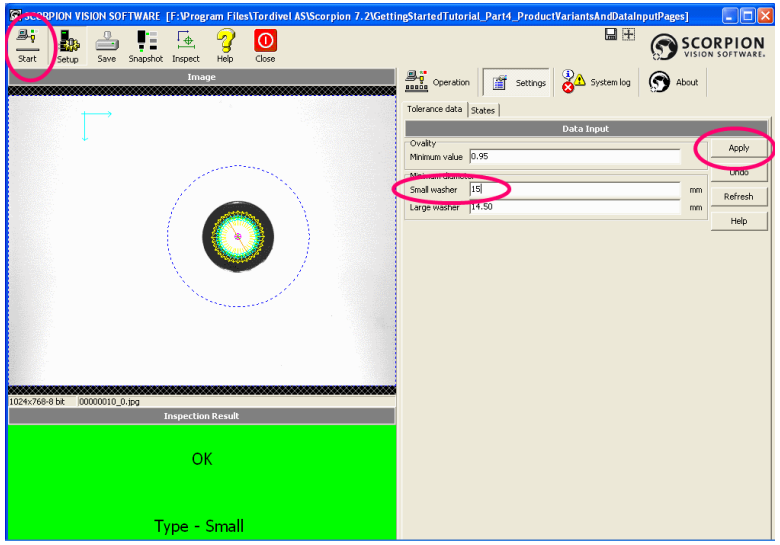


*Figure 15: Test User Data Input*

Change the '**Minimum diameter of Small washer**' back to 10.50 mm from 15.00 mm. Click on the '**Apply**' button, to restore the original settings.

Click on '**Operation**' mode available on the right hand side.

Go to the '**Curves**' tab.

Select the curve named '**Measure.Diameter min**'.

This will show a graph for the value of the '**minimum diameter of inner circle**'.

The graph is updated continuously during the inspection.

A horizontal red line is also displayed, which indicates the current value against which the 'minimum diameter of inner circle' is validated. It changes for small washers and large washers, since we have provided 2 different values from the user data input.

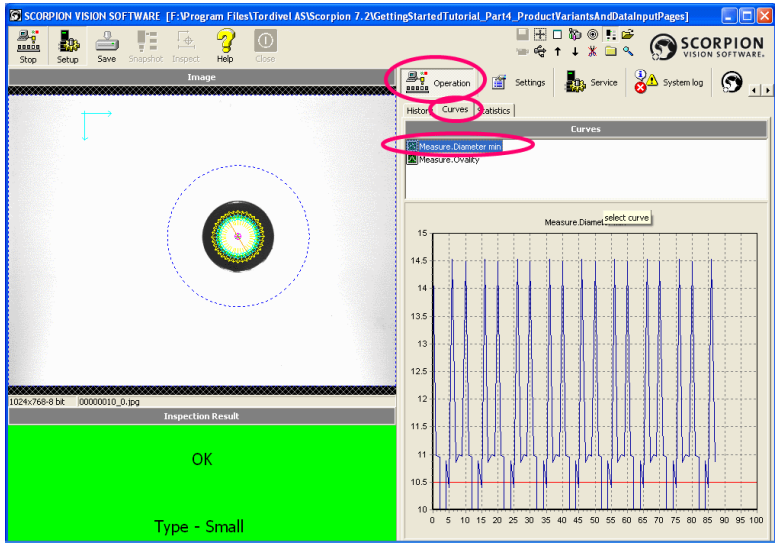


*Figure 16: Curve 'Inner Circle Minimum Diameter'*


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Select the curve named '**Measure.Ovality**'.

This will show a graph for the value of the 'ovality of inner circle'.

The graph is updated continuously during the inspection.

A horizontal red line is also displayed, which indicates the current value against which the 'ovality of inner circle' is validated.

Change the '**Minimum diameter of Small washer**' back to 10.50 mm from 15.00 mm. Click on the '**Apply**' button, to restore the original settings.

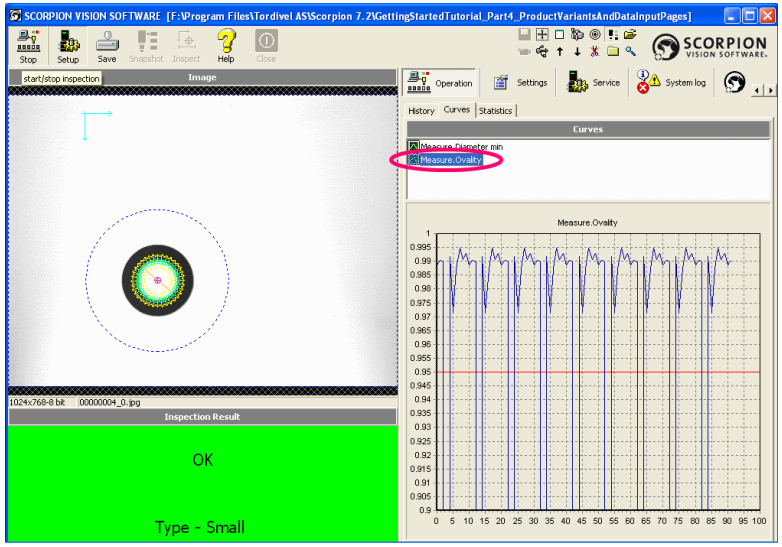


*Figure 17: Curve 'Inner Circle Ovality'*

Congratulations!
You have successfully used Scorpion Vision Software for 'Advanced Inspection with User Data Inputs'!

Now we are ready to update the profile we have created in 'GettingStartedTutorial_Part3_Gauging' to get the same 'Advanced Inspection with User Data Inputs'.


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# 3. Creating a New Profile and Copying Configurations

Close the Scorpion instance which had the pre-configured 'Advanced Inspection with User Data Inputs' profile loaded.

Launch Scorpion Vision Software from '**Start->All Programs->Tordivel Vision Solutions->Scorpion 7->Scorpion 7.2**'.

Right click on the main dialog and click on the '**New**' sub-menu. This will ask for a name of the new profile. Type '**My_ProductVariantsAndDataInputPages**' (or you may choose any name of your choice) and click on the '**OK**' button. This will add the new profile to the list.

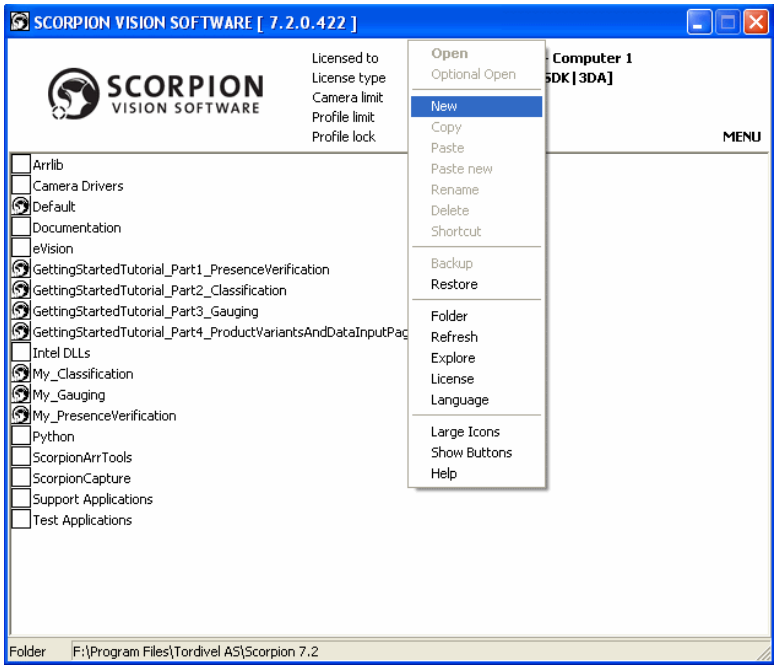


*Figure 18: New profile*

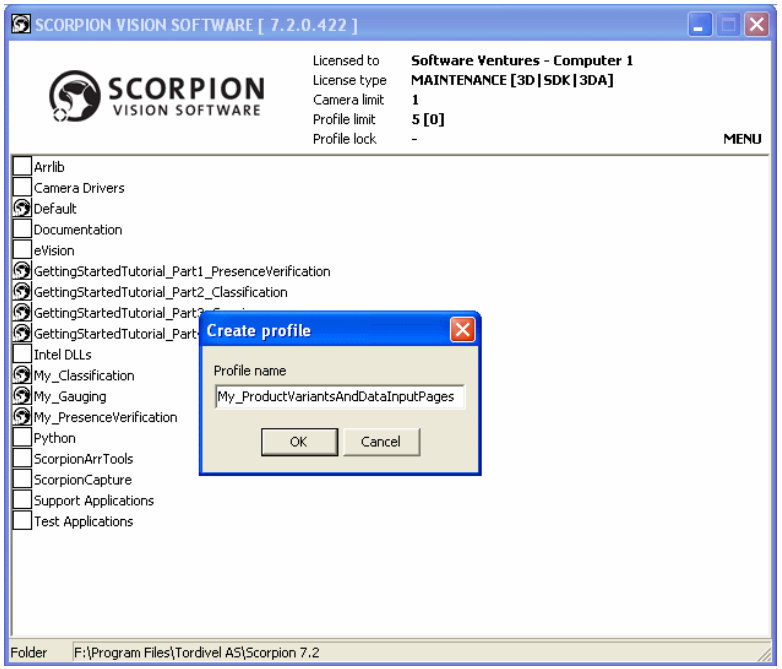


*Figure 19: New Profile Name*


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Right click on the previously created profile '**My_Gauging**' and click on '**Copy**'.

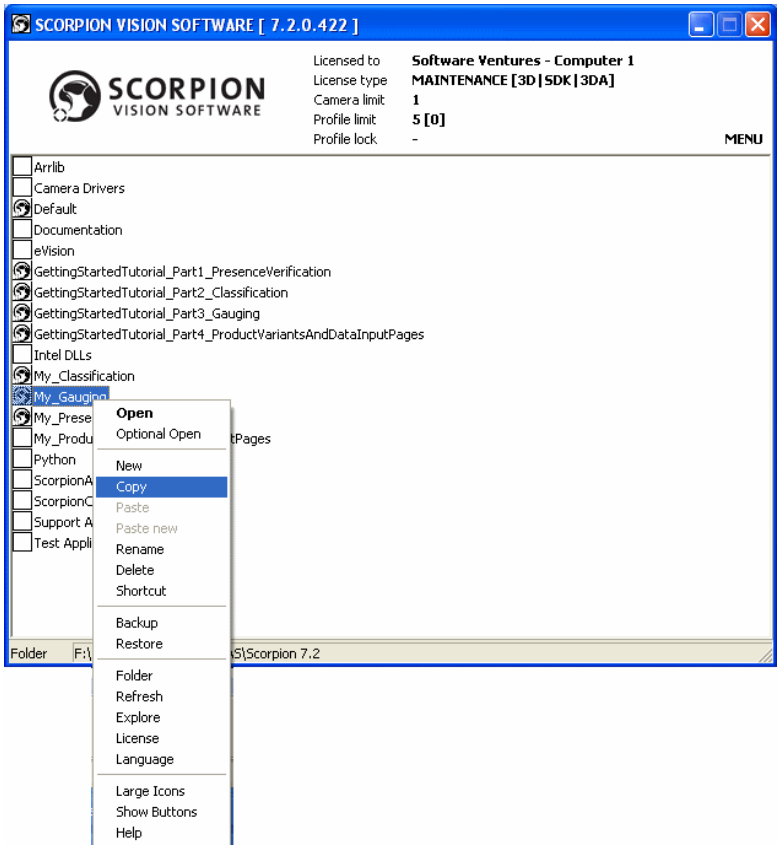


*Figure 20: Copy Profile Settings*

Right click on the newly created profile '**My_ProductVariantsAndDataInputPages**' and click on '**Paste**'. Scorpion will pop up a confirmation dialog, click on the '**Yes**' button to confirm pasting.

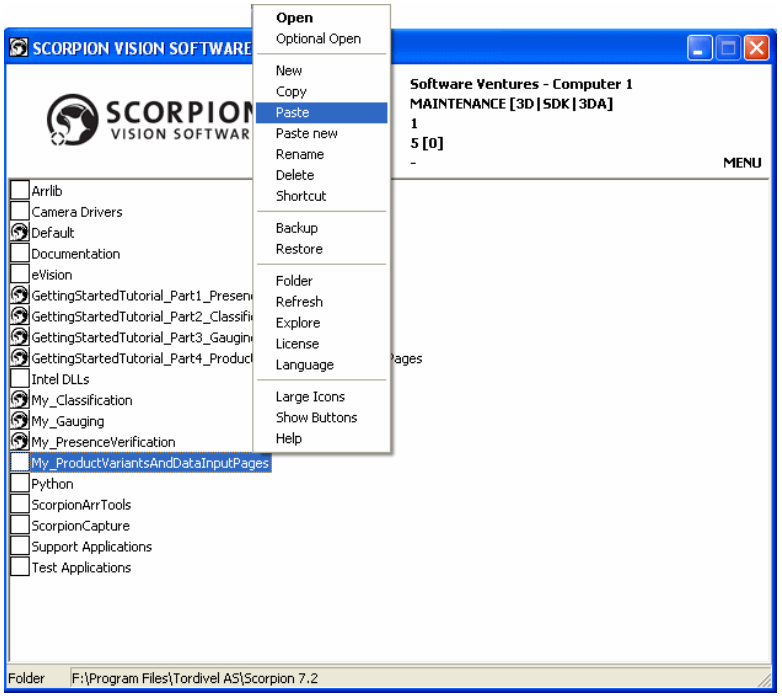


*Figure 21: Paste Profile Settings*


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Right click on the newly created profile name in the list and click on '**Open**'. This will also launch Scorpion with the new profile loaded.

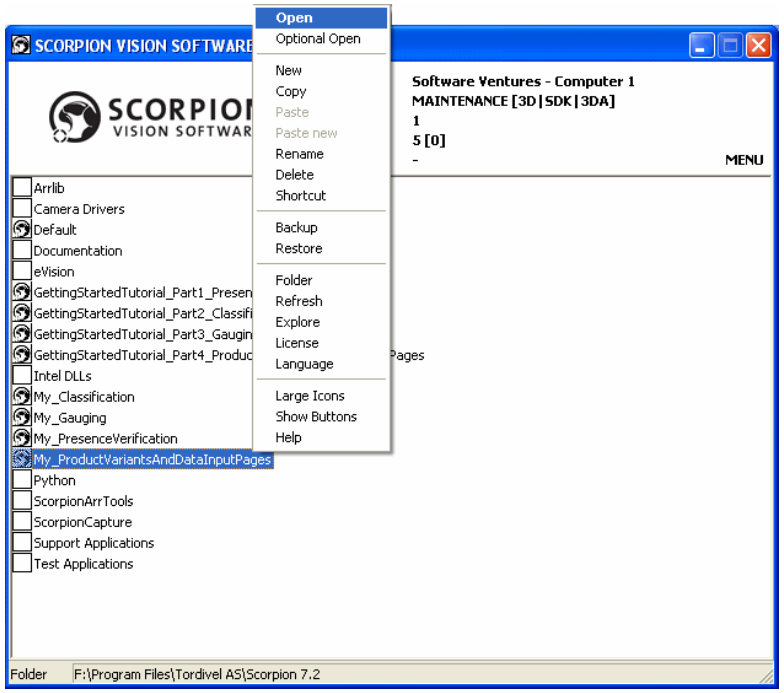


*Figure 22: Open Profile*

Click on the '**Setup**' tool bar button. This will pop up a password dialog. Type **911** and click on the '**OK**' button. This will switch Scorpion to '**Service mode**'.

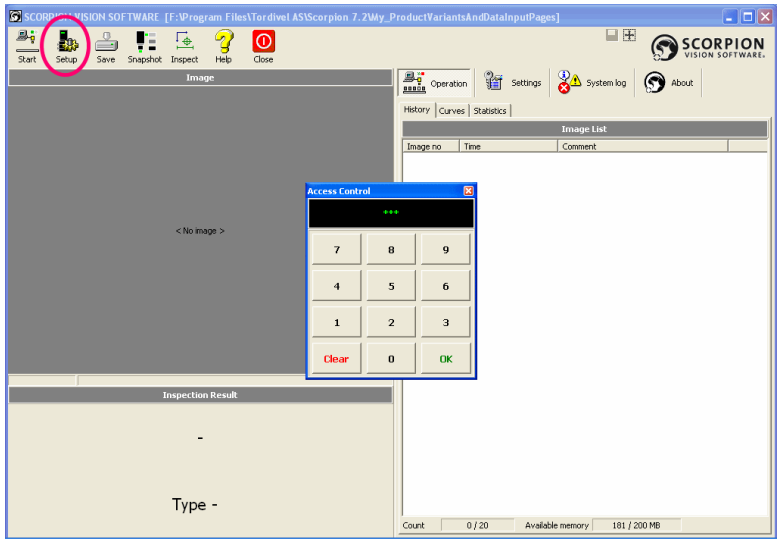


*Figure 23: Service Mode Password*

Scorpion provides a very easy and convenient way to copy the configuration from a profile to another profile. We have used the same to re-use configurations from a previously created profile, instead of doing all configurations again.


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# 4. Setting the ExternalData Tool

Go to '**Service**' mode. Click on the '**Toolbox**' tab.

Click on the '**New**' button to add a new tool. This will pop up the '**New Tool**' dialog.

Type '**Name**' as '**ToleranceData**'.

From '**Tools**', select Category '**Data**' and select Tool '**ExternalData**'.

Click on the '**OK**' button to close the '**New Tool**' dialog box. This will add a new entry in the list of configured tools.

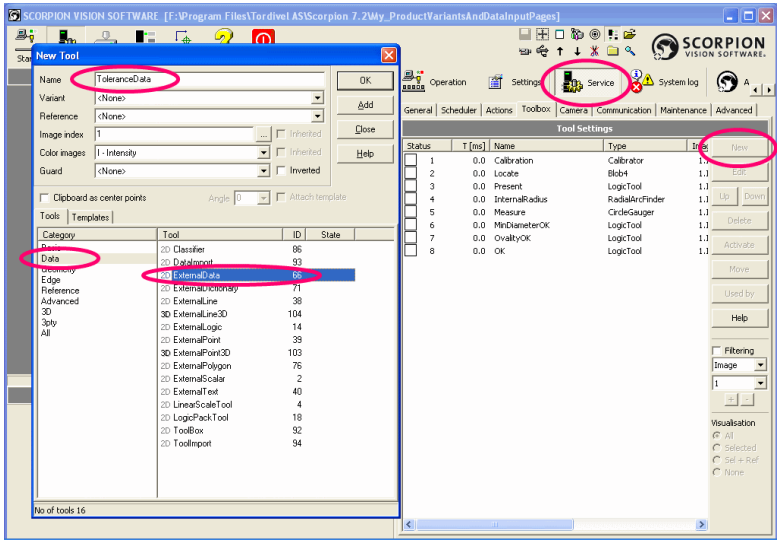

*Figure 24: New Tool 'ExternalData'*

Select the newly added tool '**ToleranceData**'. Click on the '**Edit**' button which will pop up the '**Change ToleranceData**' dialog box.

Under the '**Setup**' tab, click on the '**New**' button available in the '**External data**' section. This will pop up the '**Datatype**' dialog box.

Type '**Name**' as '**Ovality**'.

Type '**Value**' as **0.95.**

Click on the '**OK**' button to close the '**Datatype**' dialog box.

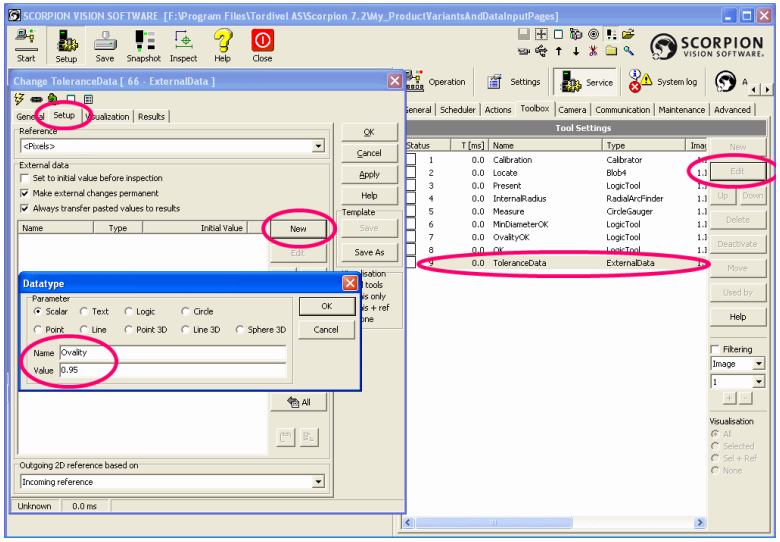

*Figure 25: Add Datatype 'Ovality'*


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Click on the '**New**' button available in the '**External data**' section. This will pop up the '**Datatype**' dialog box.

Type '**Name**' as '**Small**'. Please make sure that the text 'Small' has correct spelling and has upper-case 'S'. It is important that this text should match exactly with the name of the class 'Small' defined in the Blob4 tool.

Type '**Value**' as **10.5**

Click on the '**OK**' button to close the '**Datatype**' dialog box.

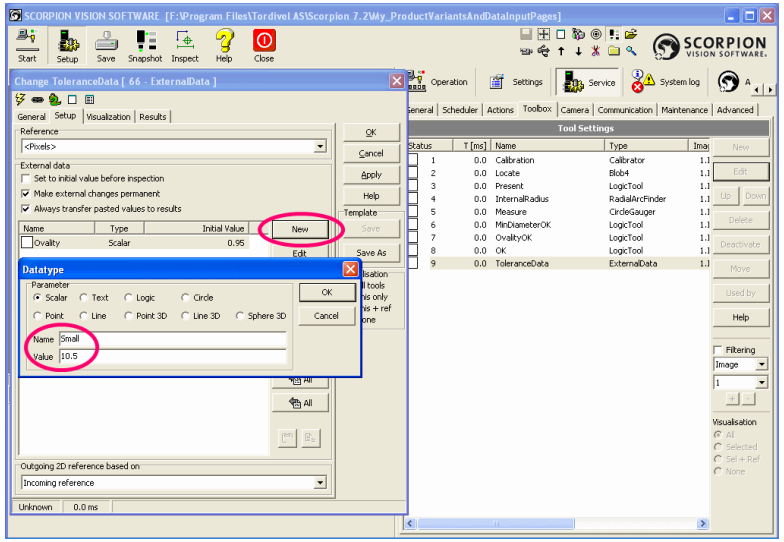


*Figure 26: Add Datatype 'Small'*

Click on the '**New**' button available in the '**External data**' section. This will pop up the '**Datatype**' dialog box.

Type '**Name**' as '**Large**'. Please make sure that the text 'Large' has correct spelling and has upper-case 'L'. It is important that this text should match exactly with the name of the class 'Large' defined in Blob4 tool.

Type '**Value**' as **14.5**

Click on the '**OK**' button to close the '**Datatype**' dialog box.

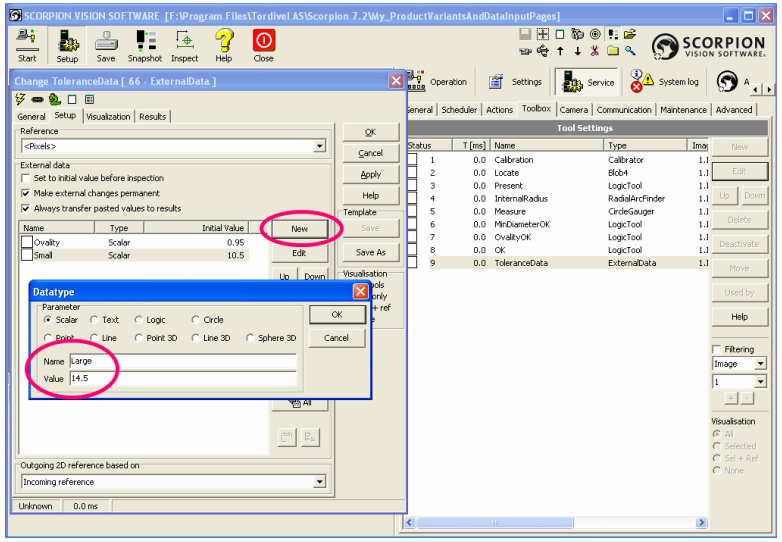


*Figure 27: Add Datatype 'Large'*


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Click on the '**All**' button. This will pop up the '**Confirmation**' dialog box. Click on the '**Yes**' button to confirm.

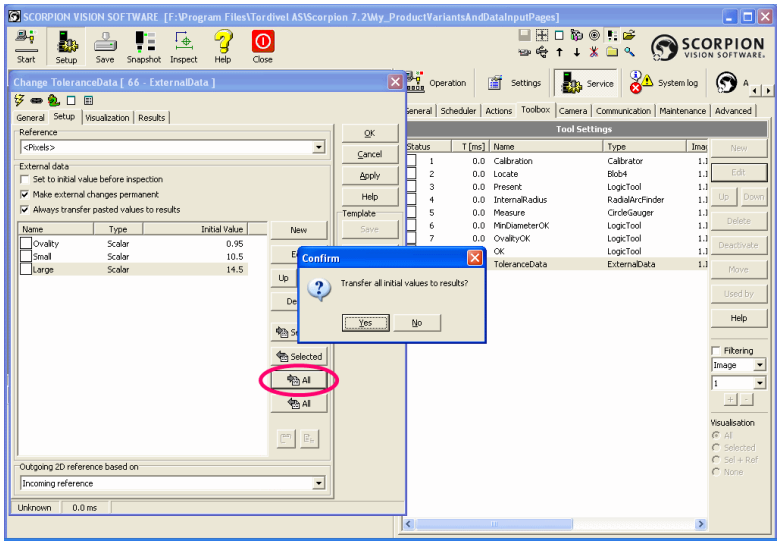


*Figure 28: Transfer Values to Result*

Under the '**Results**' tab, select parameter '**Small**' from the available list and right click on it. Select the menu '**Unit**'. This will pop up the '**Configuration**' dialog box.

Type '**Unit**' as '**mm**' and click on the '**OK**' button to close the '**Configuration**' dialog box.

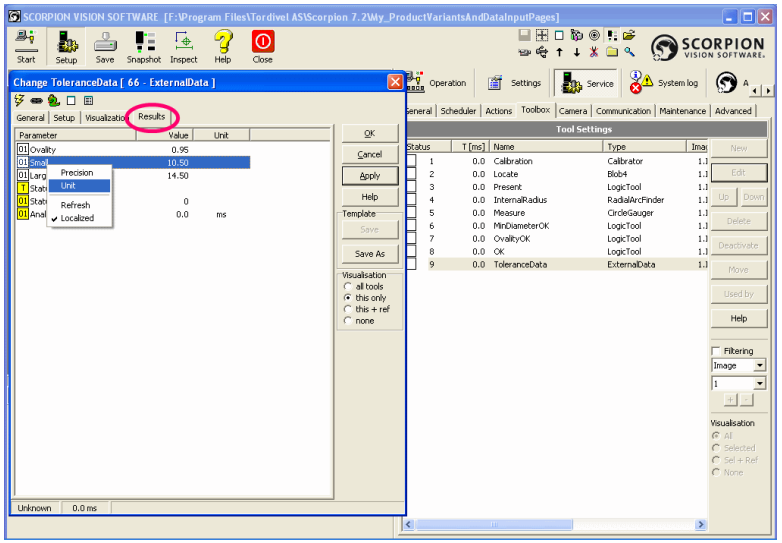


*Figure 29: Edit Unit for Result Parameter 'Small'*

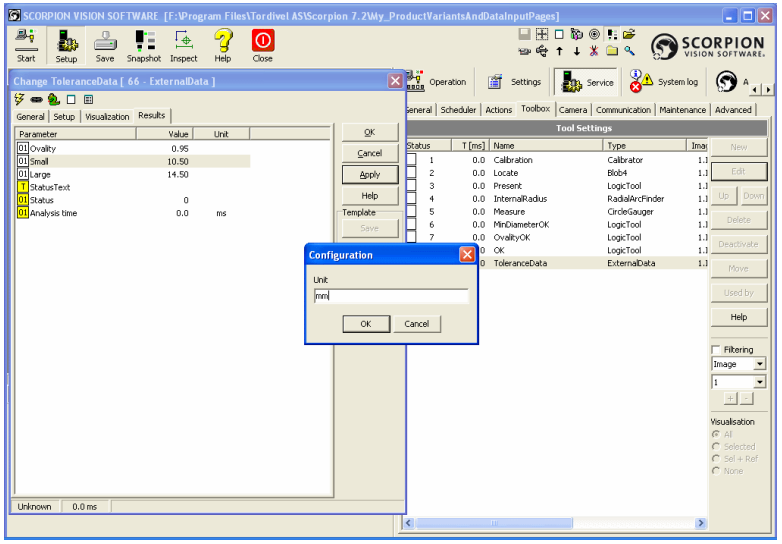


*Figure 30: Set Unit for Result Parameter 'Small'*


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Select the parameter '**Large**' from the available list and right click on it. Select the menu '**Unit**'. This will pop up a '**Configuration**' dialog box.

Type '**Unit**' as '**mm**' and click on '**OK**' button to close the '**Configuration**' dialog box.

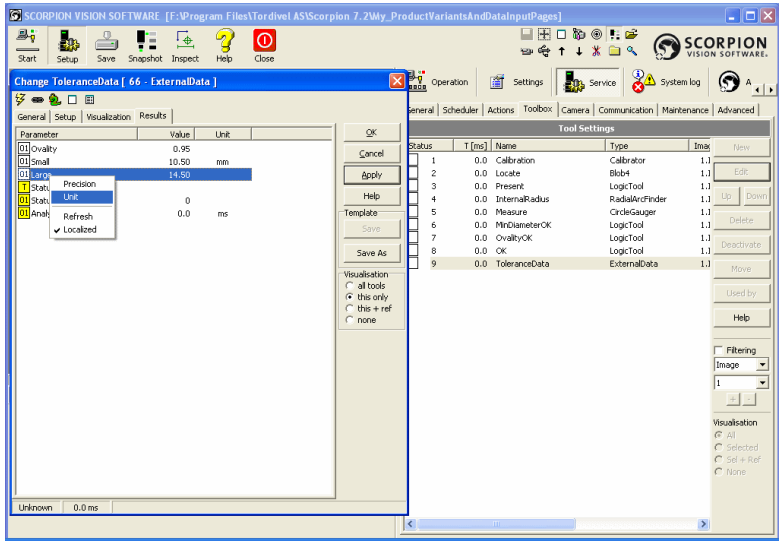


*Figure 31: Edit Unit for Result Parameter 'Large'*

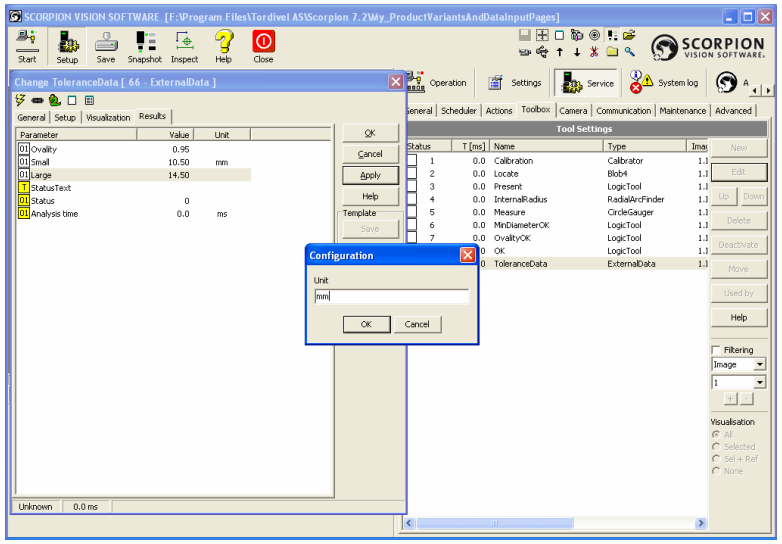


*Figure 32: Set Unit for Result Parameter 'Large'*

Click on the '**OK**' button to close the '**Change ToleranceData**' dialog box.


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Select the newly added tool '**ToleranceData**' and using the arrow keys, move it up to the 2nd position in the list, below the '**Calibration**' tool and above the '**Locate**' tool.

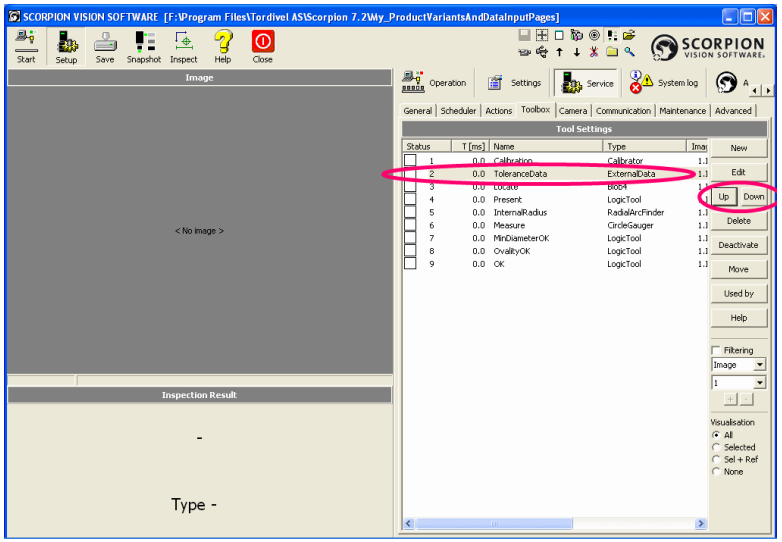


*Figure 33: Change Tool Position*

We have now set up the 'ExternalData' tool. As the name suggests, this holds the external data parameters. The User Interface is linked with this tool. We have defined 3 parameters, since we expect 3 external values from the user – 'minimum inner circle ovality for all washers' (defined parameter 'Ovality'), 'minimum inner diameter for small washers' (defined parameter 'Small') and 'minimum inner diameter for large washers' (defined parameter 'Large').

We have also changed the position of the 'ExternalData' tool, so that it is earlier in the execution sequence. This way the user input is updated / analyzed before any processing starts.


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# 5. Setting the PythonScript Tool

Click on the '**New**' button to add a new tool. This will pop up the '**New Tool**' dialog.

Type '**Name**' as '**SelectTolerance**'.

Select '**Guard**' as '**Present**'.

From '**Tools**', select Category '**Basic**' and Tool '**PythonScript**'.

Click on the '**OK**' button to close the '**New Tool**' dialog box. This will add a new entry in the list of configured tools.

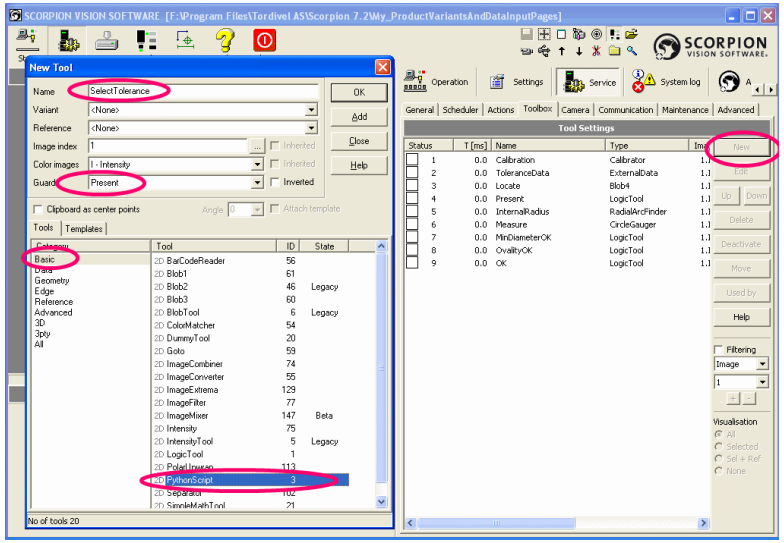


*Figure 34: New Tool 'PythonScript'*

Select the newly added tool '**SelectTolerance**'. Click on the '**Edit**' button which will pop up the '**Change SelectTolerance**' dialog box.

Under the '**Setup**' tab, edit the python script.

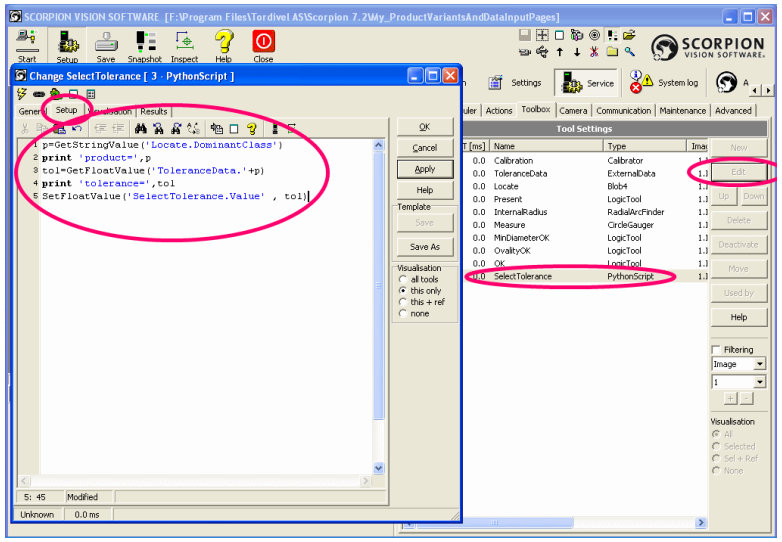


*Figure 35: Edit Tool 'PythonScript'*


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In the Python script, we need to use several variables associated with Scorpion modules. Instead of typing text for these variables, its recommended to use the 'Tag Database Browser', to avoid any typing mistakes and hence debugging time related to the same.

Click on the '**insert text**' button available in the toolbar. This will pop up the '**Select.....**' dialog.

Select the required class/collection from the left panel and the linked variable from the right panel.

Click on '**OK**' to close the '**Select...**' dialog. This will also copy the text for selected parameter on the Python script editor. The text can be manually edited, copy-pasted etc as per other normal text.

The following Python script should be used for this tutorial:

```
p=GetStringValue('Locate.DominantClass')
print 'product=',p
tol=GetFloatValue('ToleranceData.'+p)
print 'tolerance=',tol
SetFloatValue('SelectTolerance.Value' , tol)
```

Click on the '**OK**' button to close the '**Change SelectTolerance**' dialog box.

Select the newly added tool '**SelectTolerance**' and using the arrow keys, move it up to the 7th position in the list, below the 'Measure' tool and above 'MinDiameterOK' tool.

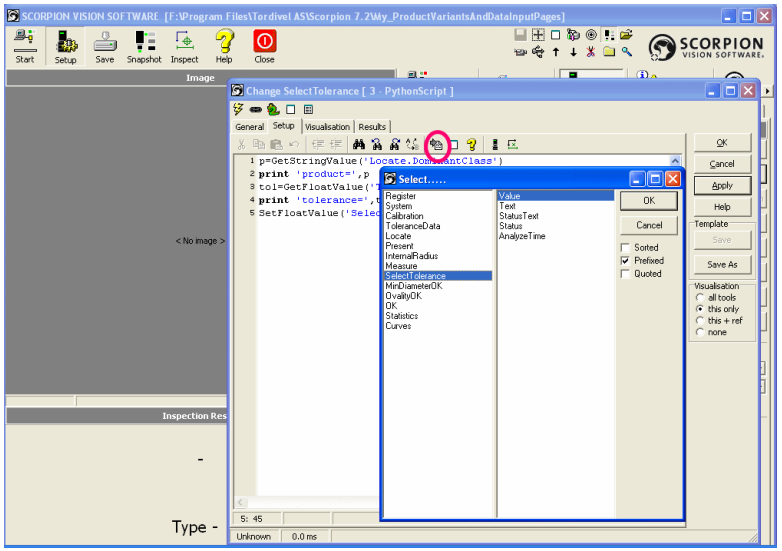


*Figure 36: Python Script – Browsing Tag Database*

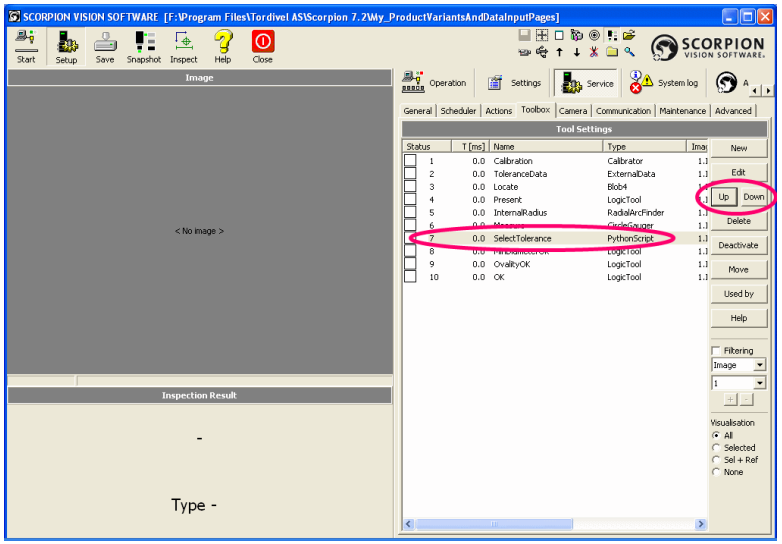


*Figure 37: Change Tool Position*


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We have now set up the 'PythonScript' tool. Scorpion Vision Software has a very important feature that it supports Python scripting. This makes Scorpion very flexible, and a variety of custom logic and custom functionalities can be added to Scorpion.

The Python script first gets the washer classification result ('Small' or 'Large'), then finds the user input value associated with the classification result by accessing an appropriate result parameter from the 'ToleranceData' tool. For 'Small' washers, the 'ToleranceData.Small' result parameter value is used and for 'Large' washers, the 'Tolerancedata.Large' result parameter value is used. Finally this selected user input value is set as 'SelectTolerance.Value', so that it is accessible to other tools for further analysis.

Since we are using strings to directly access values, the 'Small' and 'Large' strings used as class names in the Blob4 classification set up; and the 'Small' and 'Large' strings used as datatypes in the ExternalData tool should match exactly, including the upper case and lower case match.

We have also changed the position of the tool in the tool processing sequence, such that it is processed after processing the tools from where 'PythonScript' gets the parameter values and before the logic tools which use output from 'PythonScript' tool.


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# 6. Updating LogicTool for Checking the Minimum Inner Diameter

Click on the tool '**MinDiameterOK**' available in the list of configured tools.

Click on the '**Edit**' button which will pop up the '**Change MinDiameterOK**' dialog box.

Under the '**Setup**' tab, select the available logic parameter entry and click on the '**Edit**' button. This will pop up the '**Logic Parameter**' settings dialog.

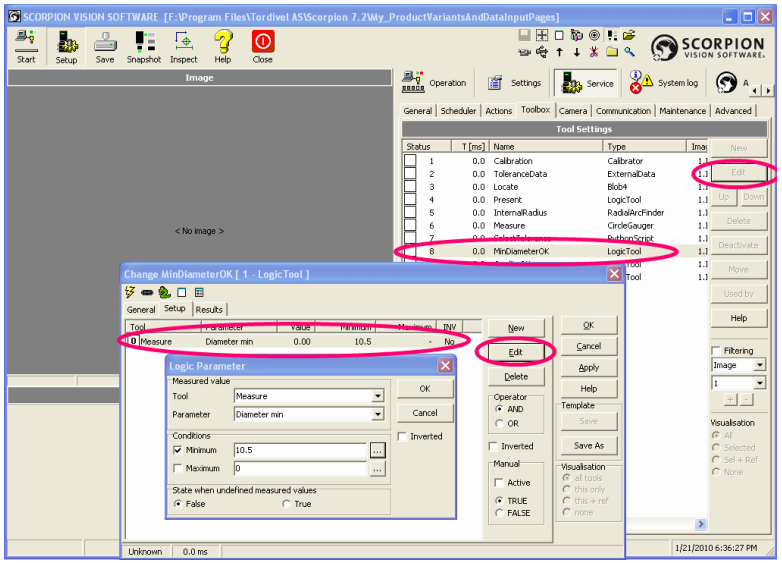

*Figure 38: Edit Tool 'MinDiameterOK'*

Click on the '**...**' button available next to '**Condition**' -> '**Minimum**'. This will pop up the '**Select.....**' dialog box.

Select '**SelectTolerance**' from the left panel and '**Value**' from the right panel.

Click on the '**OK**' button to close the '**Select.....**' dialog box.

Click on the '**OK**' button to close the '**Logic Parameter**' dialog box.

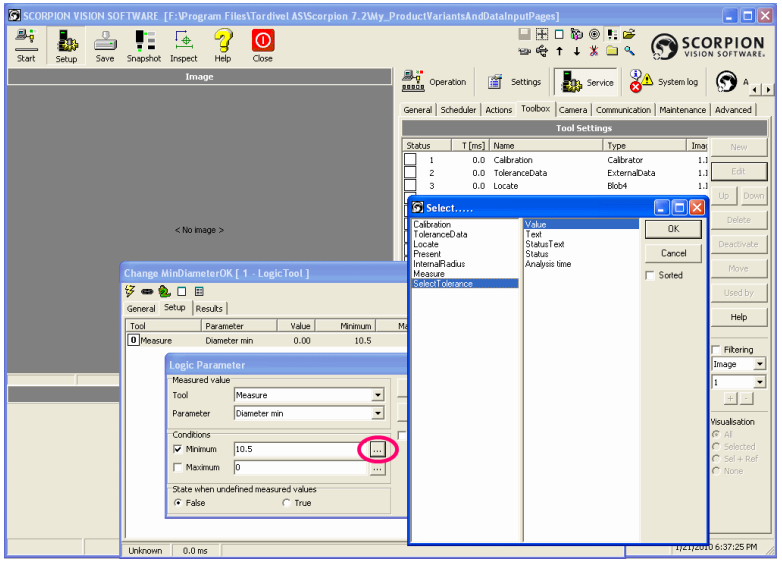

*Figure 39: Edit 'Minimum Condition'*


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The '**Change MinDiameterOK**' dialog box now shows the updated value for minimum condition.

Click on the '**OK**' button to close the '**Change MinDiameterOK**' dialog box.

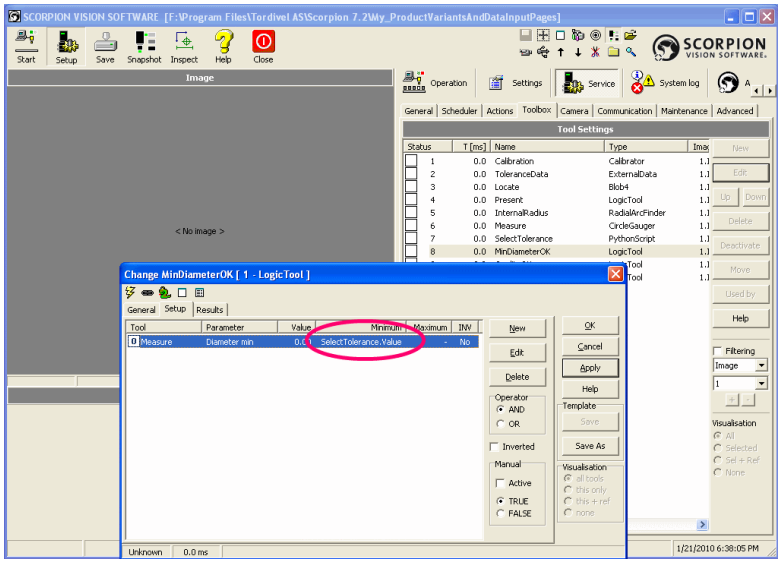


*Figure 40: Updated 'Minimum Condition'*

We have now updated the Logic Tool 'MinDiameterOK'. Instead of using a fixed value, it now uses a value from the 'SelectTolerance' tool.

'SelectTolerance' has a python script which checks the washer classification and accordingly sets the threshold for the 'minimum inner diameter'.

Thus now the 'MinDiameterOK' tool uses different thresholds for small and large washers.


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# 7. Updating LogicTool for Checking Ovality

Click on the tool '**OvalityOK**' available in the list of configured tools.

Click on the '**Edit**' button which will pop up the '**Change OvalityOK**' dialog box.

Under the '**Setup**' tab, select the available logic parameter entry and click on the '**Edit**' button. This will pop up the '**Logic Parameter**' settings dialog.

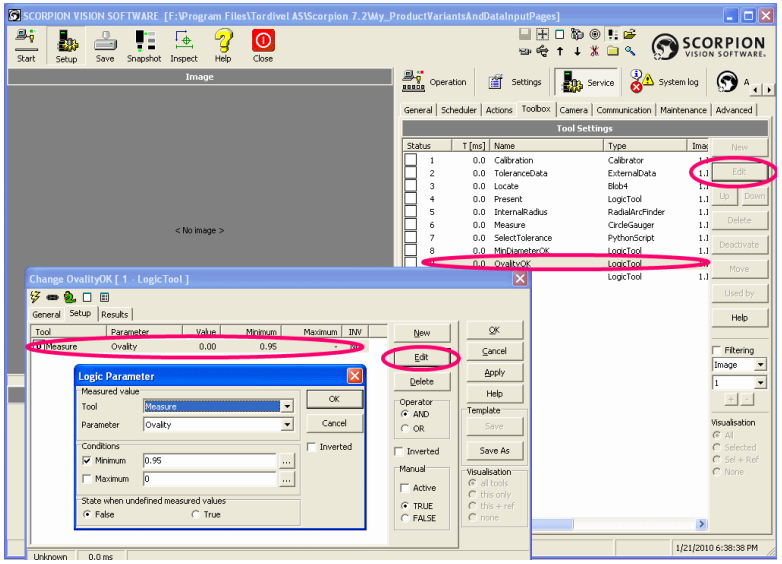

*Figure 41: Edit Tool 'OvalityOK'*

Click on the '**...**' button available next to '**Condition**' -> '**Minimum**'. This will pop up the '**Select.....**' dialog box.

Select '**ToleranceData**' from the left panel and '**Ovality**' from the right panel.

Click on the '**OK**' button to close the '**Select.....**' dialog box.

Click on the '**OK**' button to close the '**Logic Parameter**' dialog box.

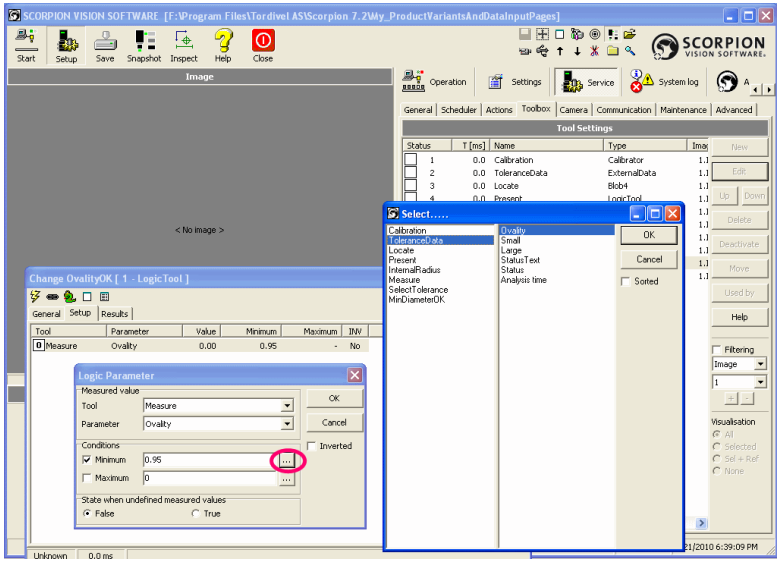

*Figure 42: Edit 'Minimum Condition'*


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'**Change OvalityOK**' dialog box now shows the updated value for minimum condition.

Click on the '**OK**' button to close the '**Change OvalityOK**' dialog box.

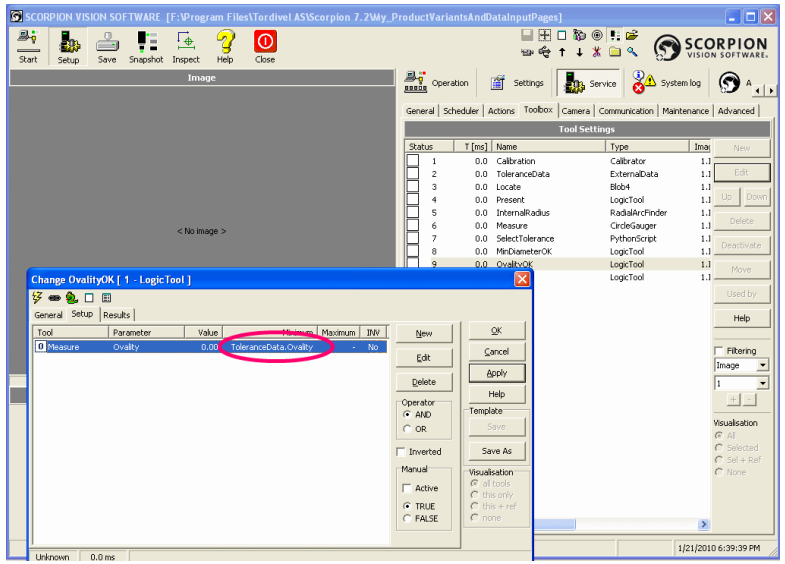


*Figure 43: Updated 'Minimum Condition'*


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# 8. Setting up User Data Input

Select the '**General**' tab under '**Service**' mode. Select the '**Panels**' sub-tab, under the '**General**' tab.

In the section '**Page Administrator**' (Right Pane), click on the '**New**' button. This will pop up the '**Page Content**' dialog box.

Type '**Name**' as '**Tolerance data**'.

Select '**Host**' as '**Settings**'.

Click on the '**OK**' button to close the '**Page Content**' dialog box.

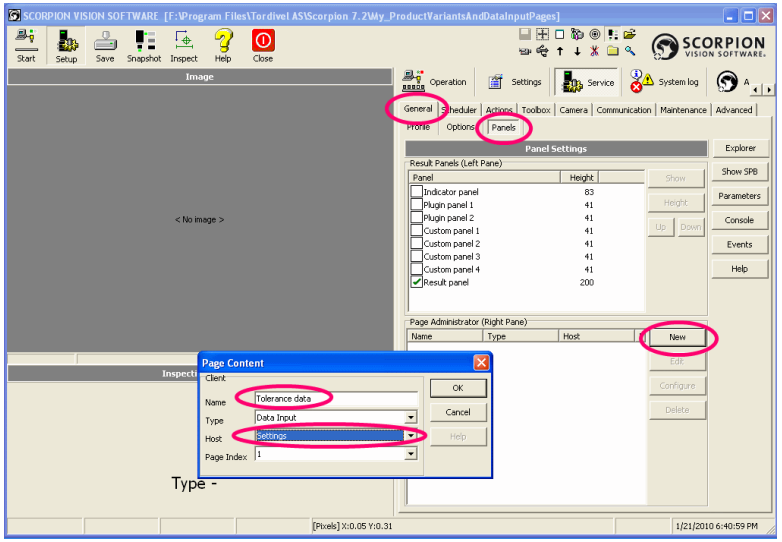


*Figure 44: Add New Page in Right Pane*

A new page will be added to the list under the section '**Page Administrator**' (Right Pane).

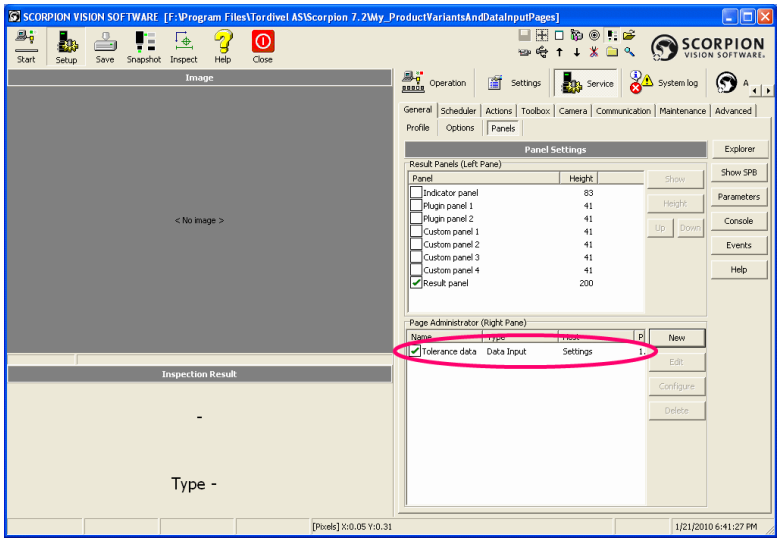


*Figure 45: New Page in Right Pane*


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Select '**Settings**' mode. It now shows an additional page '**Tolerance data**'.

Select the '**Tolerance data**' tab. The page is empty by default. Right click anywhere on the page and click on the '**New Group**'. This will pop up the '**New Group**' dialog box.

Type '**Name**' as '**Ovality**'. Click on the '**OK**' button to close the '**New Group**' dialog box.

A new group box will now be displayed on the '**Tolerance data**' page.

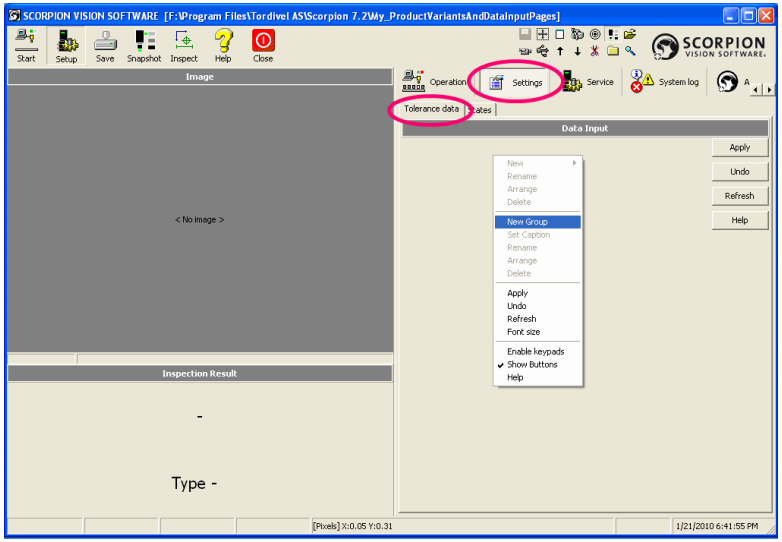


*Figure 46: New Group 'Ovality'*

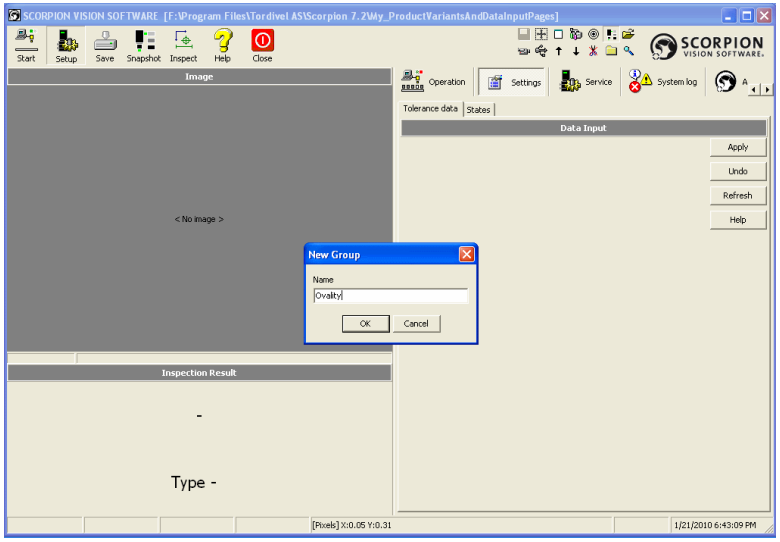


*Figure 47: Added Group 'Ovality'*


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Right click anywhere inside the '**Ovality**' group box. Click on the '**New**' menu and '**Parameter**' sub-menu. This will pop up the '**Alias definition**' dialog box.

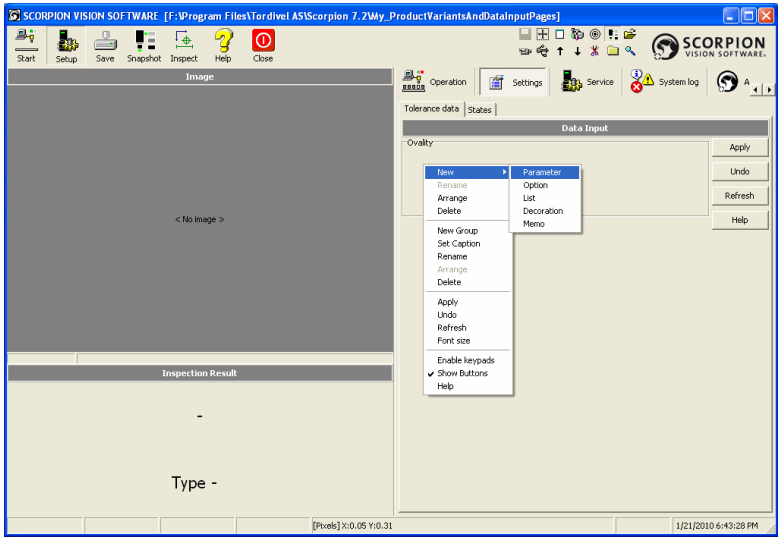


*Figure 48: New Parameter*

Type name as '**Minimum value**' and click on the '**...**' button next to '**Parameter**'. This will pop up the '**Select.....**' dialog box.

Select '**ToleranceData**' from the left panel and '**Ovality**' from the right panel.

Click on the '**OK**' button to close the '**Select.....**' dialog box.

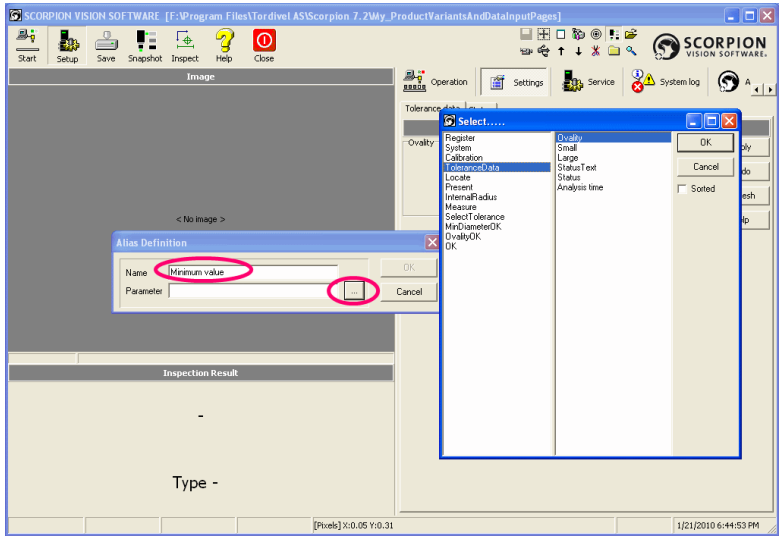


*Figure 49: New Parameter Setup*

Click on the '**Ok**' button to close the '**Alias definition**' dialog box.

A new user interface element will now get added under the '**Ovality**' group.


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Right click anywhere on the vacant area on the '**Tolerance data**' page and click on '**New Group**'. This will pop up the '**New Group**' dialog box.

Type '**Name**' as '**Minimum diameter**'. Click on the '**OK**' button to close the '**New Group**' dialog box.

A new group box will now be displayed on the '**Tolerance data**' page.

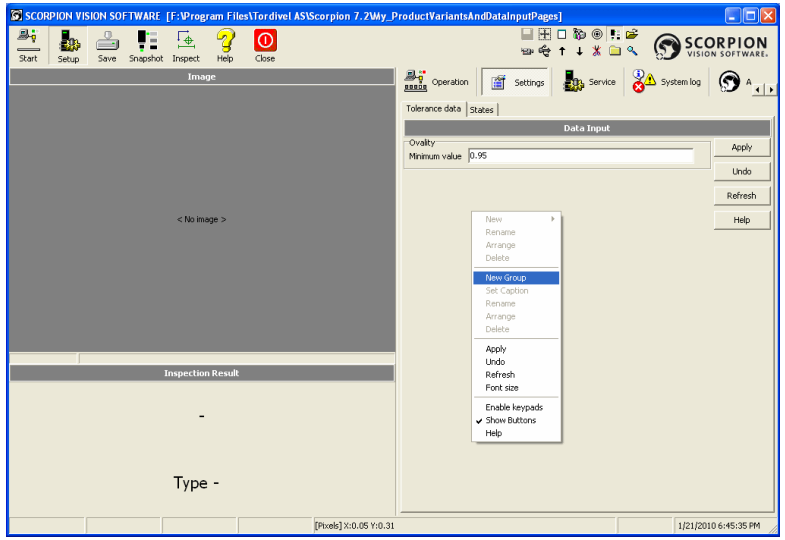


*Figure 50: New Group 'Minimum diameter'*

Right click anywhere inside the '**Minimum diameter**' group box. Click on the '**New**' menu and '**Parameter**' sub-menu. This will pop up the '**Alias definition**' dialog box.

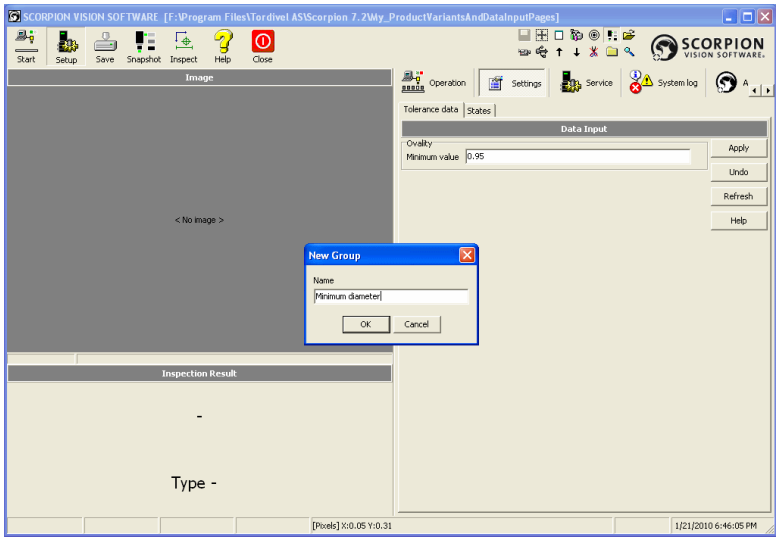


*Figure 51: Added Group 'Minimum diameter'*

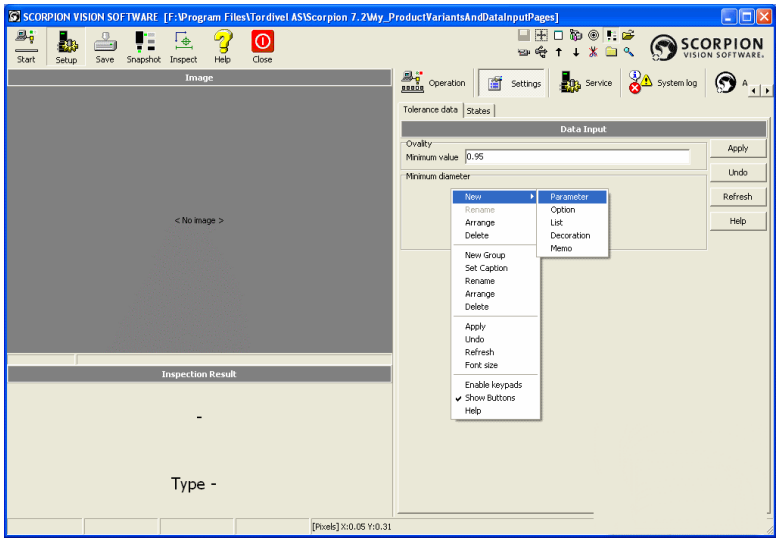


*Figure 52: New Parameter*


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Type name as '**Small washer**' and click on the '**...**' button next to '**Parameter**'. This will pop up the 'Select.....' dialog box.

Select '**ToleranceData**' from the left panel and '**Small**' from the right panel.

Click on the '**OK**' button to close the '**Select.....**' dialog box.

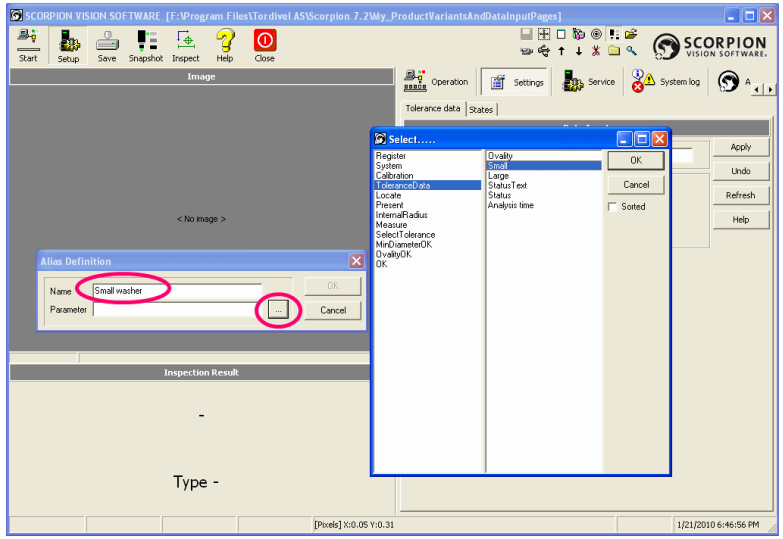


*Figure 53: New Parameter Setup*

Click on the '**Ok**' button to close the '**Alias definition**' dialog box.

A new user interface element will now get added under the '**Minimum diameter**' group.

Right click anywhere inside the '**Minimum diameter**' group box. Click on the '**New**' menu and '**Parameter**' sub-menu. This will pop up the '**Alias definition**' dialog box.

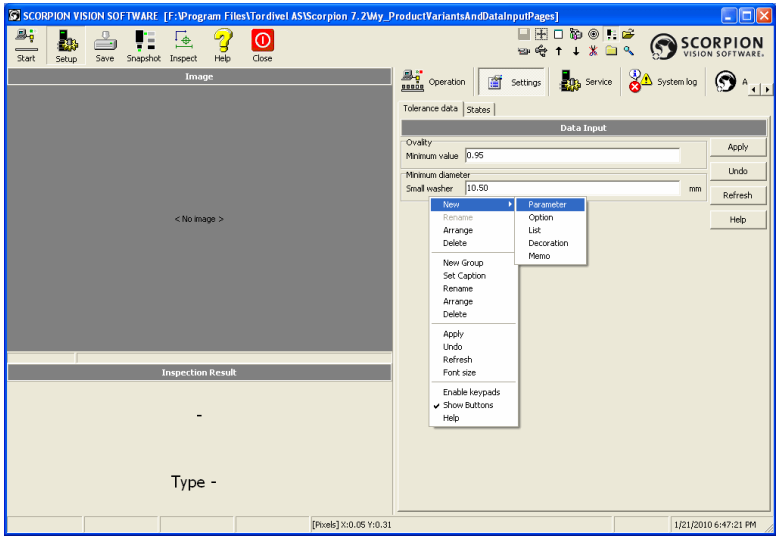


*Figure 54: New Parameter*


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Right click anywhere on the vacant area on the '**Tolerance data**' page and click on '**New Group**'. This will pop up the '**New Group**' dialog box.

Type '**Name**' as '**Minimum diameter**'. Click on the '**OK**' button to close the '**New Group**' dialog box.

A new group box will now be displayed on the '**Tolerance data**' page.

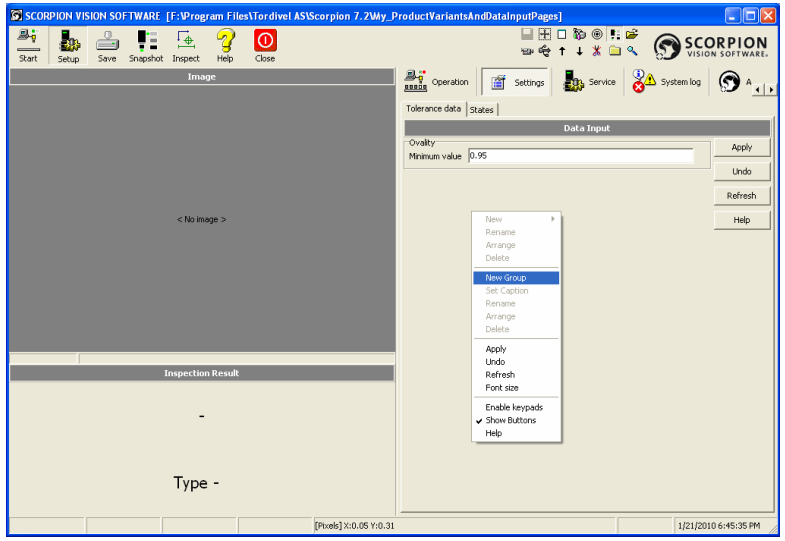


*Figure 50: New Group 'Minimum diameter'*

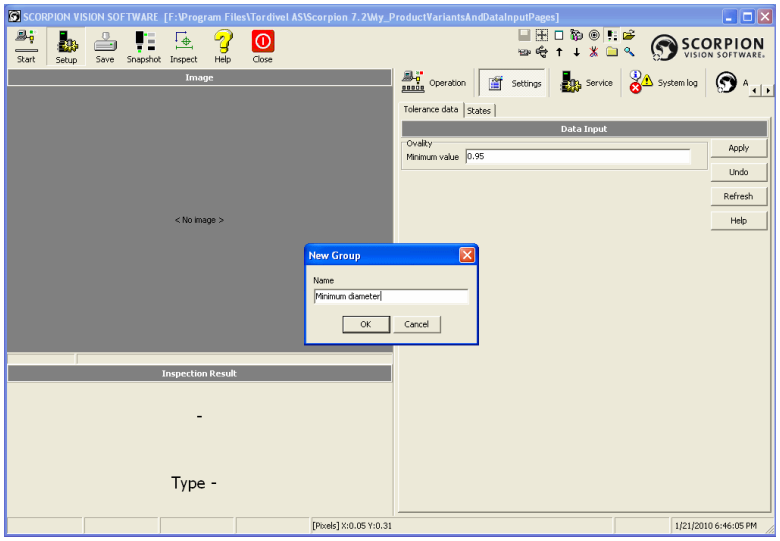


*Figure 51: Added Group 'Minimum diameter'*

Right click anywhere inside the '**Minimum diameter**' group box. Click on the '**New**' menu and '**Parameter**' sub-menu. This will pop up the '**Alias definition**' dialog box.

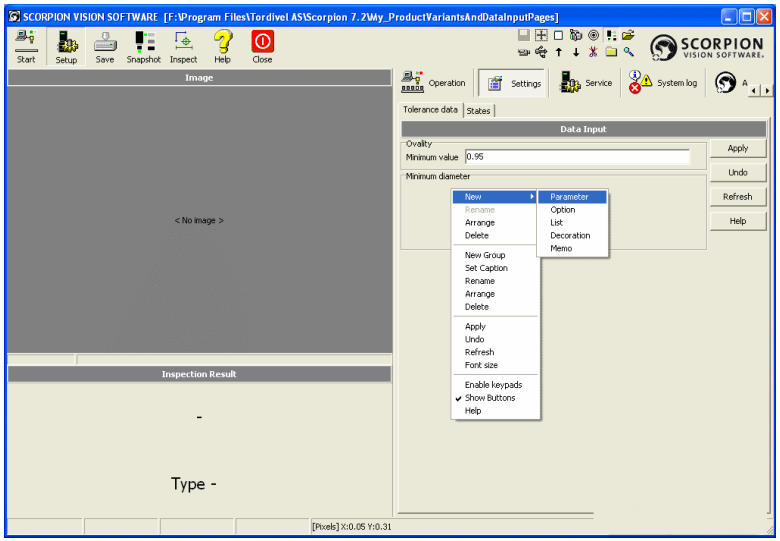


*Figure 52: New Parameter*


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Type name as '**Small washer**' and click on the '**...**' button next to '**Parameter**'. This will pop up the 'Select.....' dialog box.

Select '**ToleranceData**' from the left panel and '**Small**' from the right panel.

Click on the '**OK**' button to close the '**Select.....**' dialog box.

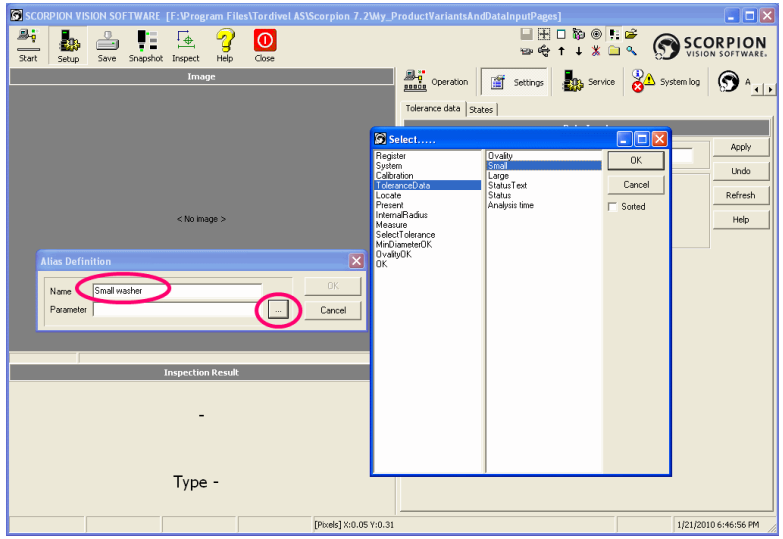


*Figure 53: New Parameter Setup*

Click on the '**Ok**' button to close the '**Alias definition**' dialog box.

A new user interface element will now get added under the '**Minimum diameter**' group.

Right click anywhere inside the '**Minimum diameter**' group box. Click on the '**New**' menu and '**Parameter**' sub-menu. This will pop up the '**Alias definition**' dialog box.

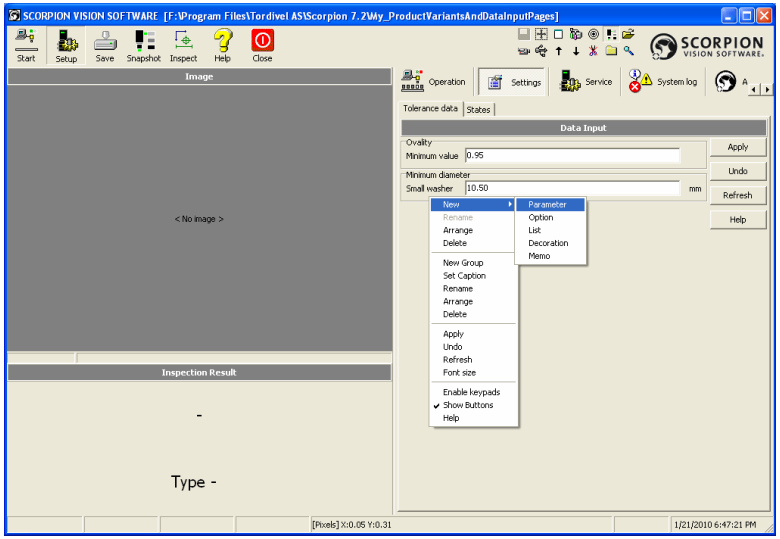


*Figure 54: New Parameter*


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Type name as '**Large washer**' and click on the '**...**' button next to '**Parameter**'. This will pop up the '**Select.....**' dialog box.

Select '**ToleranceData**' from the left panel and '**Large**' from the right panel.

Click on the '**OK**' button to close the '**Select.....**' dialog box.

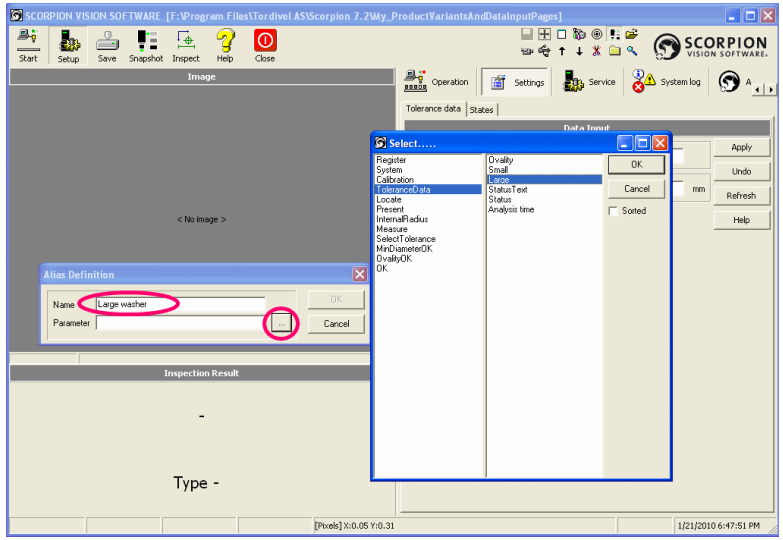


*Figure 55: New Parameter Setup*

Click on the '**Ok**' button to close the '**Alias definition**' dialog box.

A new user interface element will now get added under the '**Minimum diameter**' group.

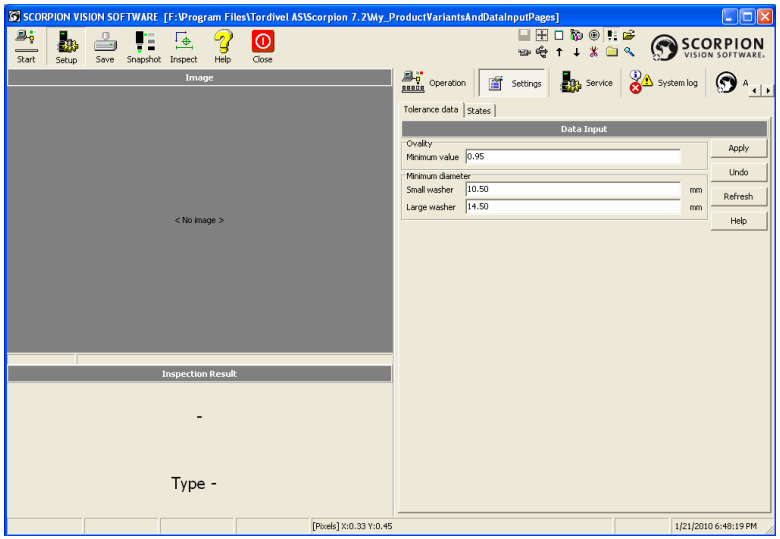


*Figure 56: User Input Setup Complete*

We have added a new page in the right pane, for user inputs. Then we added user interface elements to the new page linking each one of them with the 'ToleranceData' tool data types.


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# 9. Setting up Curves

Select '**Operation**' mode from the right hand side mode selection buttons.

Click on the '**Curves**' tab.

Right click on the blank area below the '**Curves**' title. Click on '**Add**'. This will pop up the '**Select.....**' dialog.

Select 'Measure' from the left panel and '**Diameter** min' from the right panel.

Click on the '**OK**' button to close the '**Select.....**' dialog.

This adds the '**Measure.Diameter min**' curve to the list of curves.

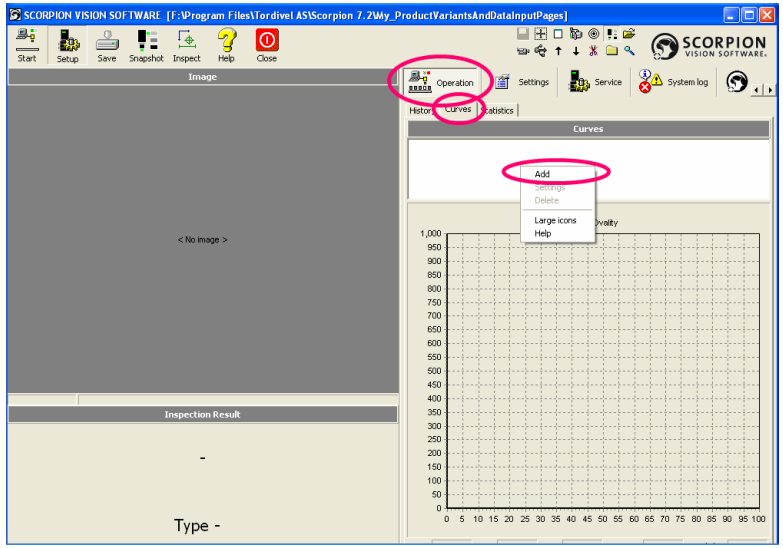


*Figure 57: New Curve 'Measure.Diameter min'*

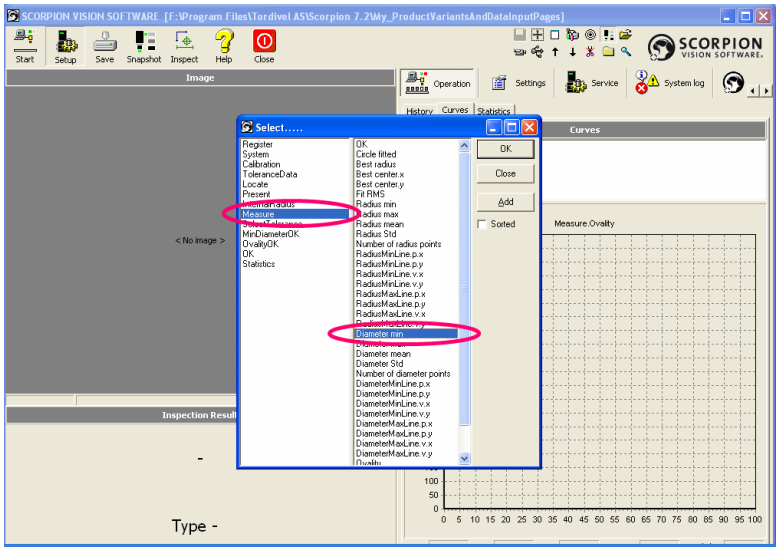


*Figure 58: 'Measure.Diameter min' Parameter Selection*


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Right click on the newly added curve '**Measure.Diameter min**' and click on '**Settings**'. This will pop up the '**Settings for Measure.Diameter min**' dialog box.

Under '**Axis Settings**', set '**Max value vertical axis**' as **15** and '**Min value vertical axis**' as **10**.

Under '**Limits**', select the '**Active**' checkbox next to '**Alarm low limit**'. Click on the '**...**' button. This will pop up the '**Select.....**' dialog box.

Select '**SelectTolerance**' from the left panel and '**Value**' from the right panel. Click on the '**OK**' button to close the '**Select.....**' dialog box. This will set the '**Alarm low limit**' as '**SelectTolerance.Value**'.

Click on the '**OK**' button to close the '**Settings for Measure.Diameter min**' dialog box.

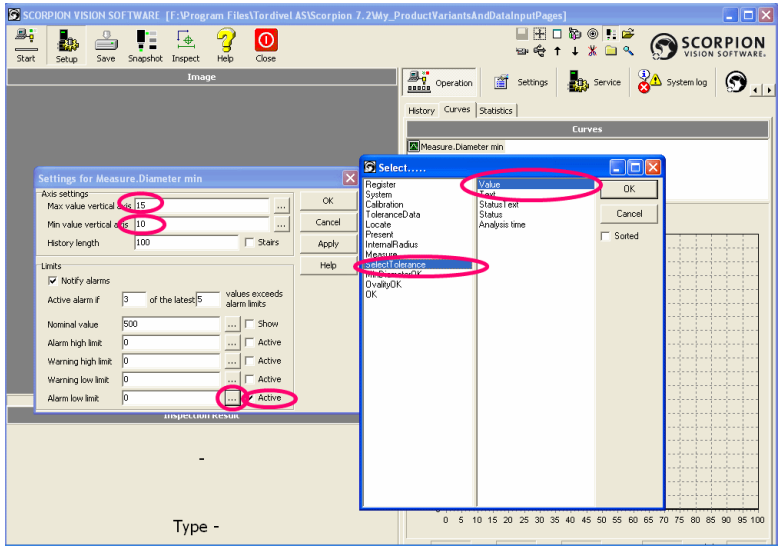


*Figure 59: 'Measure.Diameter min' Curve Settings*

Right click on the blank area in the curves list below the '**Curves**' title. Click on '**Add**'. This will pop up the '**Select.....**' dialog box.

Select '**Measure**' from the left panel and '**Ovality**' from the right panel.

Click on the '**OK**' button to close the '**Select.....**' dialog.

This adds the '**Measure.Ovality**' curve to the list of curves.

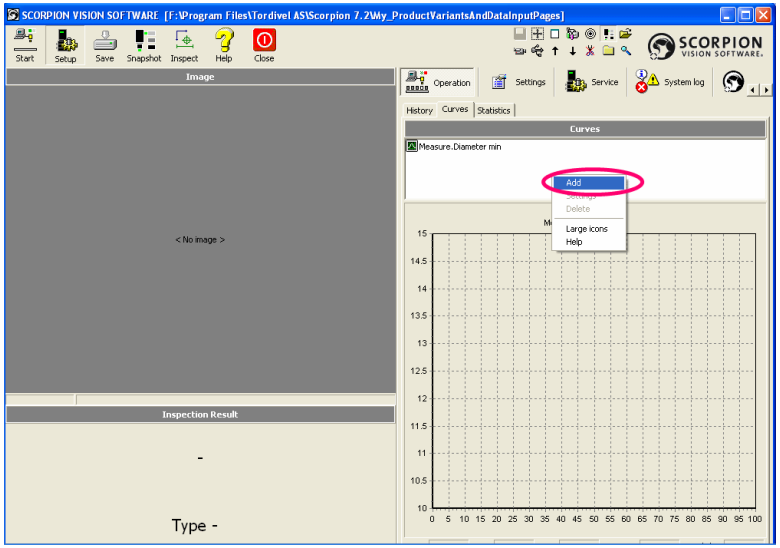


*Figure 60: New Curve 'Measure.Ovality'*


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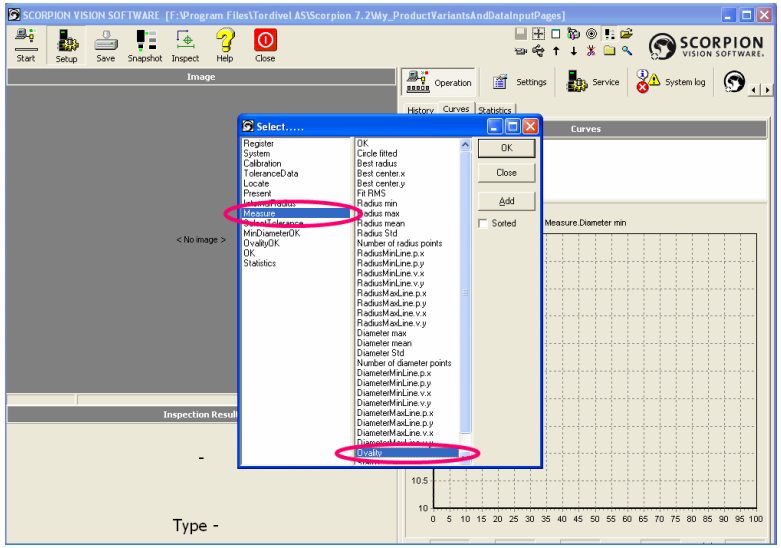


*Figure 61: 'Measure.Ovality' Parameter Selection*

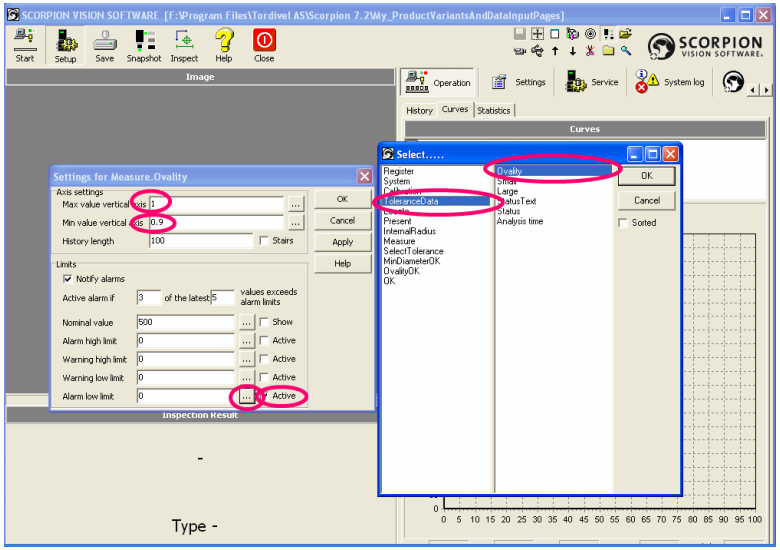


*Figure 62: 'Measure.Ovality' Curve Settings*

Right click on the newly added curve '**Measure.Ovality**' and click on '**Settings**'. This will pop up the '**Settings for Measure.Ovality**' dialog box.

Under '**Axis Settings**', set '**Max value vertical axis**' as **1** and '**Min value vertical axis**' as **0.9**.

Under '**Limits**', select the '**Active**' checkbox next to '**Alarm low limit**'. Click on the '**...**' button. This will pop up the '**Select.....**' dialog box.

Select '**ToleranceData**' from the left panel and '**Ovality**' from the right panel. Click on the '**OK**' button to close the '**Select.....**' dialog box. This will set the '**Alarm low limit**' as '**ToleranceData.Ovality**'.

Click on the '**OK**' button to close the '**Settings for Measure.Ovality**' dialog box.

We have set up 2 curves – one each for the 2 parameters being inspected; 'Minimum diameter of inner circle' and 'ovality of inner circle'.

Curves give a visual indication of the output from Scorpion. Visual indication is useful in set up to fine tune the user data input. Visual indication is useful during the inspection process to understand the inspection results and the trend.


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# 10. Running the System

Set up is complete and we are now ready to run the system

Click on the '**Start**' tool bar button. This will start capturing the images (from camera simulator as per our settings) and will also do the analysis for '**Washer classification**'.

The captured image is displayed below the toolbar buttons and it also has visualization updates done by Scorpion.

When a washer is present in the captured image, it is classified as '**Small**' or '**Large**'. The classification result is displayed in the '**Results**' panel. The washer inspection is done against user defined values. If both the 'inner diameter' and the 'ovality of inner circle' are higher than the user specified threshold; the result is '**OK**' and the '**Results**' panel color is set to green.

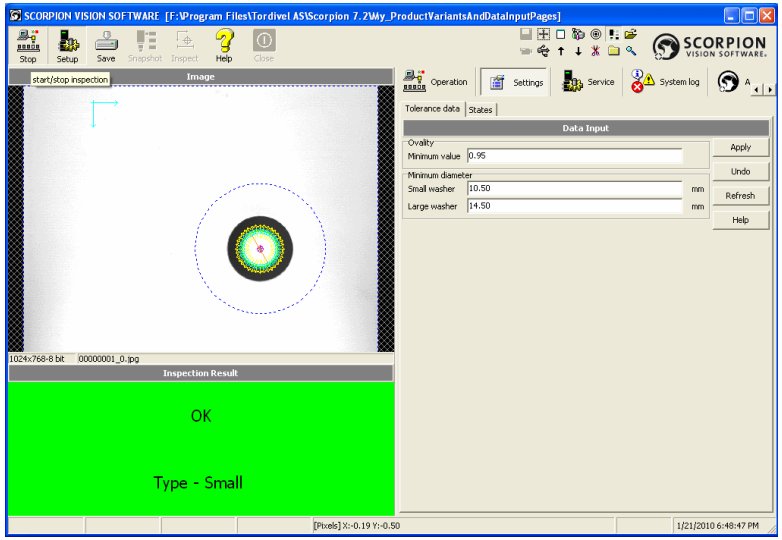


*Figure 63: Result 'OK'*

When a washer is present in the captured image, it is classified as '**Small**' or '**Large**'. The classification result is displayed in the '**Results**' panel. The washer inspection is done against user defined values. If any of the parameters - 'inner diameter' or 'ovality of inner circle' are lower than the user specified threshold; the result is '**FAIL**' and the '**Results**' panel color is set to red.

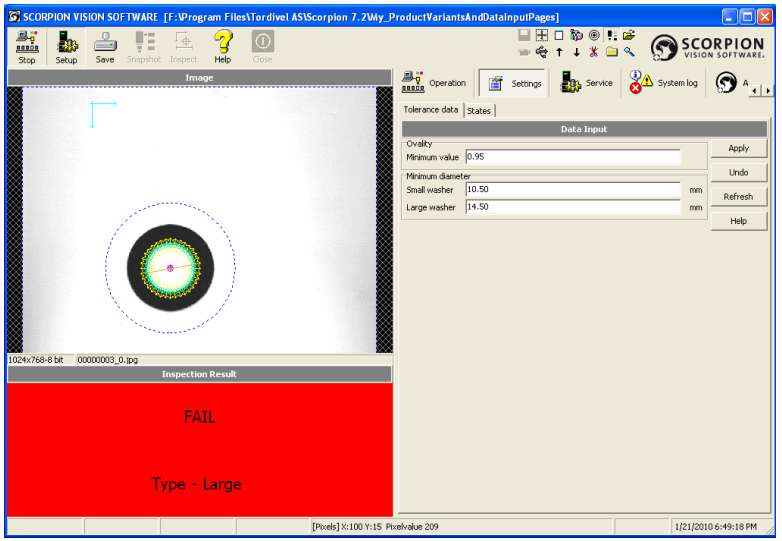


*Figure 64: Result 'FAIL'*


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When a washer is not present in the captured image, the '**Result**' panel shows a yellow color with the '**No washer'** text.

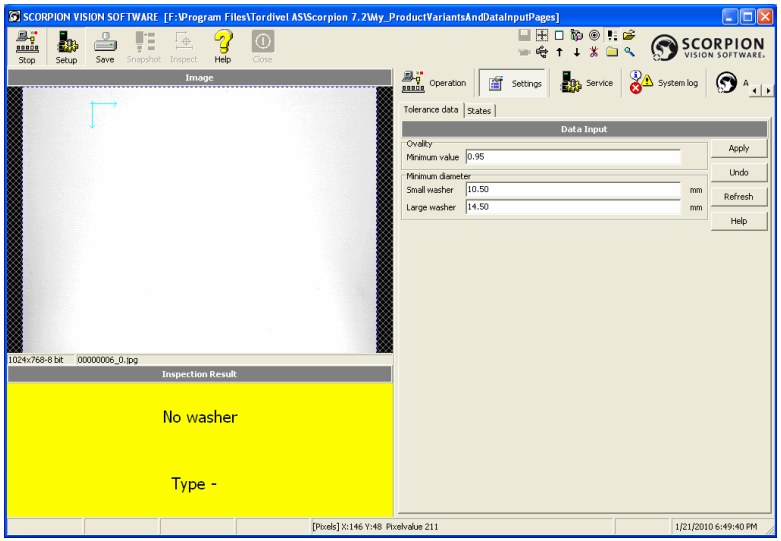


*Figure 65: Result 'No washer'*

Congratulations!
You have successfully created an 'Advanced Washer Inspection System with User Data Inputs' system using Scorpion Vision Software!

Try changing the user data input values from the '**Tolerance data**' page: '**Ovality Minimum value**', '**Minimum diameter for Small washer**', and '**Minimum diameter for Large washer**'.

Click on the '**Apply**' button to apply the changes.

The inspection results will change as the user specified values change.


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# 11. Measurements on the Displayed Image

Scorpion provides an easy way to quickly measure distances on the displayed image. This feature is very useful during set up and analysis.

**Mouse left button down** anywhere on the displayed image and **dragging**, draws a rectangle. When the **mouse left button is released** after drag, the display **zooms** to the selected rectangle.

When zoomed, a rectangle indicator is displayed in the top-left corner of the display panel which indicates the current zooming and position of the current view. This zoom indicator can be moved to the left bottom corner of the display panel by clicking on it.

Clicking anywhere on the image, **resets zoom** and shows the image in the original full view state.

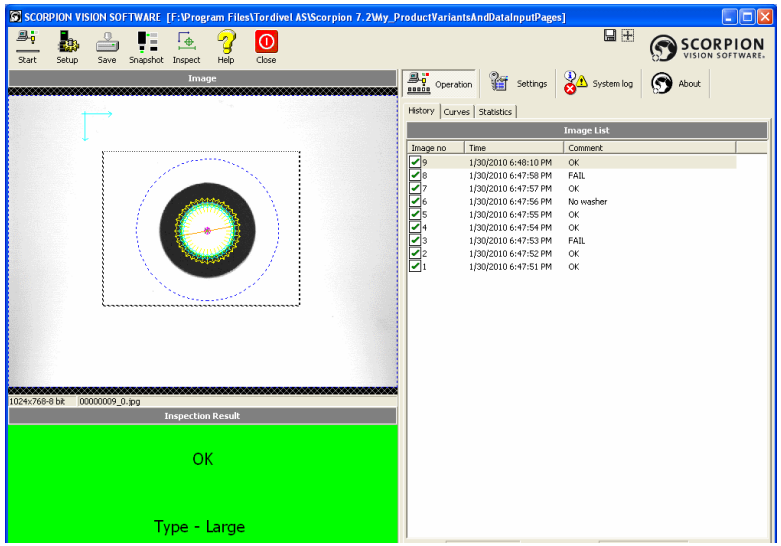


*Figure 66: Select Zoom Area*

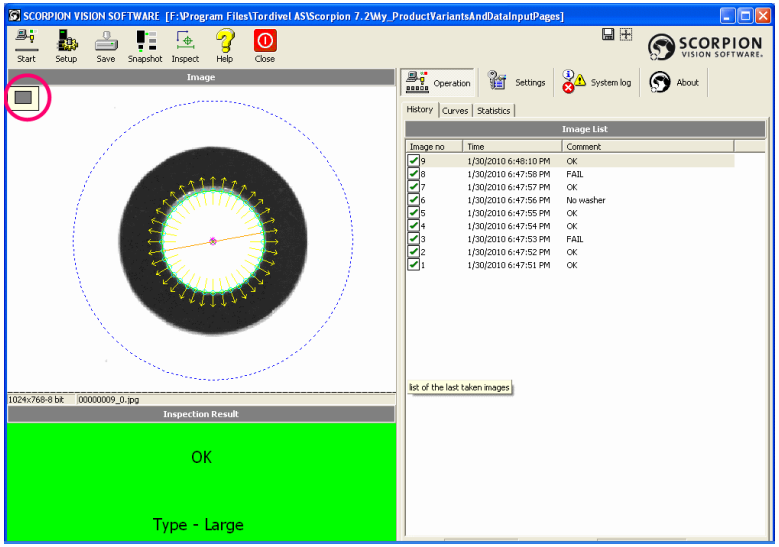


*Figure 67: Zoom*


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**Right click** on the image. Click on the '**Show info**' menu. Now whenever the mouse moves on the image, it shows information about the pixel where the mouse is currently pointing. Information includes the 'Reference **System**' used (pixels / calibration), **X** position, **Y** position and **color value** of the pixel.

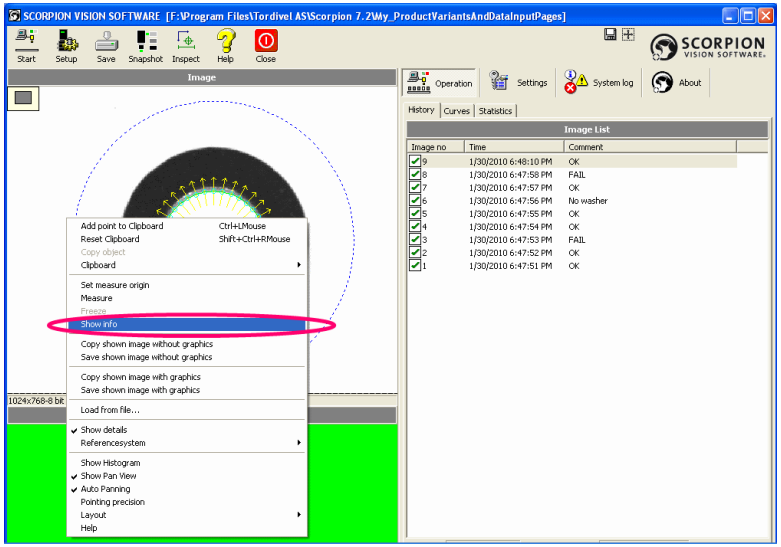


*Figure 68: Enable 'Show info'*

**Right click** on the image. Click on the '**Referencesystem**' menu and '**Calibration**' sub-menu. This will start showing the info in calibrated units instead of pixel units.

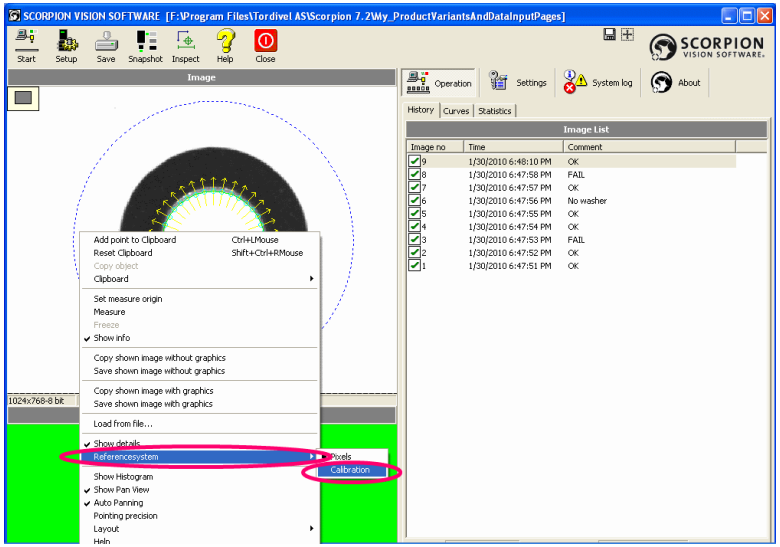


*Figure 69: Set Reference System*


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**Right click** on the image. Click on the '**Measure**' menu. This starts the measurement.

When '**Measure**' is enabled, the information displayed at the mouse cursor changes. Information now includes the '**Reference System**' used (pixels / calibration), **Origin X** position, **Origin Y** position, **dX** which is the difference in the current X position with respect to the origin X position, **dY** which is the difference in the current Y position with respect to the origin Y position, **Length** which is the distance between the origin and the current point and **Angle** in degrees.

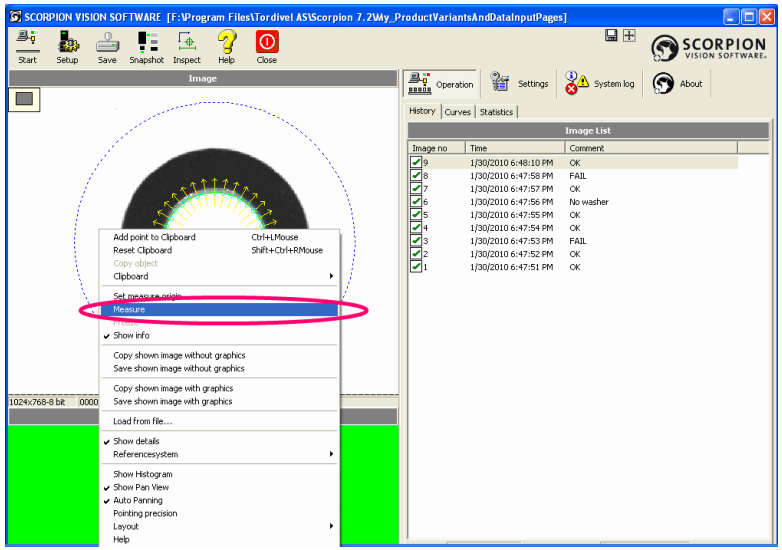


*Figure 70: Enable Measurement*

While measurement is enabled, the mouse cursor is treated as the 2nd point of a line. The 1st point of the line is 'measurement origin'. The default origin is at the top-left corner of the image.

**Right click** on any point on the image and click on '**Set measure origin**' to set the selected point as origin.

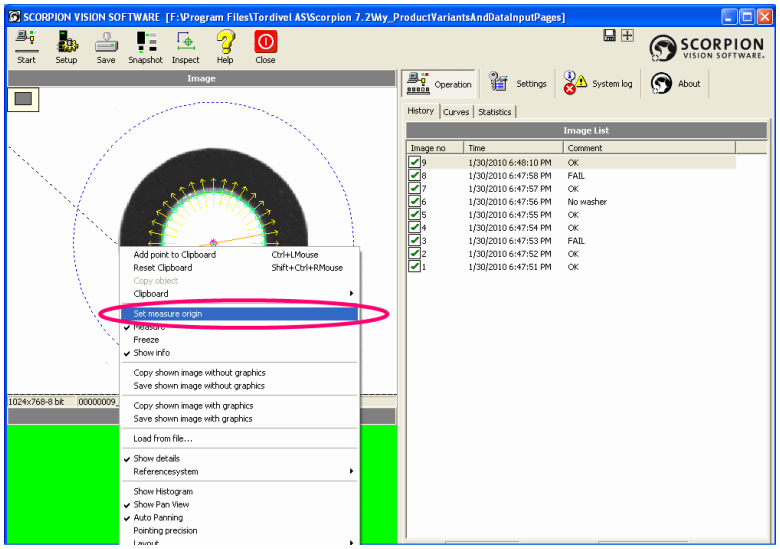


*Figure 71: Set Measurement Origin*


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As an example, select a point on the outer circle as origin.

Now for measuring the outer diameter, move the mouse on the diametrically opposite point on the outer circle. The information displayed near the cursor will include the '**Length**' which is the diameter of the outer circle.

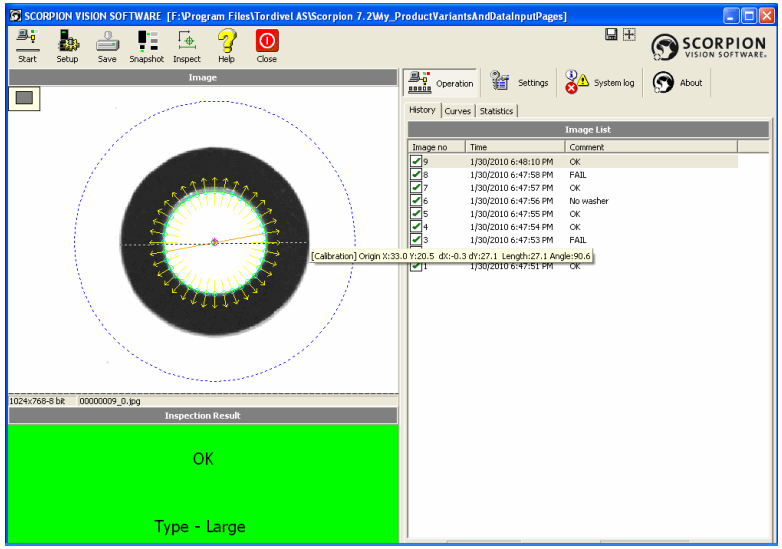


*Figure 72: Measure Outer Diameter*


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# 12. *Tutorial Summary*

- We tried out the pre-compiled profile 'GettingStartedTutorial_Part4_ProductVariantsAndDataInputPages' for classification and user input data based inspection of washers available in the images captured by Scorpion.

- Then we updated the 'Gauging' profile from the last tutorial 'GettingStartedTutorial_Part3_Gauging' and configured the 'ProductVariantsAndDataInputPages' profile and saw it in action. The profile updates included setting up the new tool 'ExternalData', the new tool 'PythonScript', updating logic tools to process user input data, and setting up the user interface for user input data.


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