Beginners Tutorial for HDV300 with M3 Software

Section 1: Starting up

With the machine plugged in on the back of the machine towards the right side by the plug, there is a power switch that must be turned on. The “line” symbol indicates ON which should be on the top, the “circle” symbol indicates OFF which should be on the bottom. Flip this switch to the ON position. The machines main power is now turned on. The next step is to toggle the power switch located to the right-hand side of the lens on the front of the machine to the ON position. Once this turns on the monitor should have a blue light that illuminates. This means the machine has been powered on.

Once the machine is completely powered up, double click the icon for the M3 software to start it up. This should look like an “M” symbol. Once the software opens up a window will pop up requesting that you home out the machine. To manually home out the machine just follow the prompts on the screen. The first prompt will be to “cross the reference mark for the X-axis”, to do this you rotate the control for the X axis and move the machine in the X direction (the knob on the top, left-hand side of the machine that controls the left and right movements) either way (positive or negative) until you hit the first reference mark and the prompt changes. The second prompt will say to “cross the 2nd reference mark for the X-axis”. When you see this just continue the same movement in the X direction until the machine hits the 2nd reference mark and the prompt changes again. The values on the left-hand side of the screen will adjust, or home out, from what is a very large X value (for example something like 9,900) down to a smaller more realistic X value. The third prompt that will pop up says to “cross the reference mark for the Y-axis”. This will be the same process as before but instead for the Y-axis. Using the controls for the Y axis (the knob on the bottom, right-hand side of the machine that controls the up and down movement), move the machine in the Y direction either way (positive or negative) until the machine hits the first reference mark and the prompt changes. The last prompt will pop up and say “cross the 2nd reference mark for the Y-axis”. When you see this just continue the same movement in the Y direction until the machine hits the 2nd reference mark. The values on the left-hand side will adjust, or home out, from what is a very large Y value (for example something like 9,900) down to a smaller more realistic Y value. The prompts will close and you will see a green check in the top right corner on the screen. This means the machine has been homed out.

If a mistake is made and the “quit” button it hit instead of homing out the machine you will see a red X in the top right corner of the machine. This will cause errors in your measurements. If you accidentally hit the quit button you can click the button with the red X on the top right corner of the screen which will take you into the homing process manually. Every time you close and start up the software again you need to re-home the machine.

Section 2: Using tools (aka probes) to create features

Now that the machine is homed out and ready for use, we need to specify what tool or probe we want to use to collect our data points. On the bottom of the screen we have a toolbar with icons. This tool bar will be our main controls for extracting our data. The third icon from the left-hand side of the screen is going to be the icon used to switch between our tools or probes. There are going to be three main options that you will most likely use.

The first icon is called the crosshair (X-hair). This is the option that is most similar to older style comparators. This option shows a crosshair on the screen. To use this to collect data points you line up the crosshair with the point you would like to take and take the data point. You can drag the crosshair

around on the screen to different locations, so it does not always have to be in the center. To drag the cross hair around, click with the mouse or use the touch screen to grab the center of the crosshair and hold down and drag it to the new position. This allows you to select other points that are in the field of view without having to move the machine axis. If you drag it to a new position and want it to reset to the center again, hold down the button on the top, left side of the field of view screen (it looks like two arrows intersecting). This snaps the crosshair back to center. You can also rotate the crosshair to a different angle. To do this click once on the button on the top, left side of the field of view screen (it looks like two arrows intersecting). This will toggle to rotation and the symbol of the button will change to a semi-circle with an arrow. To rotate the crosshair, click or touch one of the lines and drag in the direction you would like to rotate it. The "Q" value on the left side of the screen will display the angle you are rotated to. If you want it rotated back to the default position, click and hold the button on the top, left of the field of view screen. This will snap it back to the default position (0 degrees). In summary, to toggle between translation or rotation of the crosshair click the button on the top, left side of the field of view screen. To reset to the default center location, click and hold the button on the top, left side of the field of view screen.

Another thing to pay attention to when using the crosshair tool is the gray bar that pops up on the right-hand side of the field of view screen. You want this bar to be stable to make sure you are collecting good data points. If this bar is jumping up and down you may need to change the focus of your part by moving the focus knob or moving the part forward or back on the table. You also might need to change the lighting. To change the lighting there is a button on the bottom tool bar that looks like a sun and is called "Light". This is how you can adjust the lighting to get a more stable view of your part. If you make the lighting too bright or too dark the gray bar will turn red, this lets you know that the light is distorting the view of the part and you will not get good measurements.

To take measurements using the cross hair the first step is to decide what feature you are trying to measure, the options you have are on the bottom tool bar. There is a point, line, circle, slot, or blob for the feature options. To create a point, select the point icon on the bottom tool bar. Next drive the crosshair to the location you would like to take the point and either click the enter button on the bottom right of the screen to take the point and then the done button to close out of the feature or click in the big yellow box on the top left of the screen to take the point and then the done button to close out of the feature. To create a line, select the line icon on the bottom tool bar. Next drive the crosshair to the location you would like to take the first point for the line and take the point using the enter button or the yellow box. To take another point on the line drive the crosshair over to the next location you would like a point and take that point by clicking enter or the yellow box. Continue to do this until you are happy with the points on the line. Once you are happy with the line, click done to close out of the feature. To create a circle, select the circle icon on the bottom tool bar. The circle icon is a little different because you need to tell the software whether you want a full circle or an arc segment. Then using the crosshair take the points for the circle by clicking enter or the yellow box then done to close out of the feature. If you take a point you don't like, you can click the undo button on the top menu bar to delete the last point.

The next icon in the tool menu (The third icon from the left on the bottom toolbar) is called "Active" and shows an icon of crosshair with a little starburst type image in the center. A crosshair will appear in the middle of the screen again but this one will have a circle in the center, this is a more advanced crosshair. Inside this circle the software uses edge detection to determine where the actual

edge is located on the part based upon the dark to light contrast by the edges. This helps to align the points you are taking to the actual edge of the part instead of just using the center location of the crosshair. This crosshair can also be rotated or translated using the same methods as the traditional crosshair. Also, you still need to pay attention to the gray bar just like the traditional crosshair. If no edge is detected the circle in the center of the crosshair will appear red, if an edge is detected this will appear green. To create points, lines, circles, slots, and blobs use the same method as previously described with the traditional crosshair.

The third tool option is called the “eye measure tool” and shows an icon of a finger with a little starburst type image by the fingertip. This method allows you to trace featured using your finger or the mouse and also uses edge detection to determine the actual location of the edge. You can zoom in or out using your fingers by pinching or spreading your fingers on the screen to get a better view if you need to. You will notice the icon for the rotation/translation for the crosshair disappears, because there no longer is a crosshair, your finger (you can use a stylus) or mouse, is the new tool for selecting points. The gray indicator bar disappears as well, there will be a new way to see if your view is stable enough covered soon. To create a point, select the point icon on the bottom toolbar and then click with the mouse or use your finger to select the point you would like, the edge detection will snap this to the edge, and then click done to close out of the feature. To create a line, select the line option from the bottom toolbar. To collect the data, click and drag using your finger or mouse along the edge of the line you would like. When you release the mouse or finger you will see an image with two bands and your line in the middle. The line will have a bunch of points in it. These points will act as your gray indicator bar, if the points are floating around, your image may not be stable enough so you might have to change focus or the lighting, if this doesn’t help see the further section containing some advanced techniques. If you are selecting something and it is not detecting the edge a symbol will appear where you touched with a starburst like image with a red X over it to let you know. To continue to collect data points for this line you can move the machine axis and continue to drag your finger or mouse to collect more data. Once you are happy with the points in the line click ok to close out of the feature. To create a circle, slot, or blob follow the same methods.

As you create features, they will appear on the right-hand side of the screen. To delete features, highlight the feature in the list and a delete button will appear in the bottom right corner of the screen, click this button to delete. Once you delete a feature the previous feature on the list will automatically be highlighted. If you accidentally delete a feature and want it back, click the undo button. To change the units from millimeter to inches click the mm button in the top right corner of the screen. The button will switch to sat inch instead of mm. To switch back click that button again.

Section 3: Setting the origin

To make sure that you are getting accurate results it is a good idea to set up an origin on the part. This is known as a “Datum” in the software. The best way to go about setting this up is to first create a skew to level out the part to the machine axis then create the datum. To create a skew, first you need to create a line on a surface of the part that you want to be the y origin point using one of the methods listen in the previous section. Next click on the “datum” icon on the bottom toolbar that looks like a picture of two lines intersecting, this is the last button to the right on the bottom toolbar. Now we are in the datum menu. Before we create the datum, we need to skew by using the “skew” button that appears on the bottom toolbar that looks like a crooked rectangle. After you click the skew button, we

need to select the line in our features list on the right and then click done. The line in the image located on the left of the screen should straighten out and a feature called “skew” should appear in the features list on the right-hand side. Now the part is skewed or leveled out to the axis. Next, we need to set up the datum or origin. The datum has to be a point so we need to create an intersection point between two lines where we want our zero point or origin to be located. We first need to create another line on the surface of the part where we would like our X origin to be located. Once we have this line, we need to create an intersection point. To do this click the point option on the bottom toolbar then click both of the lines in the features list on the right side of the screen. They should highlight in blue, then click done. To set this as our datum in the system click the datum button, then select the point from the list on the right of the screen. We now have our origin created.

Section 4: Getting dimensions

Now that we have our origin, we can start to program our dimensions. First you need to create the features that you will need for the dimension. If you are writing a program to use on multiple samples pay attention to the order you create the features, they cannot be rearranged so the order you create them in will be the order the program runs in. Try to minimize the movements/travel. To output angles or distances click the button on the bottom toolbar to select it. Next select what two features you would like the distance or angle between from list on the right and click done. Now we need to edit the nominals and input the tolerance for the dimension. To do this highlight the dimension in the list on the right side of the screen, then click in the white box on the left side of the screen that says the dimensions name and the x/y coordinates. This opens a new window where you can edit the dimension. To rename the dimension click on the button that has the dimensions name in it. The box will turn green and then you can type in the new name, click done when you are finished to save the changes. If you are reporting a distance on the bottom left of the window there will be a button to toggle through different options for the distance. For distances that use circles or arcs there will be an option for nearest, furthest, or center. For other distances there will be a perpendicular option. For angles there will be options for included, 180 plus, 180 minus, or 360 minus. The image will show which angle or distance is being reported. This screen is displaying the actual measured values. Also on this screen on the right hand side for certain features you will see a button to toggle to different evaluation options. To set up the nominal value click the button on the top that says Actual/n/t/d one time. This will toggle to the screen with the nominal information, the button will update at the top to say nominal/t/d/a. Click in the box for the number you would like to edit and type in the nominal value from the print using the keyboard or the number pad that appears on the bottom right of the screen and click done to save the change. If you do not hit done after editing any of the numbers it will not save the changes. To add in a tolerance, click the top button that says nominal/t/d/a to toggle to the tolerance screen, the button will update to say tolerance/d/a/n. There will be at least one new button that appears on the bottom right. These buttons are the options to add in tolerances for dimensions. For example, the angle will show a picture of a +/- sign and an angle image, a circle will have more options like roundness, diameter, or position. Click the appropriate tolerance button to report it. There will now be boxes for the - tolerance and + tolerance. To edit these, click in the first box and type in the lower tolerance, the box will highlight in blue. You do not need to include the minus sign with the value, it automatically does this. If you have a min/max dimension, click one of the buttons that say - tol or + tol to toggle between the two options. Click done after you input the tolerances to save the changes. If you need to add in more dimensions for that feature add the tolerances in for those as well, for example a circle might ask for roundness and the

diameter. If you click the button that says tolerance/d/a/n it will toggle to the next screen which shows the deviation. To toggle back to the actual screen that we started on click the button that says deviation/a/n/t. Follow this same process to output all required dimensions from the print.

Section 5: Getting the data

Once all of the dimensions needed are reported we need to output our report. To navigate to the data screen, click the data button located on the top row of icons, the 4th button from the left that looks like 3 columns. This is where we set up all of the report settings. To choose a report format click the 2nd button from the left on the bottom of the screen called "list". The template that is the least busy is called "European 2". To export the data, click and hold the 5th button from the left on the bottom of the screen. The export file window will open. Choose the file type (CSV will work in excel) and name the file. The default location for the exported results is at C:/users/public/publicdocuments/metlogics/exports.

To save the program click the M3 button located in the top left corner, then select the floppy disk. The default location for the program files is at C:/users/public/publicdocuments/metlogics/parts.

Section 6: Running a program

If you have a part that has multiple samples you can use the same program to measure the parts. To run a program, click the M3 button at the top left of the screen and then click the play button. From here one of two things might happen. The software will either ask if the part is in the same approximate location or ask you to measure the first feature in the list used for the skew. If the software asks you if the part is in the same approximate location you can click yes or no. If you say yes, it will ask you to drive the machine over to the first edge that is highlighted in the image on the left and you will see an arrow appear on the screen. The arrow points in the direction of the feature. The goal is to drive the machine over so that the arrow goes into the center of the circle that appears by the feature. When you do this the machine will use the edge detection and automatically measure that feature. Repeat following the same steps. If you click no the software will ask you to locate and measure the features needed for the datum or origin (The skew line for the y axis and the other line for the x axis). To measure them drive the view over to the correct edge that is shown highlighted in the image on the left and take the data points manually for that feature. Repeat for the next feature. If the software does not ask the question, then it will ask you to manually measure the two features and then it will start to show the arrows.

Section 7: Shutting down

When you are finished using the machine you should shut it down. To shut it down first save any work you have then exit out of the software by clicking the x in the top right corner or from the M3 symbol on the top then the power symbol. Power down the machine then turn off the power switch on the front right of the machine. After that turn the switch in the back of the machine to the off position.

Section 8: Advanced tips

When using the eye measure tool after you select the data point and before you hit enter to take the data points you will see symbols on each side of the lines capturing the points. If you click and drag the circular symbol this will allow you to change the angle of the line. If you click and drag the

triangle symbol allows you to change the width between the lines. If you click and drag the straight line or dash mark it allows you to switch to a line or a radius, so it adds or removes a curve to the line. If you click on the triangle symbol once it will flip the triangles so they are facing the same direction, so when the machine searches for the edge it only will search in one direction instead of two, light to dark or dark to light. Clicking it again will toggle through the different options. This is good to try when your data points look unstable after you try to take them.

If you click and hold while trying to extract data points it will zoom in to allow you to choose points more specifically.