

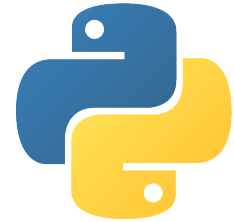
Application Note

Polar Coordinates Extension

VIC-3D 11.2

2026

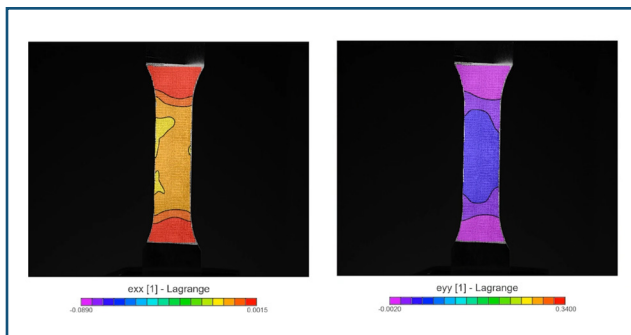
Polar Coordinate Extension



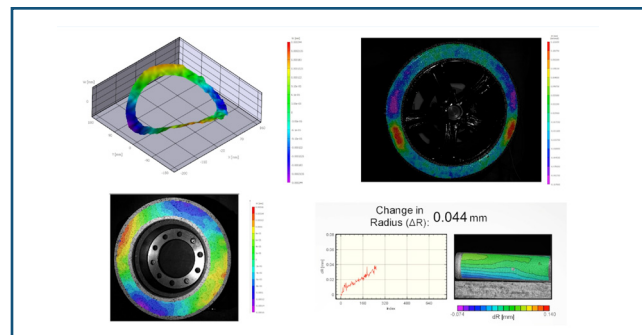
Introduction

Standard DIC analysis produces displacement and strain data in Cartesian (x, y, z) coordinates. This works well for many applications, but certain geometries and loading conditions are better understood in alternative coordinate systems. For turbine blades, flywheels, brake rotors, and other rotating machinery, understanding radial versus tangential behavior is critical. A displacement that appears as a complex combination of X and Y components in Cartesian coordinates becomes a clear radial expansion or tangential shift in polar coordinates.

Pressure vessels, pipes, and O-ring seals naturally deform in radial patterns. Analyzing hoop strain (tangential) separately from radial strain provides direct insight into material behavior and failure modes that would be obscured in Cartesian representation. Further, the stress field around circular holes follows polar patterns. Expressing strain in polar coordinates aligns your measurements with analytical solutions and textbook formulas, making validation and comparison straightforward.



Strain data in Cartesian coordinates on a standard dogbone sample



Examples of tests benefitting from polar coordinates

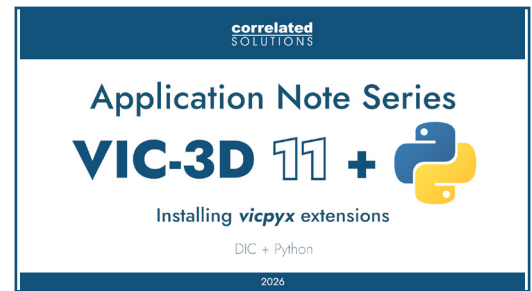
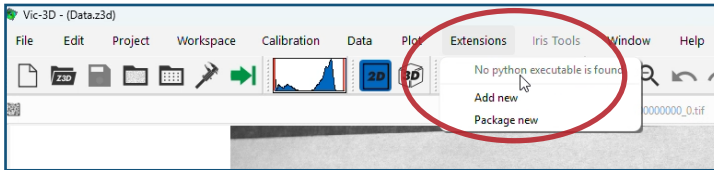
To demonstrate the use of the Polar Coordinate extension in VIC-3D 11.2, we devised a simple test using a speckled ring printed on a piece of paper variously crinkled over 5 images.

[Download the data by clicking here](#) or click the QR code to follow along.



Running *vicpyx*

To use *vicpyx*, click the *Extensions* tab in the Main Tool Bar.



If you see “No python executable is found,” Python needs to be installed before you continue.

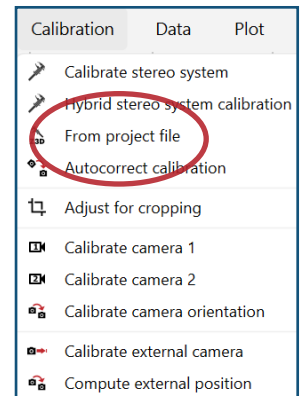
Please see "Installing *vicpyx* extensions," which is available as a [PDF](#) or [video application note](#).

Getting Started

Begin the project as usual with the following steps. First, start a new project and bring in the calibration images (or calibration data from another project).


If using the provided example, go to *Calibration* -> *From project file* and select the .z3d file in the downloaded folder which contains calibration and coordinate data for this project.


Then, import test images, and define the Area of Interest (AOI) using the *Create Circle* and *Cut Circle* tools. Adjust the subset and step size before analyzing the test images by clicking the *Start Analysis* icon.




In the analysis window, under the *Post-Processing* tab, be sure to disable “Best plane-fit.” Then, click *Run*. When the analysis is complete, take a moment to notice the absence of Polar Coordinates (R, θ) in the list of available contour variables. Lastly, click *Close* to return to the Main Workspace.

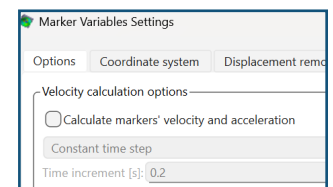
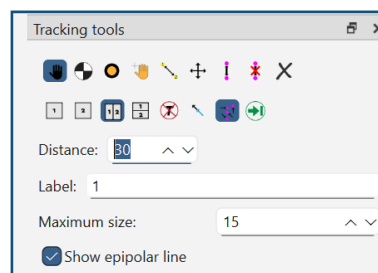
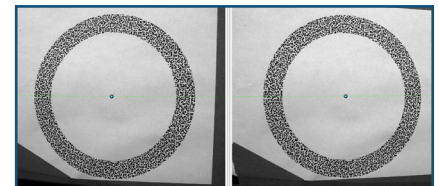
Finding the Origin using the Marker Tracking Workspace

The next step is to use the Marker Tracking Workspace to find the correct center point in preparation for the Polar Coordinates Extension. Using the more convenient split screen view, place an ellipse marker at the origin point in Camera 1. 

Then connect the origin point in Camera 1 with the same point in Camera 2 using the associate markers tool. 

Next, click the green arrow  to process the marker locations and associate the origin point.

In the Marker Variables Settings window, unclick *Calculate marker velocity and acceleration* under the Options tab. Then click *Apply* and *Close*.



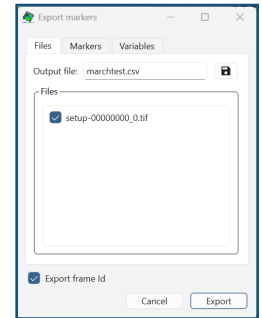
Marker Tracking split screen workspace (top), detail on the tracking tools (left) and the Marker Variables Settings window.

Next, export the marker data by clicking *Data - Markers - Export Marker Data*.

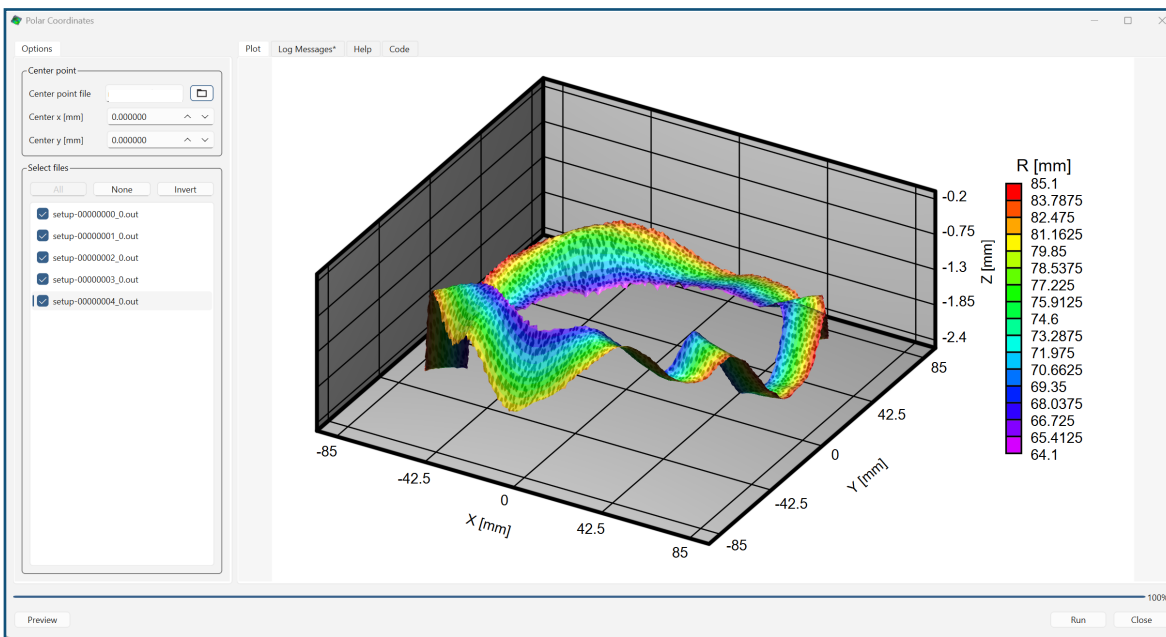
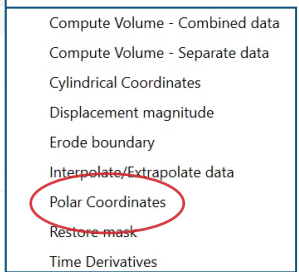
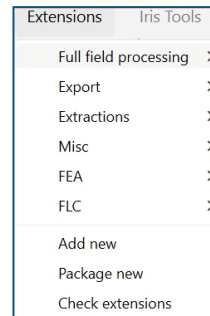
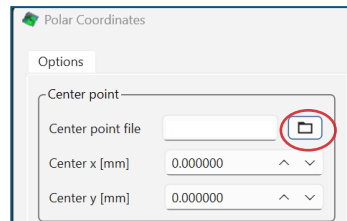
Now, return to the Main Workspace.

Running the Polar Coordinate Extension

Run the Polar Coordinate Extension by clicking *Extensions -> Full field processing -> Polar Coordinates*.



Click the folder icon under the *Options* tab and select the just-exported marker data to import it here.




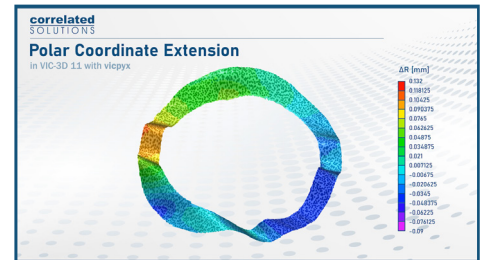
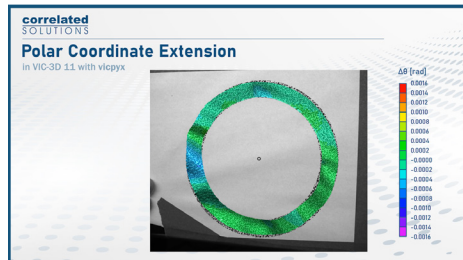
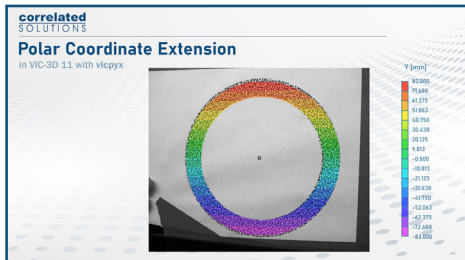
- X [mm]
- Y [mm]
- Z [mm]
- U [mm]
- V [mm]
- W [mm]
- exx [1] - Lagrange
- eyy [1] - Lagrange
- exy [1] - Lagrange
- e1 [1] - Lagrange
- e2 [1] - Lagrange
- gamma [1] - Lagrange
- R [mm]**
- ΔR [mm]**
- θ [rad]**
- $\Delta \theta$ [rad]**
- e_rr [1]**
- e_theta [1]**
- e_r0 [1]**
- sigma [pixel]
- x [pixel]
- y [pixel]
- u [pixel]
- v [pixel]
- q [pixel]
- r [pixel]
- q_ref [pixel]
- r_ref [pixel]

Click *Run* to align the images to the polar coordinates and then click *Close* to return to the Main Workspace.

Right-click again to check that the new set of contour variables are in place (as shown in the red rectangle to the right).

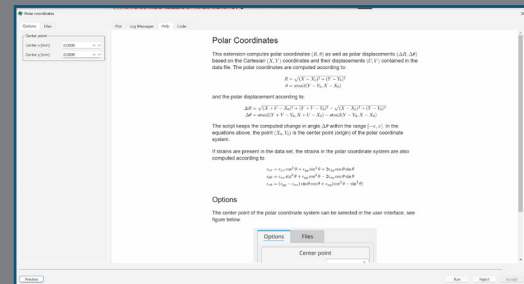
Export & Visualization

When the data is ready for export, right-click again to export directly as a PDF or video. For more complex presentations including juxtaposing the polar coordinate data with the test images and other animations, click the *iris* icon. 



For a video tutorial series covering tips and tricks in iris presentations, check out [Visualizing DIC](#).

NOTE: the details of the Polar Coordinates Extension can be found in the *Help* tab.



Support

Click this QR code for the calibration information, test images, and project file for this test which can be found under **Example Data** on the [Downloads page](#) of the Correlated Solutions website.

If you have any questions about this document or any other questions, comments, or concerns about our software, please contact us at support@correlatedsolutions.com, or visit our website at correlatedsolutions.com/support.



The powerful *vicpyx* extensions feature is available exclusively in VIC-3D 11. Contact one of our Sales Engineers at sales@correlatedsolutions.com for information on updating your software.