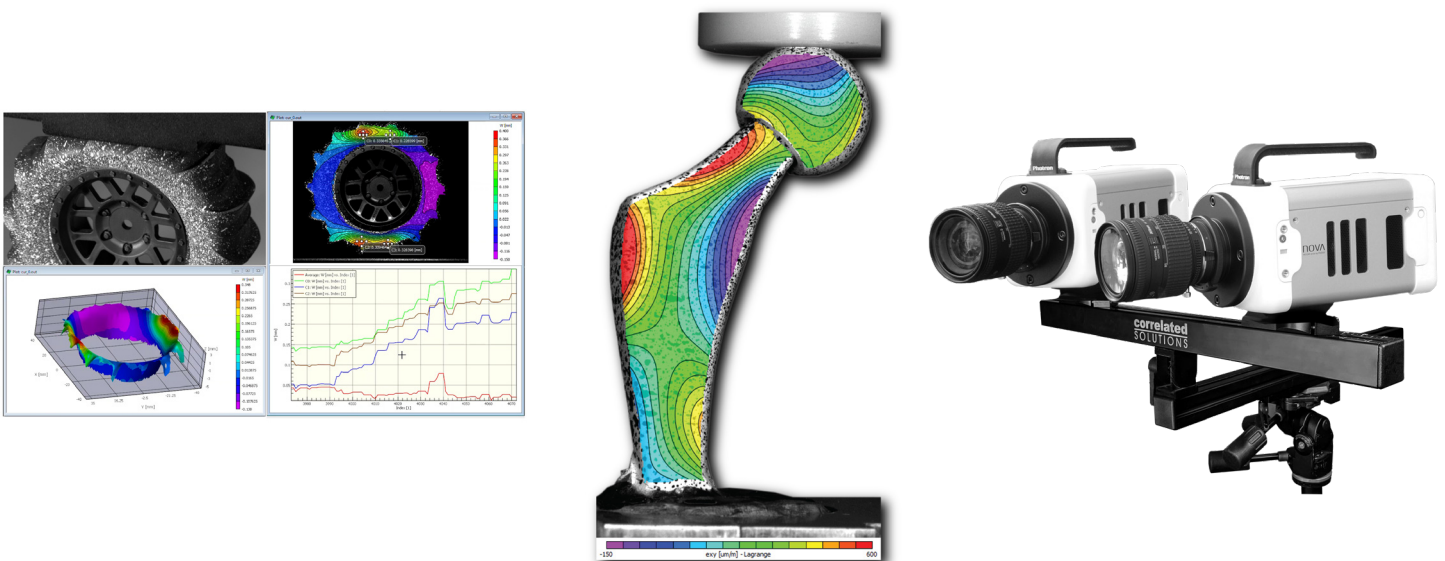


VIC-3D with *iris* System Specifications

The VIC-3D 9 system is a turnkey non-contact measurement system for full-field surface shape, deformation, strain, vibration, and much more. The system's core is the VIC-3D digital image correlation (DIC) software combined with VIC-Snap data acquisition software, which acquires and analyzes images from stereo-mounted digital cameras. Whether you are measuring deformation on biological tissue or dynamic vibrations of turbine engine components, there is virtually no mechanical testing application too complex for VIC-3D. Our engineers have developed the system from the ground up with over 120 years of combined experience offering researchers and engineers unmatched speed and accuracy for a wide range of quasi-static and dynamic applications, even providing 3D data in real-time. This datasheet explains the features and specifications of the system.



Variables Measured:

- 3D surface shape profile: Cartesian and cylindrical coordinates
- 3D displacements (u,v,w, dR, dZ, dθ, etc.)
- 3D strain tensor (Exx, Eyy, Exy, e1, e2, Tresca, von Mises, etc.)
 - Tensor Types: Engineering, Biot, Lagrange, Hencky (log), Euler-Almansi, Log, Euler-Almansi
- 3D velocities & strain rates
- 3D Operational Deflection Shapes (ODS) – requires FFT module
- 3D Accelerations – requires FFT module
- Analog data (via DAQ input)
- User-defined: enter your own formula to create new variables, such as engineering stress during elasticity

Real-Time Capabilities:

- **VIC-3D Real-Time** displays FULL-FIELD live strain data up to 10 Hz @ 5,000 subsets per data set
- **VIC-Gauge** displays and exports live video strain gauges & extensometers via analog outputs up to 250 Hz
- Processing 3D full-field data AND outputting analog data up to 10 Hz can be performed simultaneously. Full-frame images can also be saved for post-processing.

VIC-3D 9 Measurement Resolution:

Measurements made by the VIC-3D system have been extensively tested against devices such as strain gauges, extensometers, and precision stages. Although the specifications listed below are already exceptional, the VIC-3D 9 system can often exceed them in ideal conditions.

- High strain resolution: down to 0.001% (10 $\mu\epsilon$)
- Strain measurement range from 0.005% (50 $\mu\epsilon$) to 2,000% or higher possible
- In-plane resolution: down to 1/200,000 * FOV (field of view)
 - E.g. FOV = 100 mm, in-plane displacement measurement resolution +/- 0.5 μm
- Out-of-plane resolution: down to 1/100,000 * FOV
 - E.g. FOV = 100 mm, out-of-plane displacement measurement resolution +/- 1.0 μm
- ODS amplitudes: down to 10 nm resolution with **patented FFT module**
- Stereo-microscope: down to 10 nm in-plane and 120 nm out-of-plane displacement resolution with **patented distortion correction module**

VIC-3D 9 New Features:

- **New** import finite element data feature for visualization and comparison to measurement data into new iris graphics framework
- **New** analog data display feature - values can now be animated alongside extractions and/or contour plots
- **New** 3D marker tracking visualization in iris
- **New** customizable marker/extraction labels with escape codes for inserting data
- **New** animation tools that allow the creation of life-like animations using integrated adaptive motion blurring for fast-moving objects
- **New** tools for animating object position, scale, opacity, rotation, and more with an all new user-friendly interface
- **New** 3D speckle rendering
- **New** high-resolution isolines on 2D and 3D plots with scalable fonts
- **New** video export feature for high-resolution, publication-ready plots in PDF and ultra-high-definition video formats up to 4K
- **New** Unicode support
- **Improved** 3D full-field real-time analysis. See live data from multiple stereo systems attached to one PC (previously restricted to primary system)
- **Improved** data extraction tools - extensometers now show initial length and multiple extractions are saved with the project
- **Improved** performance for multi-threaded CPUs

Includes Existing VIC-3D Analysis Software Features:

- High-performance processing optimized for multi-threaded CPUs
- VICPy is Correlated Solutions' free library of scripts written in the Python programming language. Python scripting can be used to create highly customized solutions by allowing users to manipulate VIC-3D data files. This is an exciting and empowering way to achieve repeatable results and is especially useful for batch processing. Custom scripts may also be developed upon request (evaluated on a case-by-case basis).
- Report generation feature using templates for text documents and presentations. Some of the items that can be included in the reports are calibration values, analysis settings, speckle images, AOIs, tables, result plots, external images etc.
- Hybrid calibration options for improving calibration via the use of speckle images
- Customizable calibration options for modeling radial, prismatic, and tangential distortions
- Projects templates that contain saved calibration data, AOIs, analysis settings, coordinate transformations etc.
- Extraction options: Data extraction can now be limited to a portion of the data files to permit quick inspection of large volumes
- Post-processing network licensing options available
- Polygon data extraction tool
- Variable Ray Origin (VRO) calibration algorithm for correcting distortions when imaging through glass interfaces or in to liquid environments
- Multi-system registration calibration procedure resulting in much higher coordinate transformation accuracy. This method also allows the user to calibrate systems with no overlap, such as two sides of a specimen or opposite ends of a long beam, blade, or wall
- AOI Editor to include drag and drop
- IR data integration

VIC-Snap 9 Image Acquisition Software Features:

- New support for select ultra-high-speed cameras (up to 5MHz) and medium-speed cameras (~500fps)
- New focus and brightness tools to guide users through every phase of test setup
- New support for multiple NI devices including thermocouple measurements
- New streamlined image saving for calibration and speckle images
- New one-click importation of calibration images, test images, and analog data into VIC-3D for faster analysis
- New camera support for USB3 cameras for quasi-static image streaming and high-speed camera control
- New customizable stereo calibration imaging options for advanced distortion correction
- Improved IR camera integration for live concurrent display of white light and IR images
- Improved Fulcrum module flexibility and speed with turbo mode
- Improved auto-exposure feature
- Live / real-time stereo calibration
- Multiple camera acquisition for up to 16 low-speed cameras for complete 360° capture of spheres, cylinders, or large objects
- Image acquisition options for low-speed cameras
 - Timed Capture: Cameras trigger from a user-defined time interval
 - Flex Capture: Create a user-defined timetable of acquisition rates & durations
 - Streaming Capture: Maximizes image capture rate
 - Hardware Sync: Triggers cameras via direct external signal input
 - TTL Capture: Utilizes a TTL input signal for additional triggering options
 - Fulcrum Capture: Hardware triggers cameras from a fatigue or vibration signal

- Image acquisition options for high-speed cameras
 - Static capture: Acquire synchronized images per trigger for easy calibration
 - Start trigger: Acquire images at the desired frame rate from a start trigger
 - Center trigger: Acquire images at the desired rate from the center RAM
 - End trigger: Acquire images at the desired frame rate stopping at the trigger
 - Manual trigger: Acquire images at the desired frame rate from a frame number
 - Random trigger: Acquire a defined number of images per trigger
 - Chose frame rate, pixel resolutions, and exposure times with a simple click
- Synchronize external analog data (+/-10V) for low-speed and high-speed systems via the include USB data acquisition system for up to 16 channels (depending on compatible DAQ acquisition speed when using multiple channels speed).
- Remote control image acquisition via any Android or iOS device using the free VIC-Snap app downloaded from the device's online application store.
- Clipping and binning options for increasing acquisition speed or decreasing file size.
- Optimized for Windows 10 and high-DPI displays.

Recent VIC-3D 9 Hardware Enhancements:

- New camera options: VGA @ 500 FPS; 12 MP @ 335 FPS; 31 MP @ 26 FPS
- New high-speed camera options up to 5 MHz
- New and improved stereo mounting system with fine adjustment
- New high-speed and ultra-high-speed camera heavy duty stereo mounting
- New and improved high-speed LED lighting systems
- New stereo-microscope polarized lighting system available
- New backlit calibration fixture for small scale calibration
- New 3D macro system for .5X, 1X, and 2X magnification applications
- Improved speckle pattern application kit
- Improved stereo-microscope motorized stage integration
- Improved rollers for the VIC Speckle Pattern Application Kit
- Improved air brush system for fine speckle pattern application
- Coming soon: new calibration panels for increased accuracy
- Coming soon: VDI 2626 standardized calibration panels for traceability

VIC-3D System Standard Features:

- **Software licensing:** The system will include VIC-Snap image acquisition software and VIC-3D analysis software preinstalled on a desktop or laptop computer. One additional VIC-3D/2D roaming license will be provided on a USB dongle. This dongle permits execution of the analysis software on any computer the user chooses. Flexible network licensing options are available.
- **Data exporting for FEA:** Pixel/metric node and point-cloud data can be easily exported for FEA validation in the following formats: csv, STL, Tecplot, ASCII, csv, MatLab. Other formats may be supported upon request as part of your technical support contract.
- **Operating system:** Systems are supplied on the latest version of Microsoft Windows. Our software supports copy and paste functionality with Microsoft Office (and other office programs) in the form of graphs, 2D and 3D plots.
- **Compatible image formats:** Most standard image formats that do not employ lossy compression are supported directly (tiff, pgm, bmp, pnm, etc.)

- **Graphical display:** The analysis software includes graphical display of deformations and strain distributions over a 3D depiction of the geometry of the test article, and as a 2D overlay on the image.
- **Integrated inspection tools:** The analysis software includes integrated inspection tools for exporting data at user defined locations in the form of points, extensometers, circular/rectangular/polygon regions, and segmented/non-segmented line slices.
- **Statistical data export:** Statistical data can be exported from each data file including min, max, mean, median, & standard deviation
- **Video creator:** The analysis software includes the capability to generate compressed AVI & MP4 animations of any variable in both 3D and 2D image-overlay contour plots.
- **Integrated data playback:** A video player with adjustable frame rate, single step functionality and zooming is included for data display.
- **Automatic & multiple start point:** The analysis software is capable of automatically selecting a start point for the correlation and image sequence analysis. The software also includes advanced predictive algorithms for both spatial as well as temporal start point generation at multiple locations – such as either side of a failure location.
- **FEA coordinate system matching:** The analysis software provides a variety of methods to create custom coordinate systems and transform coordinate systems. The coordinate system can be selected from markers on the test article or by selecting three points for easy FEA validation.
- **Advanced multi-system calibration:** The analysis software includes a new speckle calibration method for transforming data from multiple systems into a common coordinate system. Analyzing data from adjacent or separate stereo systems has never been more accurate.
- **Coded calibration targets:** Never worry about using an incorrect spacing with our coded targets. The software automatically detects the size of the target.
- **Powerful control system:** Turnkey systems include a powerful computer for image acquisition and data analysis with the following options:
- **Quasi-static imaging:** Each system includes two or more high-resolution monochrome cameras with resolutions available from VGA to 31 Megapixels and frame rates from 1 Hz to 500 Hz.
- **Dynamic imaging:** Each high-speed system includes two high-speed monochrome digital cameras with frame rates from 1 KHz to 5 MHz.
- **Integrated marker tracking:** All systems include free integrated marker tracking for measuring motion of ellipse or bow-tie markers.



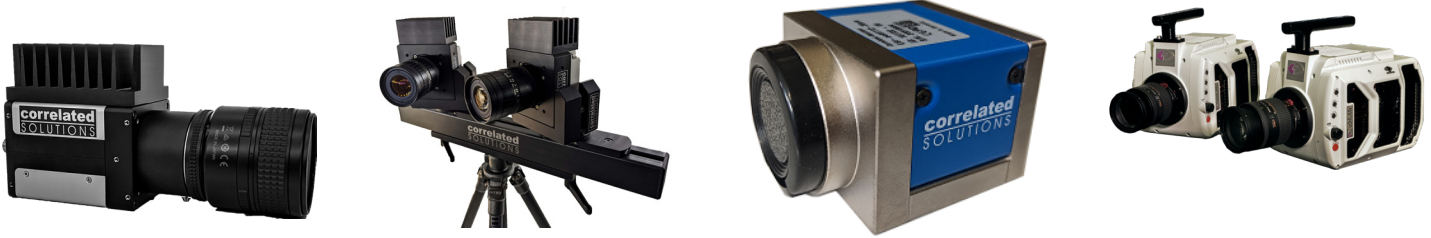
Portable Laptop



Compact Desktop



Rack-mount PC Workstation



- **Technical Support:** All systems include at least one year of unlimited remote technical support and free software upgrades. Technical support is available Mon-Fri 9am-5pm EST. On-site support and consulting is available, and multiple years can be purchased at a discounted rate.
- **Hardware Warranty:** All systems include a two year replacement warranty for defects in materials and/or workmanship on all parts. In many cases, extending your technical support contract may also extend the hardware warranty.

VIC-3D System Add-ons & Additions:

- **VIC-3D Real-Time:** full-field real-time display of data up to 10 Hz @ 5,000 points - multiple systems now supported on one control computer with rate and point decrease
- **VIC-Gauge 3D:** real-time output of virtual strain gauge or extensometer via DAQ up to 280 Hz (camera rate dependent)
- **VIC-3D HS FFT:** patented module for measuring operational deflection shapes (ODS) from transient/non-transient vibrations – requires high-speed cameras
- **VIC-3D Stereo Microscope:** patented system for measuring objects from 0.7 mm – 7 mm
- **3D-Micro-DIC:** hardware for 0.5X to 2X magnification configurations - much higher quality results and optical performance over using standard lenses
- **VIC-3D Fatigue & Vibration:** enables accurate triggering of vibration events up to 5 KHz
- **VIC-EDU:** inexpensive integrated system for teaching the DIC method for students

Training / Installation Services:

A standard 2 day on-site training seminar is included with all VIC-3D systems, and additional days may be purchased for more complex applications or multiple systems. Virtual training is now available and may be chosen in conjunction to onsite training or as an alternative. The seminar will cover the DIC setup (calibration, speckling, etc.), data analysis, theory and best practices. The purpose of the on-site training is to ensure users have the knowledge to a) setup and use the system correctly to achieve the most accurate data possible, b) understand the systems capabilities and full-potential, and c) provide the highest quality technical support post-sale. For more information about the training seminar, please email sales@correlatedsolutions.com.