The VIC-3D 8 Measurement System

The **VIC-3D 8 system** is a turn-key **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. Our engineers have developed the system from the ground up with over 100 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 with proven accuracy, and often the system achieves measurement resolutions far better than what is listed. Please contact sales@correlatedsolutions.com for more details.

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VIC-3D 8 Specifications

The VIC-3D system is a turn-key measurement solution capable of measuring 3D motion, deformation, and strain and features add-on modules for real-time, vibration (ODS), microscopy, and thermal measurements. Below are highlights of the system's capabilities and features:

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

VIC-3D 8 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 8 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 $\mu\epsilon$) global to 2,000% or higher possible
- In-plane resolution: down to 1/200,000 * FOV
  - E.g. FOV = 100mm, in-plane displacement measurement resolution +/- 0.5 microns
- Out-of-plane resolution: down to 1/100,000 * FOV
  - E.g. FOV = 100mm, out-of-plane displacement measurement resolution +/- 1.0 microns
- ODS amplitudes: down to 10nm resolution with **FFT module**
- Stereo-microscope: down to 10nm in-plane and 120nm out-of-plane displacement resolution with **non-radial distortion correction module**

Vic-3D 8 New Features:

- **New** Python scripting for customized and repeatable analysis, including batch processing
- **New** 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.
- **New** hybrid calibration options for improving calibration via the use of speckle images
- **New** customizable calibration options for modeling radial, prismatic, and tangential distortions
- **New** projects can be created from templates that contain saved calibration data, AOIs, analysis settings, coordinate transformations etc.
- **New** extraction options: Data extraction can now be limited to a subset of the data files to permit quick inspection of large volumes
- **New** post-processing network licensing options available
- **New** polygon data extraction tool has been added
- **New** Variable Ray Origin (VRO) calibration for imaging through interfaces and medium
- **New** multi-system calibration procedures resulting in much higher accuracy when compared to traditional methods. This proprietary method allows the user to calibrate systems that contain no overlap, such as two sides of a specimen or opposite ends of a long beam, blade, or wall
- **Improved** AOI Editor to include drag and drop
- **Improved** IR data integration

Vic-Snap 8 Image Acquisition Software Features:

- **New** support for select ultra-high-speed cameras
- **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
- **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.
- **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 8 Hardware Enhancements:

- **New** and improved high-speed LED lighting systems
- **New** high-speed and ultra-high-speed camera heavy duty stereo mounting options available
- **New** stereo-microscope polarized lighting system available
- **New** backlit calibration fixture for small scale calibration
- **New** Strainography macro-system for easier setup for high-magnification applications
- **Improved** speckle pattern application kit
- **Improved** stereo-microscope motorized stage
- **Improved** air brush speckle pattern application kit
- **Coming soon:** new calibration panels for increased accuracy

VIC-3D 8 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:

Portable Laptop   Compact Desktop   Rack-mount PC Workstation

- **Quasi-static imaging:** each system includes two or more high-resolution monochrome cameras with resolutions available from 1 to 29 Megapixels and frame rates from 1Hz to 280Hz.
- **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.

| 2.3 - 12.3 MP | 11 - 29 MP | 1.0 - 4.0 MP | 400 x 250 |
| 15 - 280 Hz | 3 - 5 HZ | 1 - 320 KHz | up to 5 MHz |

- **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 8 System Add-Ons:

- **VIC-3D Real-Time:** Full-field real-time display of data up to 10 Hz @ 5,000 points
- **VIC-Gauge 3D:** Real-time output of virtual strain gauge or extensometer via DAQ up to 280 Hz
- **VIC-3D HS FFT:** system for measuring operational deflection shapes (ODS) from transient/non-transient vibrations
- **VIC-3D Micro:** system for measuring objects from 0.7 mm – 7 mm
- **VIC-3D Fulcrum:** enables accurate triggering of vibration events up to 5 KHz
- **VIC-3D Education:** 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 system purchased, and additional days may be purchased for more complex applications, or multiple system purchases. The seminar will consist of a hands-on system setup, data analysis, and an introductory DIC short course involving 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, b) understand the systems capabilities and full-potential, and c) to provide the highest quality technical support post-sale. For more information about the training seminar, please email sales@correlatedsolutions.com