INNOVATION IN VOLUMETRIC PIV MEASUREMENT SYSTEMS

INTRODUCING THE V3V-FLEX 4-CAMERA VOLUMETRIC PIV SYSTEM WITH ENHANCED SPATIAL AND TEMPORAL RESOLUTIONS



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The 3-camera V3V™ system, introduced by TSI in 2008, has produced significant results in 3D3C measurements for air and water flows over the years. Now, TSI is introducing the V3V-Flex 4-camera volumetric PIV system with enhanced spatial and temporal resolutions, in order to meet the increasingly challenging requirements for fluid flow research.

Based on the Tomographic Aperture-Encoded Particle Tracking Velocimetry (TAPTV) technique, the V3V and V3V-Flex PIV systems are the most powerful and robust for your fluid flow research.



System Features:

+ Flexible camera configurations for the 4-camera arrangement, for desirable measurement volume size of over hundreds of mm^3 and velocity vector spacing down to 1 mm
+ High-temporal resolution with image capture from a wide range of high-speed cameras, from 1kHz to 10kHz capture rates, giving time-resolved capability for tracking unsteady flows
+ Wide range of high-pixel resolution camera selection: Powerview 4MP-LS, 8MP, 16MP and 29MP-LS cameras
+ Individual Scheimpflug mount arrangement on all the cameras for best focus of particles in a 3D volume
+ Expandable from the PIV, Stereo PIV and 3-camera based V3V-TS or CS system, with the same camera hardware and calibration system

System Calibration:

+ Precise and automatic calibration, providing traverse of the calibration target across the entire measurement volume with 1 micron resolution
+ Complete calibration signature graphs providing intuitive information of the specific orientation of the cameras for particle matching, dewarping error and nominal magnification factors for all cameras (photo shown at upper right)

3D Particle Reconstruction:

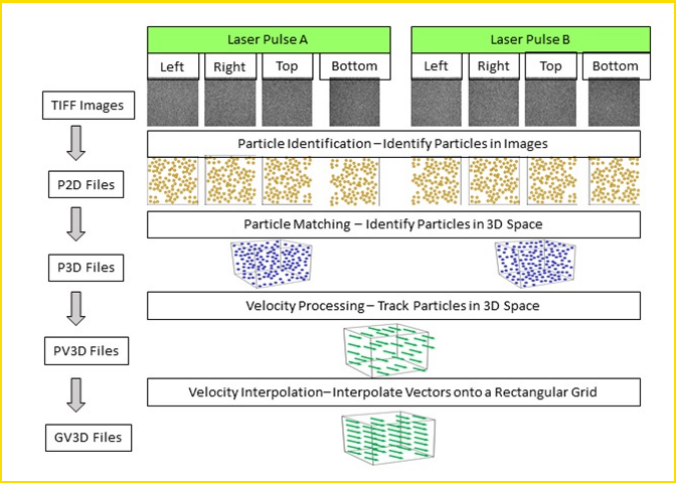
+ Particle reconstruction based on the dewarping/mapping method providing the highest yield of particle recognition in the 3D space
+ Enhancement of the particle reconstruction with the following algorithms:
  - Neighborhood tracking reconstruction
  - Weak particle reconstruction
  - Auto calibration reconstruction

Velocity Analysis:

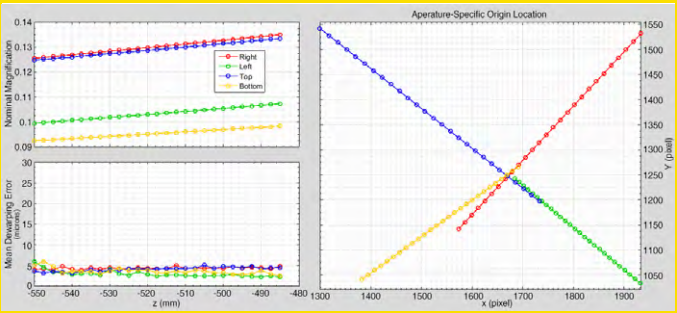
+ Particle tracking algorithm for maximum yield of velocity vectors, matching each pair of particles in the 3D volume, with selection of algorithms:
  - Relaxation method
  - Robust point matching

Grid Velocity Analysis:

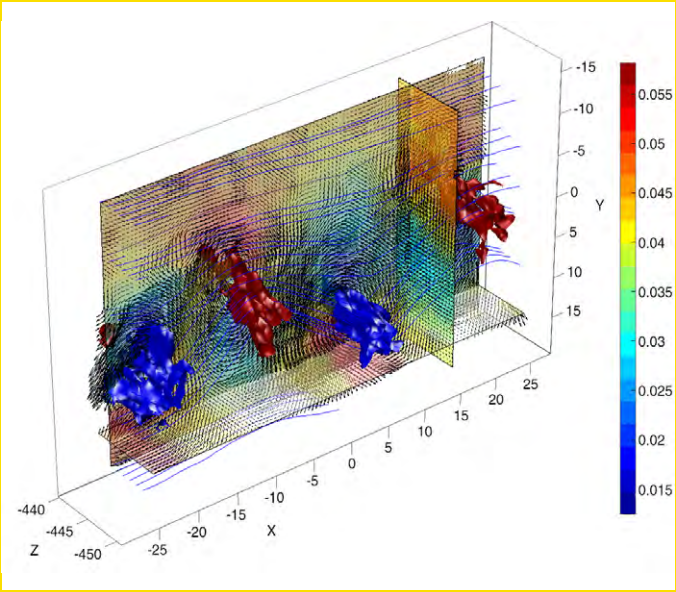
+ User-selected voxel size and overlap to provide velocity vectors in uniform grid spacing
+ Computation of other fluid mechanics quantities such as vorticity, streamlines and Q-criterion, based on the grid velocity field



System Operation and Analysis



Calibration signature plot showing magnification and dewarping error



Wake flow behind a cylinder, showing the vortex structure of the wake

SYSTEM CONFIGURATIONS

System Configurations		
	Time-Resolved System	**High Resolution System**
Camera Selection	+ Phantom high-speed cameras with 1 to 4 megapixel resolution and frame rate up to 20 kHz	+ PowerView 4MP-LS, 8MP, 16MP and 29MP-LS cameras
Laser Selection	+ High-speed pulsed dual cavity Nd:YAG laser with 400 W power and pulse frequency up to 50 kHz + High-speed pulsed dual-cavity ND:YLF laser with 100 W power and pulse frequency up to 5 kHz	+ Pulsed dual cavity Nd:YAG laser with 400 mJ energy output and pulse frequency up to 15 Hz + Pulsed dual cavity Nd:YAG laser with 100 mJ energy output and pulse frequency up to 200 Hz
Calibration System	+ V3V-CAL calibration module including single axis traverse slides and back illuminated targets of: – 100 mm by 100 mm with dot spacing of 2 mm – 200 mm by 200 mm with dot spacing of 5 mm	
Flexible Frame Structure and Scheimpflug Lens Mount	+ Flexible rail and mounting arrangement for optimal camera separation for desirable volume size + Customized Scheimpflug mount for individual camera for best focus of particle image in the volume	
Synchronization	+ Model 610036 synchronizer with 200 ps second resolution	
Camera Lens	+ F-mount based camera lenses – 50 mm, 85 mm, 100 mm and 135 mm	
Capture and Analysis Software	+ Insight V3V-4G and Module-V3V-Flex-Cap image capture analysis package	

Specifications subject to change without notice.

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