THE TRUE VOLUMETRIC FLOW MEASUREMENT SYSTEM WITH TIME RESOLVED CAPABILITY

INTRODUCING THE V3V-9800 SYSTEM FOR 3D3C FLOW MEASUREMENTS UP TO 180 HZ

UNDERSTANDING, ACCELERATED

UNLOCK TEMPORAL INFORMATION FROM YOUR FLOW ENVIRONMENT

Large Volume and Increased Time Resolution

To meet your requirement of higher temporal resolution to track flow structures, the V3V-9800 system is designed with three 4MP cameras with frame rates of 180 fps allowing you to make flow field measurements in the same large volume as the V3V-9000 system but at a capture rate 10 times faster. Now you really can see flow structures not only spatially but also in time.

Flexible and More Versatile

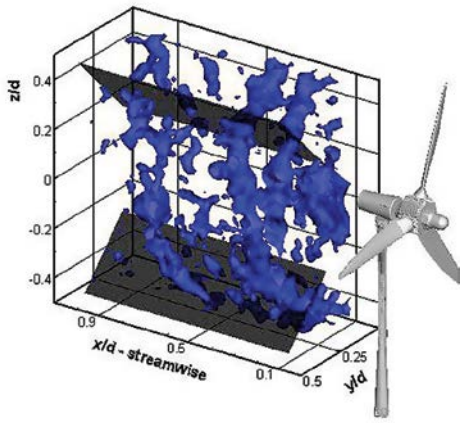
The V3V-9800 system is as flexible as the V3V-9000 system, containing individual cameras that can be removed from the system. The cameras can be configured as stereo PIV, 2D PIV, PLIF + PIV to offer additional measurement capabilities. With the camera capturing at 180 fps, the system becomes much more versatile for your measurement needs.

Easy-To-Use and Quick Results

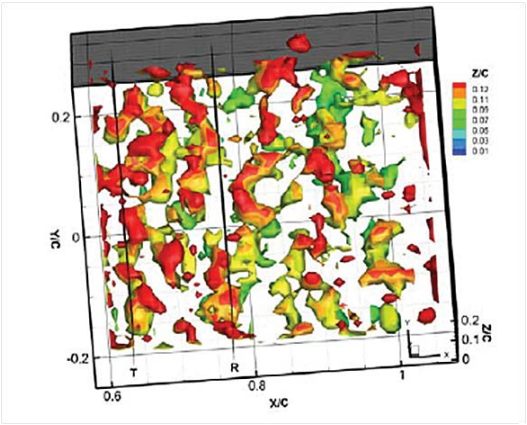
With such versatility, the V3V-9800 is very easy-to-use. A mounting bracket, included with the system, allows precise alignment of all three cameras quickly and easily for 3D3C measurements. The volumetric calibration required to map the measurement domain takes less than 15 minutes. Analysis of your flow field is performed in minutes to provide quick feedback of the experimental settings (seed particle density, pulse separation, etc).

Thorough Understanding of the Flow Structure

With the superior temporal resolution offered by the V3V-9800 system, a much more thorough understanding of the flow structure evolution can be achieved. High spatial, as well as temporal flow, structures can be revealed. This allows you to uncover many flow phenomena which may not have been seen before. Frequency signatures of the flow are now part of the measurement results as well.



Troolin D R; Chamorro L P (2011) "Spatial characterization of underwater turbine wakes using Volumetric 3-Component Velocimetry," *9th International Symposium on Particle Image Velocimetry - PIV*, Kobe, Japan, July 21-23, 2011.



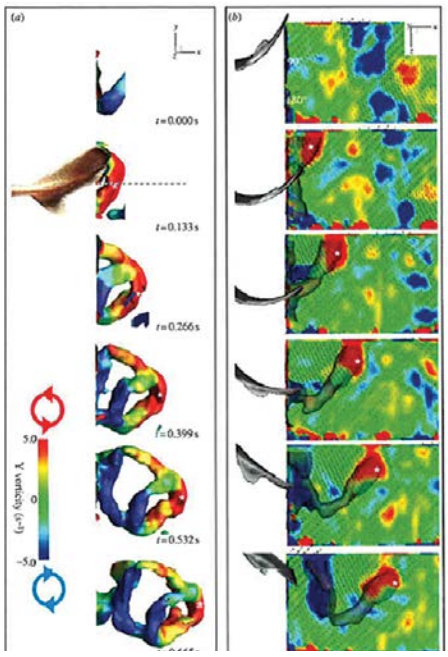
R. Wahidi, W.Lai, J.Hubner and A.Lang (2012) "Volumetric three-component velocimetry and PIV measurements of laminar separation bubbles on a NACA4412 airfoil", *16th Int. Symp on Appl. Laser Techniques in Fluid Mechanics*, Lisbon, Portugal, July 9-12, 2012.

A SYSTEM DESIGNED FOR FLEXIBILITY

System for Complete Flow Measurement Solutions

The V3V-9800 system is made up of three Powerview 4MP-180 cameras, designed as a standalone system when the cameras are in place. The system, together with the major components of a Nd:YAG laser of 100 Hz, Insight V3V-4G software package, V3V-CAL volumetric calibration module, V3V-LO laser illumination optics, and a Microsoft® Windows® 7 64-bit computer is the most powerful to provide you a complete flow measurement solution. The V3V-9800 system is ideal for 3D3C applications, including:

+ Pulsating flows
+ Wind turbine flows
+ Bio-locomotive flows
+ Boundary layer flows
+ Two phase flows with bubbles
+ Flow Structure from flapping wing
+ Flows analysis of biomedical devices
+ Vortex generation



Flammang, B.E., Lauder, G.V., Troolin, D.R., and Strand, T.E. (2011) "Volumteric imaging of shark tail hydrodynamics reveals a three-dimensional dual-ring vortex wake structure". *Proceedings of the Royal Society of London B.* doi:10.1089/rspb.2011.0489

When the Powerview 4MP-180 cameras are used separately from the V3V-9800, the range of applications opens immensely. The cameras now can be used with many of the shared components in the V3V system for PIV and PLIF measurements for other measurement research activities. In addition, the cameras can be used to investigate the same flow structure for quantity of concentration or temperature to fully pursue the complete solution.

The system is supported by the state-of-the-art Insight V3V-4G software package which utilize a Microsoft® Windows® 7 64-bit based computer for image capture and analysis. The benefit of such an arrangement is that the computer can be easily expanded with more memory for long image capture, sequences, or be equipped with multiple processors to increase the processing power. The new Insight V3V-4G software is very user friendly and easy to operate. It offers all the necessary visual tools to allow you to fine tune experimental parameters. While the volumetric calibration can be carried out in 15 minutes, the analysis of the images is very intuitive, can be completed in minutes, and provides processing options for obtaining the best and most reliable results. Visualization of the 3D3C results is simple with many flow parameters and statistics as the output for you to understand your investigation. In case you need to capture data over a longer duration for flow statistics, the software supports capture periods of up to 16 minutes.

SPECIFICATIONS

V3V-9800 SYSTEM

Description	Specifications
Image Sensor	4 million pixel sensor
Active Size	2048 x 2048 pixels
Pixel Size	5.5 µm x 5.5 µm
Quantum efficiency	55% at 550 nm with micro lens
Quantum spectral range	370 nm to 825 nm (with QE > 20%)
Imaging area	11.3 mm x 11.3 mm
Frame rate	180 fps at 10 Tap output
Dynamic range	63 dB
Exposure control	Electronic Global Shutter
Pixel clock	85 MHz
Gain control	Range : 0 to 12 dB, 64-step Gain control
Offset control	Range : 0 to 63 LSB, 64 step Offset control
Camera Trigger mode	Free Run or Frame Straddle mode
Camera capture mode	Single, Continuous and Sequence mode
Output format	Full Cameralink using PX8 frame grabber
Lens mount	C-mount or F-mount
Mechanical dimension (WxHxL)	68 mm x 68 mm x 54 mm (with F-mount)
Weight	420 g
Power requirements	12 VDC+/- 20% max
Operation temperature	Outside temperature : 0° to 50 C°, inner temperature : 0° to 70C°
Connectors	Two 25 pin Cameralink connector; 6 pin HR connector for power; 4 pin HR connector for trigger input

*U.S. Patent # 6278847, 7006132

Specifications are subject to change

Features of the V3V-9800 system

+ Total pixel resolution of 12 Mpixels
+ Capture rate of 90 captures/s (180 fps)
+ Maximum measurement volume of 110 mm x 110 mm x 100 mm
+ Minimum Stand-off at 450 mm
+ Maximum Stand-off at 670 mm
+ Patented technique* on particle search in the 3D volume
+ Particle position uncertainty at 20 micron (x-y) and 80 micron (z)

Features of the camera

+ Electronic exposure time control (Global Shutter mode)
+ Strobe Output
+ Defective Pixel Correction
+ Gain/Offset Control
+ Internal Test Image
+ Background calibration
+ Full CameraLink interface
+ Temperature Monitor

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