

POWERSIGHT LASER DOPPLER AND PHASE DOPPLER MEASUREMENT SYSTEMS

PROVIDING UNMATCHED FLEXIBILITY, SIMPLICITY,
AND PATENTED TECHNOLOGY



UNDERSTANDING, ACCELERATED

THE POWERSIGHT LDV AND PDPA SYSTEMS

AN INNOVATIVE SOLUTION FOR YOUR
VELOCITY OR SIMULTANEOUS VELOCITY
AND SIZE MEASUREMENTS

Innovation

The innovation starts with the PowerSight Laser Velocimetry module which is an integrated unit with the state of the art solid state lasers and all the optics to form the measurement volume and also for the collection of the signal. Together with the FSA signal processor and the FlowSizer64 software package, the PowerSight system gives unmatched performance of velocity measurement. For simultaneous velocity and size measurement, the patented Intensity Validation technique** implemented in the system provides the most accurate results at all time.

- + Compact standalone turn-key system for measurements quickly and accurately
- + Easy upgrade from 1D to 2D or 3D for the LDV and PDPA arrangement
- + Adaptable with different focal lenses, beam expander or beam contractor for wide velocity and particle size ranges
- + Options to use with fiberoptic transceiver probe for IC engine application, underwater flow measurement or flows in hostile environment

Applications

Velocity Measurements	Particle Sizing and Velocity Measurements
Water channel flows	Automotive fuel spray diagnostics
Two phase flows	Medical inhaler spray
Underwater wake flows	Surry spray
Supersonic flows	Spray for electronic cooling
Turbulent flow research	Agricultural spray
Large scale wind tunnel flows	Bubbly flows

**US patent #4986659

POWERSIGHT LDV

LDV SYSTEMS THAT FIT
YOUR MEASUREMENT NEEDS

PowerSight LDV Systems

The PowerSight LDV systems are designed to excel for a wide variety of flow measurements. There is a unique solution to your velocity and turbulence measurement needs. We will work with you to select the most appropriate LDV system configuration for you.

The 1-D, 2-D and 3-D configurations are available for the PowerSight LDV systems. The PowerSight Module is designed to be easily upgraded from the 1-D to 2-D or 3-D.

The PowerSight Laser Module can be fitted with different focusing lenses to accommodate your velocity range. An external Beam Expander can be attached directly in front of the laser module to increase the velocity range and standoff distance. In case of a noisy environment, like a combustion chamber, the measurement volume can be reduced by using the external beam expander to increase the signal-to-noise ratio for the measurements. Beam spaces can also be used to increase the velocity range.

The PowerSight module can be mounted on the traverse system to facilitate multi-point measurement, using the scan feature of the traverse system and the software.



System Components for LDV

1-Component	2-Component	3-Component
PowerSight PS-TM-1D-532	PowerSight PS-TM-2D	PowerSight PS-TM-2D PS-TM-1D-515
FlowSizer64 software package	FlowSizer64 software package	FlowSizer64 software package



VERSATILITY + ACCURACY + EASE-OF-USE + ROBUSTNESS

POWERSIGHT PDPA

PDPA SYSTEMS FOR A BROAD RANGE OF FLUID MECHANICS RESEARCH

PowerSight PDPA Systems

PDPA systems, based on the PowerSight module, offers 1-D, 2-D and 3-D configurations.

Upgrading the PowerSight LDV System to PowerSight PDPA System is very straightforward because of the same PowerSight solid-state laser module is shared by both configurations. This provides the flexibility of utilizing the system for either LDV or PDPA (having all the capabilities in a single system).

Use of an external beam expander or beam contractor can be used with the PowerSight laser module to increase the particle size and velocity range. At the same time, two types of the PDPA receiver probes can be used to match your measurements. The receiver probe can also be equipped with different focusing lenses to get the desirable size ranges.

System components for PDPA

1-Component	2-Component	3-Component
PowerSight PS-TM-ID-532	PowerSight PS-TM-2D	PowerSight PS-TM-2D PS-TM-1D-515
RV1070 or RV1100 Receiver probe	RV2070 or RV2100 Receiver probe	RV3070 or RV3100 Receiver probe
FlowSizer64 software package	FlowSizer64 software package	FlowSizer64 software package

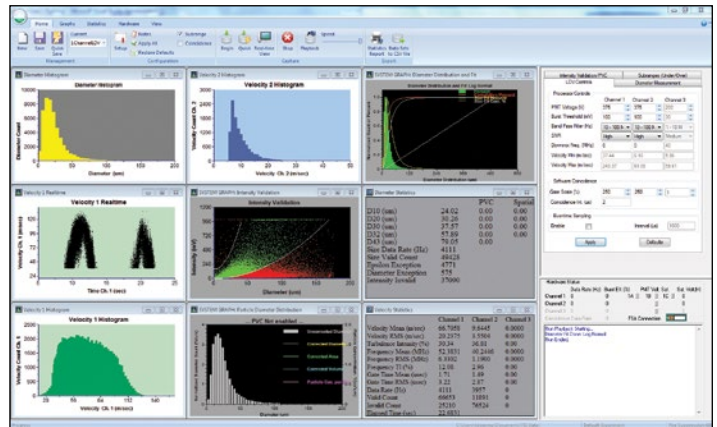


SYSTEM ELECTRONICS AND SOFTWARE

Signal Processor

The FSA series is the most accurate and fastest signal processor designed for LDV/PDPA applications. There are many innovative features offered by the FSA processor series:

- + High Doppler frequency up to 175 MHz - for dense spray and high speed flows
- + Frequency domain burst detection - A patented scheme that detects burst based on the real-time SNR level, not simply burst amplitude
- + Dynamic burst centering - for most accurate Doppler frequency measurement by extracting data from the best quality portion of the signal



FlowSizer64 Software Package

As the software portion of the PowerSight systems, the FlowSizer64 offers the most complete, state-of-the-art package allowing users to operate the PowerSight systems easily and flawlessly. The software package utilizes the Windows® 7/10 64-bit platform to allow for multi-thread processing and hardware controls. The software detects the FSA configuration automatically so that it is ready for optimal measurement once the model of the PowerSight module is entered. The package includes graphics, particle sizing, traverse control, power spectrum, full rotating machinery support, and custom data export. All of the features are designed to cater to your special requirements.

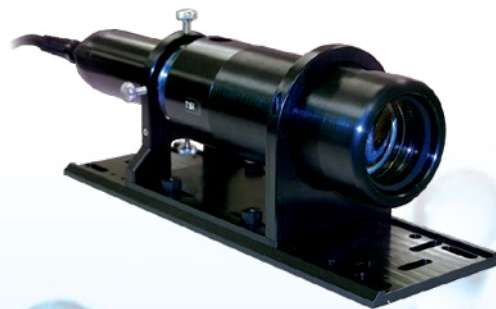
SYSTEM OPTICAL COMPONENTS

PDPA Receiver Probes

The receiver probe for PDPA is a fiber bundle based probe with the three detectors integrated. The probe provides the flexibility for measurement of all types of droplets, transparent or opaque, in sprays, and particles in your fluid. The three-detector approach is part of the intensity validation technique to provide the most accurate size measurements. Various focal lenses can be adapted to the Receiver probes to meet your requirements.

Receiver Probe	Applications
RV 70 Series	General purpose receiver for most sizing applications
RV 100 Series	Dense sprays, long stand-off, or small particle applications

RV 70 Series
PDPA Receiver



RV 100 Series
PDPA Receiver



SYSTEM COMPONENTS

Traverse Systems

The complete traverse systems provide the ability to perform data acquisition automatically. Using the controls in the FlowSizer64 software package, the "Sweep/Capture" mode allows the PowerSight module to scan in the XYZ directions for data acquisition, without the need to change the traverse hardware. Various types and length configurations are offered to fit users' needs.



3-D Traverse System

Traverse Model Number	Benefits
T1D, T2D, T3D	Traverse with 600 mm travel, with 1, 2 or 3 axes of motion
T3DL	Traverse with 1000 mm travel in 3D configuration
T3DH	Heavy duty traverse for large U-Rail system

Optical Specifications of the PowerSight Laser Velocimetry Module

Laser Velocimetry Module Only				
Lens Focal length (mm)	261	363	512	762
Clear aperture (mm)	60	60	60	60
Standard beam diameter (mm)	2.1	2.1	2.1	2.1
Beam Spacing (mm)	50	50	50	50
Fringe Spacing (µm)	2.9	4.1	5.7	8.6
Measurement Volume Diameter (µm)	84.3	117.0	165.2	245.9
1.75 X Beam Expander				
Lens Focal Length (mm)	500	750	1000	1500
Beam Spacing (mm)	87.5	87.5	87.5	87.5
Fringe Spacing (µm)	3.0	4.8	6.4	9.6
Measurement Volume Diameter (µm)	92.2	138.2	184.3	276.5
0.57 X Beam Contractor				
Lens Focal Length (mm)	250	350	500	750
Beam Spacing (mm)	28.5	28.5	28.5	28.5
Fringe Spacing (µm)	4.7	6.9	9.8	14.8
Measurement Volume Diameter (µm)	141.5	198.1	282.9	424.4

SPECIFICATIONS

A FAMILY OF LASER AND PHASE DOPPLER MEASUREMENT SYSTEMS

Optical Specifications of the PowerSight Laser Velocimetry Module

Powersight Optical Module	Description
Laser Wavelength	532 nm, 561 nm and 515 nm
Laser Power	500mW for 532 nm and 561 nm; 300 mW for 515 nm
Laser Type	Diode pumped solid state
System Configurations	1D, 2D and 3D frequency shifting
System Arrangements	Stand alone module for LDV or PDPA
Fiber Optic Probe Connection	Optional connection to fiberoptic probe with cable length up to 20 meters
Fiber Optic Probe Arrangements	Stainless steel fiber optic probes for underwater applications and IC Engine fiberoptic probes for measurements of Engine flows
Velocity Range	-313 m/s to 1600 m/s
Droplet Size Range	0.5 to 5,000 μm
Lens Options	250 mm, 350mm, 500mm, 750mm
Beam Expander Options	External and internal beam expander with various focal lenses and beam separations
FSA Signal Processor	Description
PMT	PMTs integrated with designated color bar
Processor Bandwidth	1 K Hz to 175 MHz
Maximum Sampling Frequency	800 MHz
Minimum SNR	-6 dB
Maximum Date Rate	100,000 per second
FSA Signal Processor Configurations	1D, 2D, and 3D for velocity and simultaneous velocity and size (upgradeable in single chassis)
Intensity Validation	Patented intensity validation technique for both size and velocity measurements
Connection	Firewire
Additional Input and External Control	4 channels analog; Once per Rev
Software	Description
FlowSizer64	Windows® 7/10, 64-bit software for data acquisition, analysis and presentation



Specifications subject to change without notice.

TSI and the TSI logo are registered trademarks, and DataVIEW, Fiberlight, FIND, FlowSizer and PowerSight are trademarks of TSI Incorporated.

Microsoft and Windows are registered trademarks of Microsoft Corporation in the United States and other countries.



UNDERSTANDING, ACCELERATED

TSI Incorporated - Visit our website www.tsi.com for more information.

USA	Tel: +1 800 874 2811	India	Tel: +91 80 67877200
UK	Tel: +44 149 4 459200	China	Tel: +86 10 8219 7688
France	Tel: +33 1 41 19 21 99	Singapore	Tel: +65 6595 6388
Germany	Tel: +49 241 523030		

Printed in U.S.A.