

Modular Phase Doppler Interferometer

Droplet Size and Velocity Measurements

ASA

*Variable SW selectable
aperture sizes*

*Ability to tilt apertures to adapt
to spray angles*

*Variable SW selectable masks and
beam separation for changing
measurement range*

Auto-setup

PDI-xO0MD

Artium Technologies Inc. continues to advance the state-of-the-art in phase Doppler interferometer (PDI) instrumentation. The **modular phase Doppler systems** offer turnkey operation with a fully automated setup feature. The modular system can be used for the real-time, non-intrusive measurement of individual droplet size and 1, 2, or 3 velocity components in a variety of applications.

The complete instrument includes optical transmitters, optical receiver, ASA signal processors, data management computer and the AIMS system software. The high powered DPSS lasers built into the transmitter provide stability, compactness, ruggedness, and high reliability; eliminating the need for inefficient and unreliable fiber optics and bulky Arion lasers. The Fourier transform based **Advanced Signal Analyzer (ASA)** incorporates a proprietary digital signal burst detection technique and adaptive Doppler burst sampling approach to provide high accuracy in signal detection and measurement. The **Automated Instrument Management System (AIMS)** provides fully automatic setup and operation of the instrument. A variety of standard and user-configurable views are available to analyze the data. It also offers remote operation and monitoring via the Internet.

The new PDI design incorporates several features aimed at ease-of-use and data accuracy. A key feature is the ability to change the droplet size measurement range without requiring the user to change lenses or realign the optics. This can be accomplished by changing the laser beam separation and selecting different masks in the receiver via software. A software controlled aperture module also allows for the selection of a variety of apertures and tilts. A new version of the ASA is now available for improved data accuracy at high speeds in dense spray environments. The AIMS software includes an auto-setup feature that automatically selects the processor and optics settings for optimal performance in complex sprays.



Technical Specifications

PDI-x00MD

Drop size measurement range	0.3 to > 8000 μm (spherical or near-spherical particles)
Size dynamic range	50:1
Estimated size accuracy	+/- 0.5 μm or 0.5% of full size range
Estimated size resolution	+/- 0.5 μm or 0.5% of full size range
Velocity measurement range	-600 to 1000 m/s
Velocity accuracy	+/- 0.1%
Volume flux accuracy	+/- 10%
Available receiver focal lengths	350 mm, 500 mm, 758mm, 1000 mm and 2000 mm
Available transmitter focal lengths	350 mm, 500 mm, 750mm, 1000 mm and 2000 mm
Laser type	Diode pumped solid state (DPSS)
Wavelength	491 nm, 532 nm, 561 nm, 660nm



ASA

Maximum Input Frequency	200 MHz
Processor bandwidth	160 MHz
Input voltage	200 μV to 1V
Minimum transit time	100ns
Max sampling frequency	Quadrature, 320 MHz
Measurement resolution	0.01% of the sampling frequency (frequency) 0.5 degree (phase)
Minimum SNR	-6 dB
Maximum data rate	>250,000 per second
Number of samples per record	Adaptive 16 to > 100,000 quadrature
Burst detection	Frequency domain burst detector Quadrature analog burst detector
Run time	64 bits, 0.5 μs resolution
Transit time	32 bits, 0.1 μs resolution
Amplitude Sampling Resolution	12 bits

Typical Measurement Ranges

60 mm Beam Separation

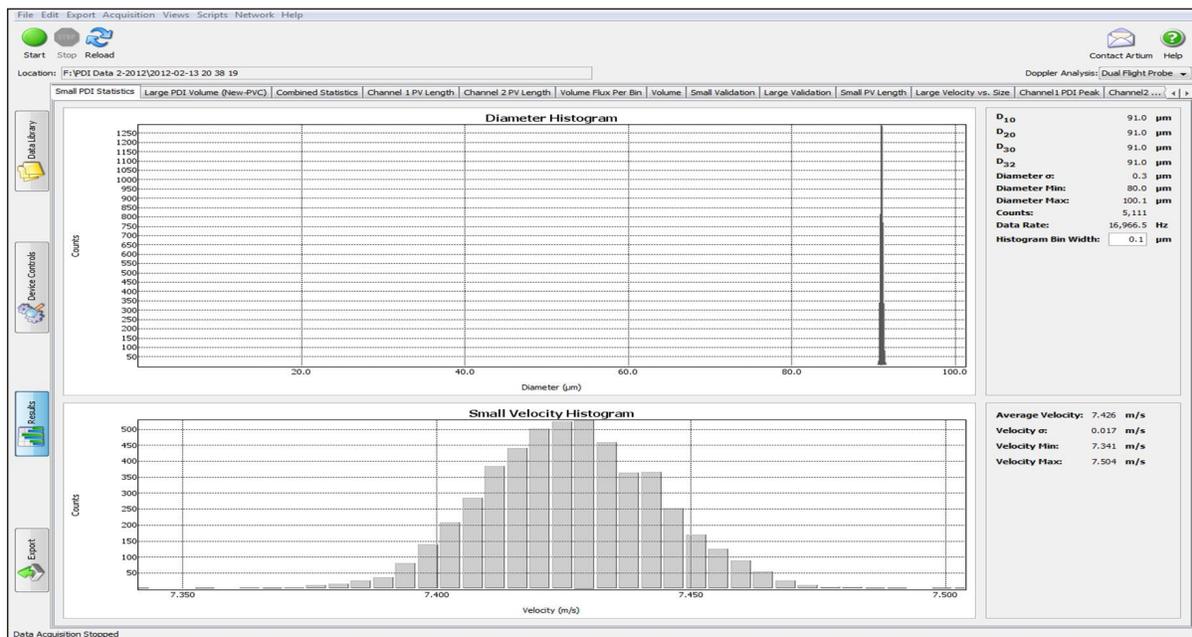
Optics		Velocity Range (m/s)		Diameter Range (microns)							
XMT Focal Length (mm)	RCV Focal Length (mm)			1X Mask		2X Mask		3X Mask		4X Mask	
		min	max	min	max	min	max	min	max	min	max
350	350	-100	350	0.4	80	1	230	2	330	2	400
500	500	-130	500	1	170	3	500	4	700	5	900
750	758	-200	700	2	400	5	1,100	8	1,600	10	2,100
1000	1000	-250	1,000	3	700	8	2,000	12	2,900	16	3,700

25 mm Beam Separation

Optics		Velocity Range (m/s)		Diameter Range (microns)							
XMT Focal Length (mm)	RCV Focal Length (mm)			1X Mask		2X Mask		3X Mask		4X Mask	
		min	max	min	max	min	max	min	max	min	max
350	350	-200	800	1	200	3	600	4	800	5	1,000
500	500	-300	1,100	2	400	6	1,100	8	1,600	10	2,100
750	758	-500	1,800	4	1,000	11	2,900	16	4,100	21	5,300
1000	1000	-600	2,300	8	1,600	23	4,600	33	6,600	42	8,500

Measurement Precision

Monodisperse Droplets





Fluid Mechanics



Spray Diagnostics



Particulate Emissions



Cloud Research

Key Features:

OPTICS

Free-space optics; eliminates need for polarization preserving fiber optics and fiber coupler; more efficient power delivery

High power (300 mW, 500 mW or 1W) diode pumped, solid state lasers packaged inside optical transmitter

Automated beam separation for doubling the particle size measurement range

Automated mask changer with five settings for doubling, tripling or even quadrupling the maximum size range

Automated aperture selection with six apertures ranging from 15 µm to 500 µm or 50 µm to 1600 µm depending on application

Ability to tilt the apertures (+/- 90 deg) to align it with the main component of flow velocity vector; maximizes droplet measurement time while minimizing the sample volume size

SIGNAL PROCESSOR

Digital frequency domain burst detection

Variable down mixing

Full complex Fourier Transform for measuring velocity (Doppler frequency) and size (phase)

Complex quadrature sampling

Sampling frequency as high as 320 MHz; option to go as high as 800 MHz

SOFTWARE

Auto setup of signal processor (sampling rate, analog filters, down mixing frequency, burst detection)

Auto high voltage setting

Auto probe volume setting (aperture selection)

Software based Fourier transform processing and signal validation

Configurable data views

Remote control and data analysis

US Patents: 7, 126, 694 B1, 7, 564, 564 B2, 7, 788, 067 B2, 8, 525, 093 B2 EPO Patent: EP 1 855 081 B1

Global Presence:

Artium's offices, research facilities & manufacturing plant are located in Sunnyvale, California. Our customers in North America are served directly from our Sunnyvale office. We have also established a world-wide distributorship to serve our customers in other parts of the world.

NORTH AMERICA

Artium Technologies Inc.
470 Lakeside Drive
Suite C
Sunnyvale, CA 94085
Phone: (408) 737-2364
Fax: (408) 737-2374
Web: www.artium.com

EUROPE AND SOUTH AMERICA (DISTRIBUTOR)

LaVision GmbH
Anna-Vandenhoeck-Ring 19
D-37081 Goettingen
Germany
Phone: +49-(0)551-9004-0
Fax: +49-(0)551-9004-100

JAPAN (DISTRIBUTOR)

Seika Digital Image Corporation
Taku-Akasaka Building
4-9-6, Akasaka, Minato-ku,
Tokyo, 107-0052 JapaN
Phone: +81-3-3405-1288

CHINA (DISTRIBUTOR)

OPLAN Co.Ltd.
Rm.1006, Block 1st
Huihuang Intl. Center,
No.1st Shangdishi St.,
Haidian Dist.
Beijing,100085, China
Phone:+86-10-62623871
Fax:+86-10-59713638

INDIA (DISTRIBUTOR)

Tesscorn Systems India
1285, 5th Main, 17th Cross,
HSR Sector 7
Bangalore 560068,
Karnataka, India
Phone: 91.80.2572.9425
Fax: 91.80.2572.9703
Email: info@tesscorn.com
Web: www.tesscorn.com

SPAIN (DISTRIBUTOR)

Solma Environmental Solutions, SLU
Calle Palomares, 25
28140 Fuente el Saz del Jarma, Madrid, Spain
Phone: +34608756759
Email: isetien@sol-ma.net
Web: www.sol-ma.net

BRAZIL (DISTRIBUTOR)

Rua Capitaó Adao
Pereira Souza Cabral
467 Centro
Sao Carlos - SP -
13561-000
Brasil
Phone: 55.16.3307.7883
Web: www.quantumtech.com.br