

Modular Phase Doppler Interferometer

Particle Size and Velocity Measurements

New 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-x00MD

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 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 > 1300 m/s
Velocity accuracy	+/- 0.1%
Volume flux accuracy	+/- 10%
Receiver focal length	100 mm, 200 mm, 350 mm, 500 mm, 1000 mm or 2000 mm
Transmitter focal Length	150 mm, 350 mm, 500 mm, 1000 mm, or 2000 mm
Laser type	Diode pumped solid state (DPSS)
Wavelength	491 nm, 532 nm, 561 nm



IEC60825 - 1:2007



ASA

Processor bandwidth	10 -150 MHz
Input voltage	200 μV to 1V
Minimum transit time	100 ns
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	>100,000 per second
Number of samples	Adaptive 16 to > 100,000 quadrature
Burst detection	Frequency domain burst detector Quadrature analog burst detector
Run time	32 bit, 0.5 μs resolution
Transit time	16 bit, 0.1 μs resolution

Typical Measurement Ranges

OPTICS		VELOCITY RANGE (m/s)		DIAMETER RANGE (um)									
Xmt Focal Length	Rcv Focal Length			100% Mask		50% Mask		2X Mask		3X Mask		4X Mask	
		min	max	min	max	min	max	min	max	min	max	min	max
150	200	-25	150	0.3	10	0.3	20	0.3	60	0.4	80	0.6	120
150	350	-25	150	0.3	15	0.3	35	0.5	100	0.8	150	1.0	200
350	100	-100	350	0.3	10	0.3	25	0.3	70	0.5	100	0.6	120
350	350	-100	350	0.3	40	0.4	80	1.2	240	1.7	350	2.3	450
350	500	-100	350	0.3	50	0.6	120	1.7	350	2.5	500	3.2	600
500	350	-125	500	0.3	50	0.6	120	1.7	350	2.5	500	3.0	600
500	500	-125	500	0.4	80	0.9	170	2.5	500	3.5	700	4.5	900
500	1000	-125	500	0.8	150	1.7	340	5.0	1,000	7.0	1,400	9.0	1,800
1000	500	-250	1000	0.8	150	1.7	340	5.0	1,000	7.0	1,400	9.0	1,800
1000	1000	-250	1000	1.5	300	3.4	680	10.0	2,000	14.0	2,800	18.0	3,600

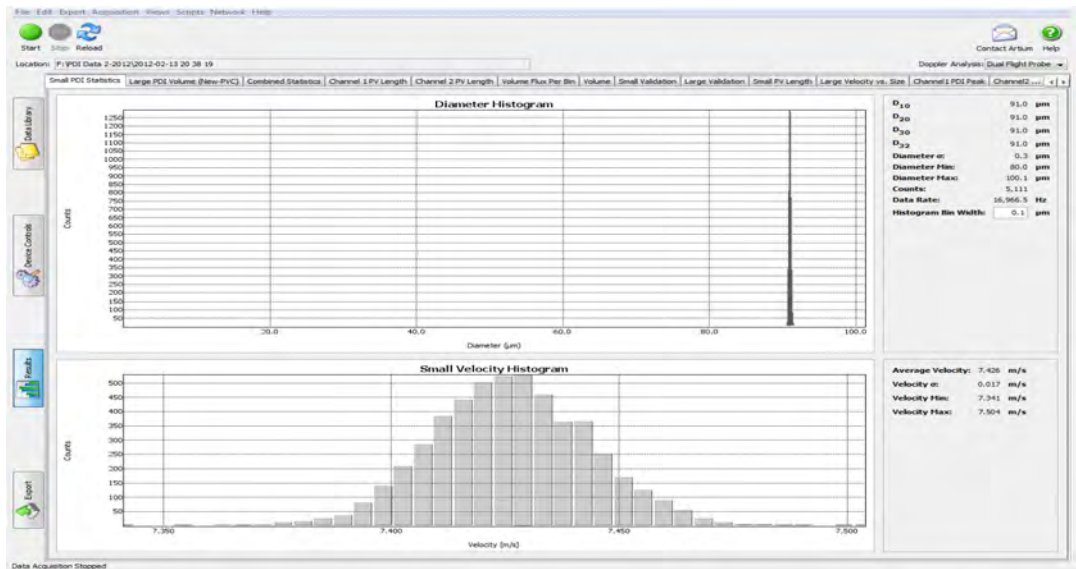
60 mm Beam Separation

OPTICS		VELOCITY RANGE (m/s)		DIAMETER RANGE (um)									
Xmt Focal Length	Rcv Focal Length			100% Mask		50% Mask		2X Mask		3X Mask		4X Mask	
		min	max	min	max	min	max	min	max	min	max	min	max
150	100	-100	200	0.3	10	0.3	25	0.4	70	0.5	100	0.7	130
150	200	-100	200	0.3	20	0.3	50	0.7	140	1.0	200	1.3	260
150	350	-100	200	0.3	40	0.4	90	1.2	250	1.8	360	2.3	460
350	100	-225	450	0.3	25	0.3	60	0.8	160	1.2	240	1.5	300
350	350	-225	450	0.4	90	1.0	200	2.9	580	4.1	820	5.3	1,060
350	500	-225	450	0.6	130	1.4	280	4.1	820	5.9	1,180	7.6	1,520
500	350	-300	650	0.6	130	1.4	280	4.1	820	5.9	1,180	7.6	1,520
500	500	-300	650	0.9	180	2.0	400	6.0	1,200	8.4	1,680	10.9	2,180
500	1000	-300	650	1.8	360	4.0	800	11.8	2,360	16.8	3,360	21.7	4,340
1000	500	-600	1,300	1.8	360	4.0	800	11.8	2,360	16.8	3,360	21.7	4,340
1000	1000	-600	1,300	3.6	720	8.0	1,600	23.5	4,700	33.7	6,740	43.5	8,700

25 mm Beam Separation

Measurement Precision

Monodisperse Droplets





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

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.

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