



UNDERSTANDING, ACCELERATED

FIBER OPTIC PROBES

FOR LDV/PDPA SYSTEMS



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TSI is the leading innovator for fiber optic technology used with LDV and PDPA systems, offering various types of fiber optic probes as transmitter, transceiver, and receiver systems. The single receiver three-detector probe was developed for the simultaneous particle size and velocity measurements with the PDPA system. TSI continues to have the most efficient optical probes for velocity measurements in LDV, allowing the highest laser power throughput and the maximum power at the measuring volume. All the probes designed for LDV can be coupled with TSI's DPSS-based PowerSight system, providing convenience and accessibility for remote locations.

TRANSCEIVER PROBES

Choosing the right probe for your application is very simple. From large to small, TSI has the right type of probe for your application. Most LDV applications use the TR 60 series probe, since they are robust, versatile, economical and compatible with the XPD50-DPSS or XPD60 beam expanders. TR160 and TR260 are available in standard, as well as submersible stainless steel versions. The TR360 is a three-component probe, with the ability to measure all three velocity components with a single probe arrangement. The TR360 probe is particularly useful for water tunnel flows. Some special applications may require the use of the compact 25 mm diameter TR 20 series probe, or the miniature 15 mm diameter TR 10 series probe.

Probe	Benefits
TR 10 series	Compact, sealed, water-tight probe for "in-flow" applications and for use with the TSI IC Engine Adaptor
TR 20 series	Sealed stainless probes for use in air or under water
TR 60 series	The most popular choice for LDV as well as PDPA systems. Wide selection of focusing lenses available. Large 61 mm collection aperture for better data rates. Heavy duty precision probe mount is included. Stainless steel versions are available for underwater applications.

Probe Series	TRx10			TRx20			TMx50			TRx60				TR360	
Maximum Outside Diameter (mm)	15.1			25			74			86				86	
Clear Aperture (mm)	10			20			50			61				61	
Fiber Cable Length (m)	8			8			8			8				8	
Length (mm)	158.8			180			310			440				584	
Std. Beam Diameter (mm)	0.47			1.06			1.77			2.65				2.82	
Std. Lens Focal Length (mm)	60			110			250			363				261	
Lens Series	TLN01-[Focal Length]			TLN02-[Focal Length]			TLN05-[Focal Length]			TLN06-[Focal Length]				TLN06-[Focal Length]	
Beam Expansion Options	-			-			0.5x or 2x using XPDN50-I 2.11x using XPD50-E			2.6x using XPD60				2.6x using XPD60	
Probe Without Beam Expander															
Lens Focal Length (mm)	60	80	120	110	144	500	750	1000	261	363	512	762	261		
Beam Spacing (mm)	7.5	7.5	7.5	15	15	20	20	20	50	50	50	50	25/50/25*		
Fringe Spacing (µm)	4.1	5.5	8.2	3.78	4.94	12.9	19.3	25.7	2.7	3.7	5.3	7.8	5.4/2.6/5.0*		
Meas. Volume Diameter (µm)	83	110	166	68	89	185	278	370	64	90	127	188	65/62/60*		
Using 2.11x Beam Expander for TMx50 probe or 2.6x Beam Expander for TRx60 and TR360 probes (partial list)															
Lens Focal Length (mm)	-			-			500	750	1000	480	760	2290	480	760	2290
Beam Spacing (mm)	-			-			40	40	40	130	130	130	65/130/65*	65/130/65*	65/130/65*
Fringe Spacing (µm)	-			-			6.1	9.1	12.2	1.9	3.0	9.1	3.8/1.8/3.5*	6.0/2.9/5.6*	9.1/4.4/8.4*
Meas. Volume Diameter (µm)	-			-			88	132	175	45.6	72.0	217.7	46/44/42*	73/69/67*	109/104/100*

*Indicates values for 514.5 nm/488 nm/476 nm

TRANSMITTER PROBES

The transmitter probes are particularly designed for Phase Doppler, to get droplet size measurements in sprays. The large fringe spacing and measuring volume are ideal for small droplet size range. The transmitter probe can also be equipped with a beam expander or contractor (XPD50-E or XPDN50-I), to expand the droplet size range.



TRx60 Transceiver Probe

RECEIVER PROBES

PDPA receiver probes are an important part of the PDPA system. The receiver probe includes the optimized 3-Detector Fiber Bundle integrated as part of the probe design. Selecting the best probe is simple, because the RV 70 series receiver has all of the most-needed features built in. For specialized applications dealing with very small particles and dense sprays, the extended range and large aperture of the RV 100 series is recommended.

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

Probe Series	RVx070					RVx100				
Maximum Outside Diameter (mm)	108					137				
Clear Aperture (mm)	72					106				
Fiber Cable Length (m)	10					10				
Length (mm)	475					615				
Optical Axis Height (mm)	108					108				
Standard Lens Focal Length (mm)	300					500				
Lens Series	TLN07-[Focal Length]					TLN10-[Focal Length]				
Standard Slit Width (µm)	150					150				
Phase Ratio (µm)	3.5:1					3.5:1				
Lens Focal Length (mm)	300	500	750	1000	1500	238	500	750	1000	1500
Nominal Minimum Diameter (µm)	0.5	0.7	1.1	1.4	2.1	0.5	0.5	0.7	1	1.5
Nominal Maximum Diameter (µm)	175	291	437	583	874	94	198	297	396	594



3D LDV System



RVx070 Receiving Probe



RVx100 Receiving Probe

LASERS TO BE USED WITH THE FIBEROPTIC PROBE

A variety of lasers can be used with the fiberoptic probes for LDV and PDPA system arrangements. Both the DPSS and fiber lasers, are individual lasers with selected wavelengths to be used with individual channels. Power of the DPSS and fiber laser, of up to 1W, can be selected for each wavelength. The Powersight laser module is designed to be a combined laser and transceiver optics which is ideal for the LDV system. The Powersight can also be coupled with a fiberoptic probe for cases where long distance or harsh environment is used.

Air-cooled and water-cooled based Ar-ion lasers are still available. The laser includes the three primary wavelengths typically used for LDV and PDPA.

The table below shows the typical wavelength and power output for each type of laser.

Channel #/ Laser Type	DPSS Laser (Wavelength – Power)	Fiber Laser (Wavelength – Power)	Powersight Laser Module (Wavelength – Power)	Ar-Ion Laser (Wavelength – Power)
1st Channel – LDV/PDPA	515 nm - up to 1W	515 nm - up to 1W	532 nm - 500mW	514.5 nm - up to 1W
2nd Channel – LDV/PDPA	488 nm - up to 1W	488 nm - up to 1W	561 nm - 500 mW	488 nm - up to 800 mW
3rd Channel – LDV/PDPA	532 nm - up to 1W	532 nm - up to 1W	515 nm - 300 mW	476.5 nm - up to 500 mW



Fiberlight color separator module to be used with Ar-ion laser, DPSS, or fiber laser.

LEARN MORE

To learn more about fluid mechanics systems please visit tsi.com/fluidmechanics



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