DANTEC DYNAMICS

FlowExplorer LDA systems
High performance – factory aligned and calibrated

FlowExplorer 3D LDA system

Pre-aligned and calibrated LDA solution for flow velocity measurements

Laser Doppler Anemometry (LDA) is an optical technique ideal for non-intrusive 1D, 2D and 3D point measurement of velocity and turbulence in a wide range of fluid dynamics applications.

The FlowExplorer optical transceiver is turn-key and uses compact lasers and Bragg cells integrated into the stable and robust design. With a range of laser powers up to 500 mW per velocity component, the FlowExplorer can be configured to meet the most demanding applications as well as those with limited budgets. The system is very easy to set up due to the factory aligned and calibrated optics. The calibration data are loaded into the BSA Flow software package providing the most accurate results directly in velocity units (m/s or ft/s).

Key benefits

- Factory aligned and turn-key operation for easy and fast setup.
- Each unit and lens is supplied with a calibration certificate to better than 0.11%
- 1-, 2- and 3 velocity component configurations
- Measurement distances from 150 mm to 750 mm
- On-line results (moments, histograms, etc.) thanks to real-time processing
- Extensive graphics and data exchange features
- Real-time system monitor display of signals, validation, data rate
- Wifi, LAN or USB connection to PC
- Can be used as phase Doppler transmitting optics for particle sizing

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The FlowExplorer LDA solution in brief

The LDA method uses the Doppler effect which occurs when laser light is scattered from seed particles in a gas or liquid flow. Inside the FlowExplorer, a laser beam is split in two and then focused to a point to form a measurement volume. The Doppler shifted scattered light of each particle passing the measurement volume is collected and then sent to the signal processor to determine their velocity.

The main benefits of LDA over other flow velocity measurement methods include; optical technique does not disturb the flow, the transfer function is linear and can be determined to high accuracy, small measurement volumes are possible, high frequency response possible in well seeded flows, and the absolute accuracy of the measurement results are unmatched due to calibrated Doppler constant and signal processor performance.

The solution is based on three core components: optics, signal processor, and software.

Configurations for one, two or three velocity component measurements are available with up to 500 mW laser power per wavelength. Even in system configurations for measuring all three velocity components, the same laser power is available for all three wavelengths, which ensures similar signal quality for all the velocity components.
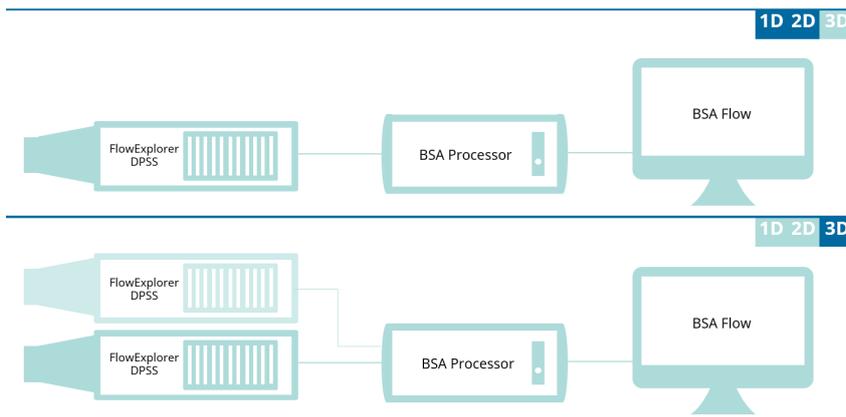
LDA FlowExplorer system –Standard 1D, 2D and 3D FlowExplorer LDA configurations

Optics

Calibrated LDA solution

Since the optical transceiver is factory aligned and calibrated, the FlowExplorer LDA system is the ideal solution for applications requiring documentation of the measurement uncertainty.

The velocity calibration uncertainty is 0.11% (coverage factor 2). The velocity resolution is better than 0.002% of the chosen velocity range.

1D and 2D systems have a single optical head with one or two lasers, connected to a BSA processor with one or two channels. The laser output powers in the FlowExplorer DPSS are controlled from the BSA Flow software.

A 3D setup requires an additional FlowExplorer 1D unit as well as an additional velocity channel in the BSA processor. To align the two FlowExplorer optical heads for overlapping measurement volumes, the 1D and 2D units are mounted on adjustable supports on a common aluminium rail. A pinhole alignment tool is supplied to ensure that both measurement volumes overlap to high accuracy.

Processor

Fast & powerful all-in-one processor

The BSA F600 processor is a fast and powerful all-in-one processor. With Ethernet, wifi and USB interfaces included, the processor can be connected to a PC via a local area network, wireless or cabled. In large facilities or where remote access is required, these features make it easy to have the processor near the experiment and separate the PC at a long distance away for safety and/or convenience.

The processor's 120 MHz bandwidth covers a wide velocity range, up to several hundred m/s depending on the optical configuration.
System setup is very easy and user friendly: the setup is done directly in velocity units, based on a center velocity and a velocity span value.

The processor software includes an on-line signal monitor which provides the user with real-time information about signal quality, data rate, validation, coincidence between channels, PM sensitivity, and anode current. This results in a powerful tool for optimizing the user adjustable parameters during set-up and monitoring of measurement results.
For more details on the signal processor, please refer to the data sheet on "Burst Spectrum Analyzer (BSA)" available at our website.


BSA F600 Processor

Data Analysis

The most flexible and comprehensive software for LDA measurements

The BSA Flow software is comprehensive, easy to use, and includes extensive graphics and data exchange features. The system setup including the optical configuration as well as processor settings is controlled via the software. Tools are provided which enables user-defined data analysis and display, which is dynamically updated during measurements.
Data analysis can be customized with a built-in Calculation module as well as a MatLab link for ultimate flexibility. Graphical output includes vector plots, 2D line and scatter plots, and 3D plots. Graphic results can be transferred to a measurement report in pdf or HTML format. Numerical output includes binary, ASCII, MS Excel, and TecPlot formats.
For further details on the software performance, please refer to the data sheet on "BSA Flow Software" available at our website.
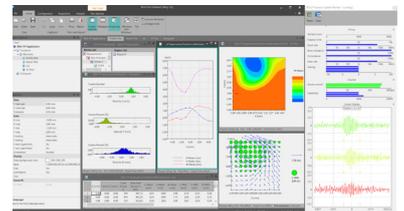
BSA Flow with Advanced Graphics add-on

FlowExplorer LDA configurations

The FlowExplorer LDA solution is being offered in the following 1D, 2D and 3D standard configurations. Other power options are available on request.

	Optics	Processor	Software
1D	660 nm 70 mW 532 nm 100 mW 532 nm 150 mW 532 nm 300 mW 532 nm 500 m		
2D	660/785 nm 70/70 mW 532/561 nm 100/100 mW 532/561 nm 150/150 mW 532/561 nm 300/300 mW 532/561 nm 500/500 mW	BSA F600 (120 MHz max. frequency)	BSA Flow Software Advanced Graphics add-on
3D	532/561/660 nm 100/100/100 mW 532/561/660 nm 150/150/150 mW 532/561/660 nm 300/300/300 mW 532/561/660 nm 500/500/500 mW		

Options

The FlowExplorer system offers several options to meet the requirements of the application. The options include:

Beam Expanders: Improve the signal quality (SNR) and reduce the measurement volume size especially at longer measurement distances.

Optics mounts: adjustable supports for rotating a FlowExplorer head around an axis perpendicular to its optical axis (panning) as well as for fine-adjustable pan, tilt and translation are available. For 3D systems, one of each is required to align the two FlowExplorer heads for overlap of their measurement volumes.

Processors: A wider velocity range can be covered using the BSA F800 upgrade which offers 200 MHz max. frequency allowing for measurements of supersonic velocities with some optical configurations.

Software: Spectrum/Correlation Add-on, Cyclic Phenomena Add-on, Scripting and MATLAB link Add-on, LIF and Parametric Analysis Add-on.

Traverse: A software controlled automatic traversing mechanism with 2D or 3D capability for flow mapping can be added to the system. Several standard traverse controllers are supported in the software. For further details on the software performance, please consult separate data sheet on our website.

Seeding: For air flows a range of liquid droplet and solid particle seeders are available. For liquid flows, we offer a variety of seeding particles. Please see separate data sheets on our website.

Technical specifications

Optics	FlowExplorer	FlowExplorer DPSS
Laser	Diode	DPSS
Laser power	70	100, 150, 300, 500
Laser wavelength	660/785 nm (1D/2D)	532/561/660 nm (1D/2D/3D)
Focal length	150, 300, 500, 750	
Optics weight (excl. laser controller)	5 kg	12 kg

Processor	BSA F600	BSA F800
Max. input frequency	120 MHz	200 MHz
Velocity range*)	432 m/s	798 m/s
Data rate	>100,000 bursts/sec	
Resolution	>16 bits	

*) depends on the optics, example for 60 mm probe with 500 mm focal length, 532 nm wavelength.

Software	Features
BSA Flow	Online oscilloscope display of signals Online display of data validation, data rate, coincidence rate, photomultiplier anode current Set up of BSA processor Acquisition of data from BSA, Control of traversing system Statistics of results (mean, RMS, Skewness and Flatness) Listing of results Set up of analysis sequences Export of data
Advanced Graphics Add-on	X-Y plots, vector plots, 3D plots, velocity profile plots

DANGER

LASER RADIATION
AVOID EYE OR SKIN EXPOSURE
TO DIRECT OR SCATTERED
RADIATION
CLASS 3B LASER PRODUCT
Max output ≤500mW
LASER ID: Laser Dx
In compliance with IEC 60825-1:2014

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