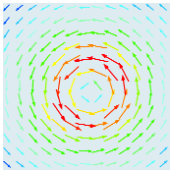
DANTEC DYNAMICS

Laser Optical Measurement Systems and Sensors

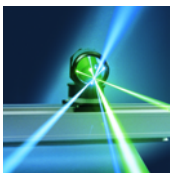
- A Product Overview

NOVA INSTRUMENTS

Fluid Mechanics



Particle Image Velocimetry (PIV)
Non-intrusive optical imaging technique for measuring velocity fields in a plane or in a volume (Volumetric Velocimetry).

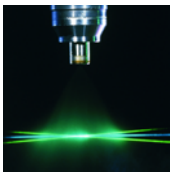


Laser Doppler Anemometry (LDA)
Optical technique for non-intrusive point measurement of flow velocity and turbulence.

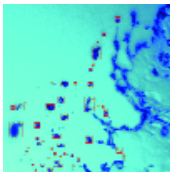
Constant Temperature Anemometry (CTA)
Technique for the measurement of turbulence in gas and liquid flows, using hot-wire or hot-film probes.

Laser Induced Fluorescence (LIF)
Optical imaging technique for the measurement of concentration and/or temperature in liquids or gases, using fluorescent dyes or vapors.

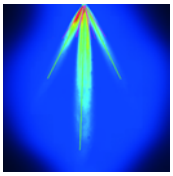
Spray & Particle Characterization



Phase Doppler Anemometry (PDA)
On-line point measurement of size, velocity and concentration of droplets in sprays.

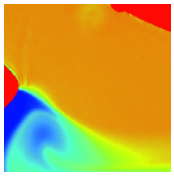


Shadow Sizing
Measurement of particle size, shape and velocity using backlighting, digital cameras and image analysis.



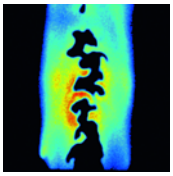
Spray geometry
Characterization of fuel injection sprays by cone angle, position and length.

Micro-fluidics

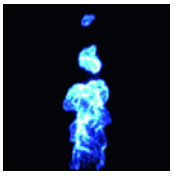


Micro-LIF and Micro-PIV
Techniques for quantifying flows and mixing in micro and mini-channels, MEMS, biomedical flows, lab-on-a-chip etc.

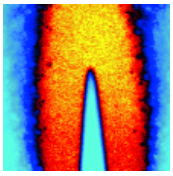
Combustion Diagnostics



Laser Induced Fluorescence (LIF)
Diagnostics of combustion species such as OH, NO, CH, and others using tunable lasers and sensitive imaging systems.



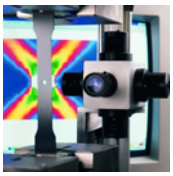
Chemiluminescence
Line-of-sight imaging technique of natural flame luminescence using sensitive imaging systems.



Rayleigh Thermometry
Planar gas temperature measurement using Rayleigh scattering.

Laser Induced Incandescence
A solution for quantitative determination of soot particles in combustion and engine exhaust.

Strain, Stress and Vibration



3D-Electronic Speckle Pattern Interferometry
Compact and robust sensors for highly sensitive displacement and microstrain testing of materials and components.

Digital Image Correlation System
Non-contact, full-field measurement of strain up to several 100% for material testing. High strain rate events with complex deformations can be analyzed with high-speed imaging.

Non Destructive Testing

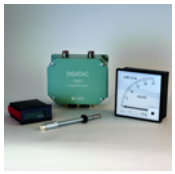
Laser Shearography
A certified non-destructive inspection method for the unambiguous detection of subsurface defects.

Portable Shearography
System using a vacuum hood to inspect large areas rapidly. Robust design for 'in-field' measurements.

Thermal Comfort

ComfortSense
A system designed for development of heating and air conditioning systems requiring multi-point measurements of air velocity, humidity, operative temperature and temperature.

Tachometers



DISATAC
A series of rugged, non-contact electronic tachometers for monitoring rotational speed in all types of high-speed turbochargers.

About Dantec Dynamics

Dantec Dynamics has been incorporated for more than 60 years during which time we have developed many unique instruments to the research community and industrial partners.

Dantec has had many breakthrough and significant industry firsts including; the first commercial hotwire anemometer, first commercial laser Doppler anemometer (LDA), first fiber optic LDA system, first hard-wired FFT signal processor, first digital PIV system, first real-time (hardware based) PIV, first StereoPIV, first Time-Resolved PIV among many more.

Our worldwide customer base includes nearly every major university doing research in fluid mechanics, chemical, civil, environmental, nuclear, ocean, and bio-mechanical engineering departments. In addition, many national labs as well as numerous industrial customers and research facilities use Dantec Dynamics' instrumentation for their measurement requirements.

Our customers enjoy a very strong industrial partner with stable financial performance, quality assurance via our ISO 9000 certification, and our total commitment to overall customer satisfaction.

Worldwide representation

From our six offices and more than 30 distributors worldwide we approach our customers individually. We examine the specific needs and find the best solution for you. For us you are a long-term partner in improving efficiency, safety and quality of life.
A list of representatives is available at our website.

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NOVA INSTRUMENTS

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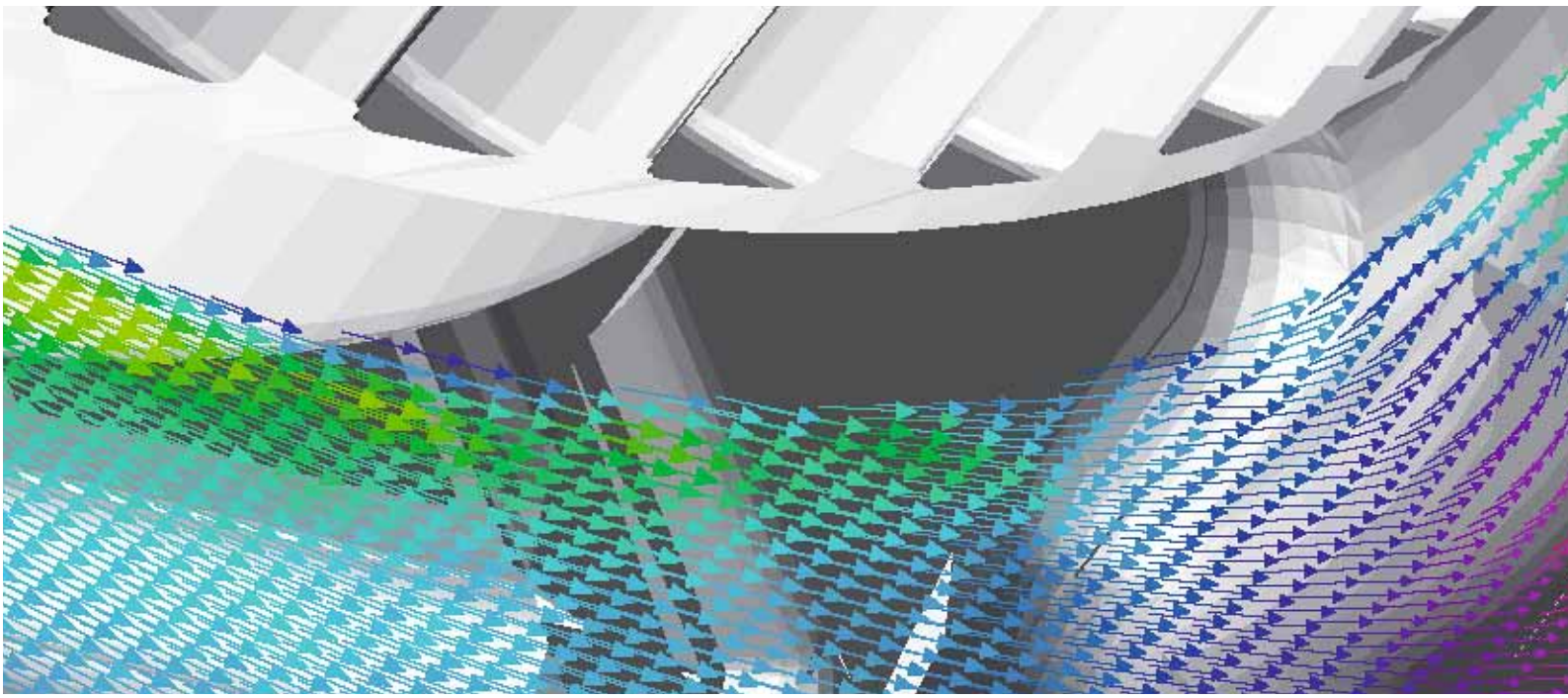


FLOW FIELD DIAGNOSTICS

Particle Image Velocimetry solutions

NOVA INSTRUMENTS

Time-Resolved PIV measurement in a turbulent flame

Time-Resolved PIV measurement of wake flow behind a car. Courtesy of PSA, France

Combining our know-how of fast, accurate synchronization and rapid digital image capture, we offer complete measurement solutions for PIV applications with all the required elements integrated into turnkey systems

Particle Image Velocimetry (PIV)

PIV is an intuitive measurement technique for measuring two or three components of velocity in a variety of flows.

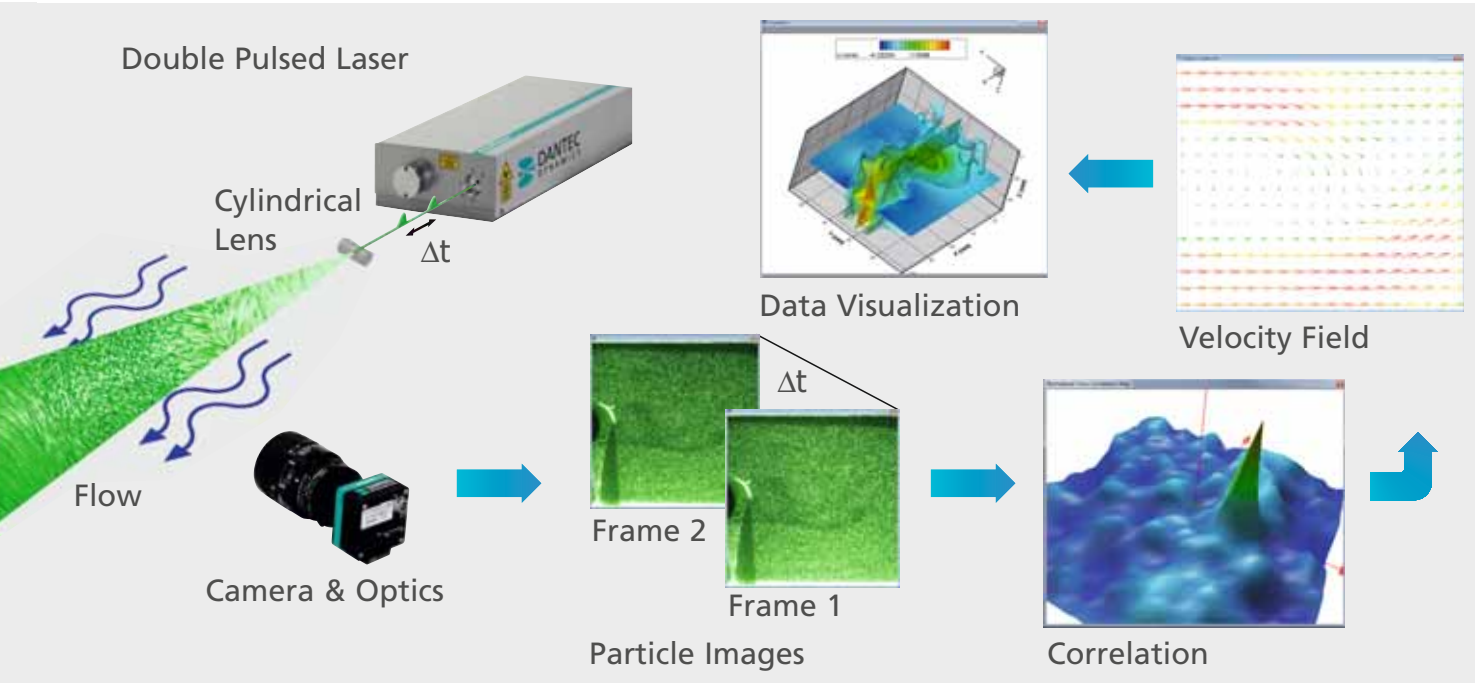
The application of PIV in research and industry is widespread, due to its ease of use and accurate data representation. As easy and intuitive as PIV is, it involves many cross-disciplinary challenges, from classical optics and imaging to the use of dedicated state-of-the-art digital electronics and lasers.

Partnering with Dantec Dynamics brings you a wide range of products to select from and expert application knowledge to assist in configuring the PIV systems that meet your needs.

We offer:

- Planar PIV as well as Volumetric Velocimetry
- Classical and Time-Resolved PIV solutions
- The widest range of CCD, sCMOS and CMOS cameras
- Lasers for any application
- Advanced timing and analog input devices
- Scalable data processing power including PC clusters and GPU solutions
- A complete software package meeting all your needs from acquisition to publishing high quality data, visualizations and animations

The Principle of PIV



An overview showing the principle of Dantec Dynamics' 2D PIV systems

Two consecutive laser pulses illuminate a slice or volume of a flow field with particles suspended in the flow. The scattered light from the particles is recorded in two consecutive images on one or several digital cameras.

The images are sub-divided into smaller areas for calculating the mean particle displacement between two corresponding sub-areas.

The particle displacement is calculated using cross-correlation or Least Squares Matching techniques. Since the time between the laser pulses is known, the particle velocity can be determined.

Taking into account the magnification of the optical setup, the absolute velocity field can be derived.
The velocities calculated from an image pair are an instantaneous snapshot of the flow viewed by the cameras.

PIV results are an accurate representation of the flow presented to the user and viewers in an easy to understand and visual manner. The presentation is aided by advanced software post-processing.

PIV data for all three velocity components can be presented volumetrically. These capabilities have made PIV a popular and yet accurate research tool.

The world's highest image quality with HiSense Neo

The world's fastest camera - SpeedSense 1610

FlowSense EO 4M - one out of five models - mounted on a Scheimpflug adapter

A Unique Selection of Equipment

Customized Stereoscopic underwater PIV systems for towing tanks. Courtesy of CEHPAR, Spain

Lasers for any application
- Pulsed lasers from mJ up to several Joule
- Continuous wave lasers up to 5+ W
- Best match of repetition rate to all CCD, sCMOS and CMOS cameras
- Rugged design and user-friendly

The market's widest range of CCD and sCMOs cameras
- High sensitivity, low noise
- CCD-Sensors from 1.3 MPixel up to 16+ MPixel
- Direct data stream to disk or RAM

Wide range of CMOS cameras
- Up to tens of kHz at full frame size
- CMOS-Sensors from 1 MPixel resolution up to 4+ MPixel
- Fast dedicated data transfer

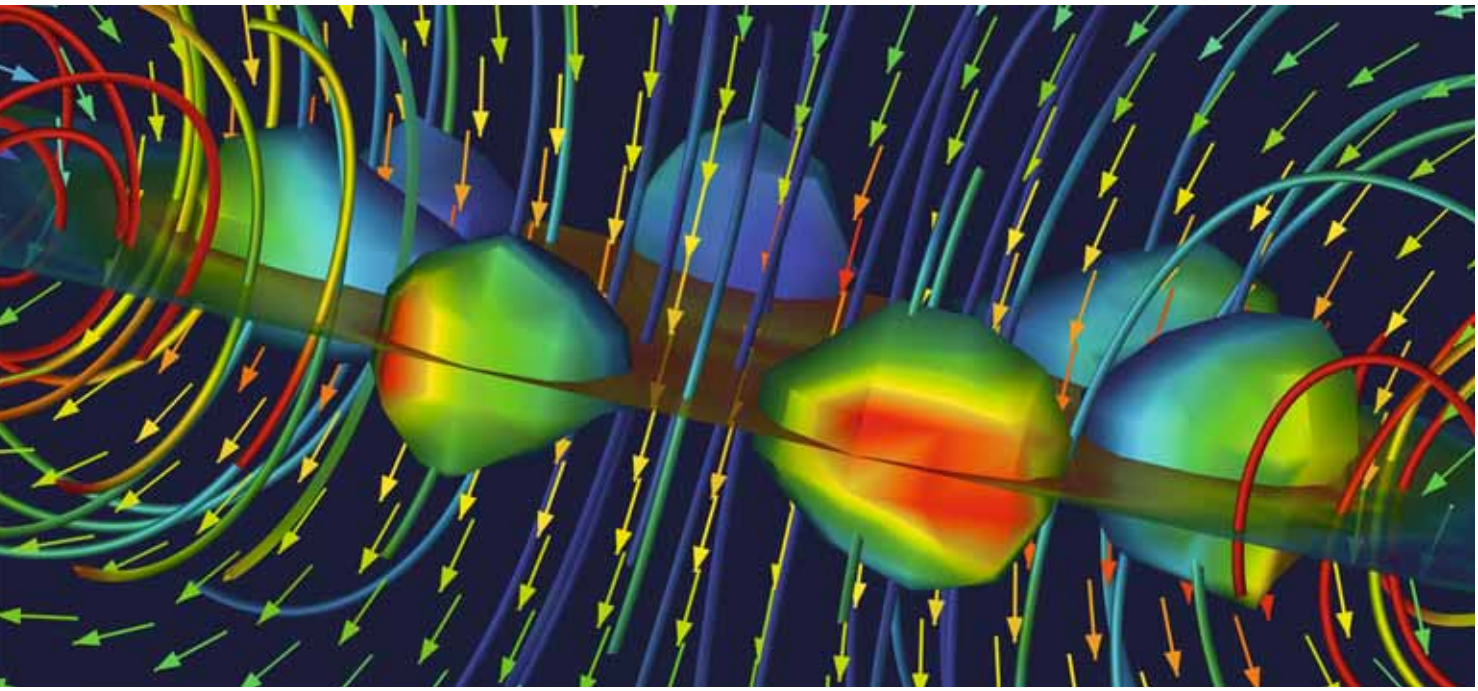
Advanced analog and synchronization devices
- Independent triggers at nanosecond resolution
- Analogue sampling up to 2+ GHz
- Advanced Waveform Analysis

Customized PIV solutions
- Streamlined probes for water and wind tunnel applications
- Fully automated and remote controlled traverse systems
- Camera and light sheet endoscopes

Modular high power light sheet optics mounted on a DualPower laser

Camera endoscopes for measurement in areas otherwise difficult to access

DynamicStudio - The Unique PIV Software Platform



3D visualization of ring vortex instability measured by 3D LSM. Courtesy of Technical University Freiberg, Germany

Key elements that makes our software dynamic

- Hardware auto-recognition and interconnection diagram
- Ensemble database structure
- Distributed acquisition, storage and analysis including GPU support
- Analysis sequences and batch processing
- Unmatched flexibility in auto-processing – works on multiple projects
- Batch exporting

Volumetric Velocimetry

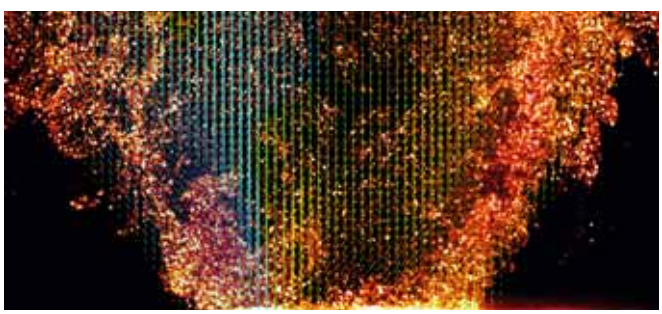
- Unique single camera solutions: Plenoptics camera with volume illumination and scanning light sheet with standard camera
- Three different processing methods: Volumetric Particle Tracking Velocimetry, Tomographic PTV and 3D Least Squares Matching
- Support for CUDA based GPU boards

2D Least Squares Matching

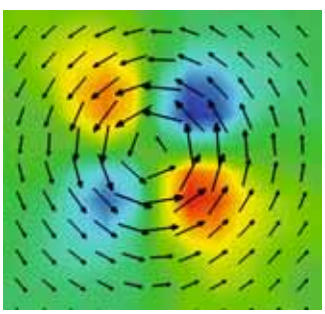
- A unique Dantec Dynamics product
- Highly increased accuracy in situations with velocity gradients
- Direct velocity gradient calculation
- No raw image manipulation needed for windows deformation

FlexPIV

- A unique Dantec Dynamics product
- Variable vector calculation in different domains
- Closely matches PIV processing nodes to CFD nodes for data comparison
- Local refinement of velocity vectors

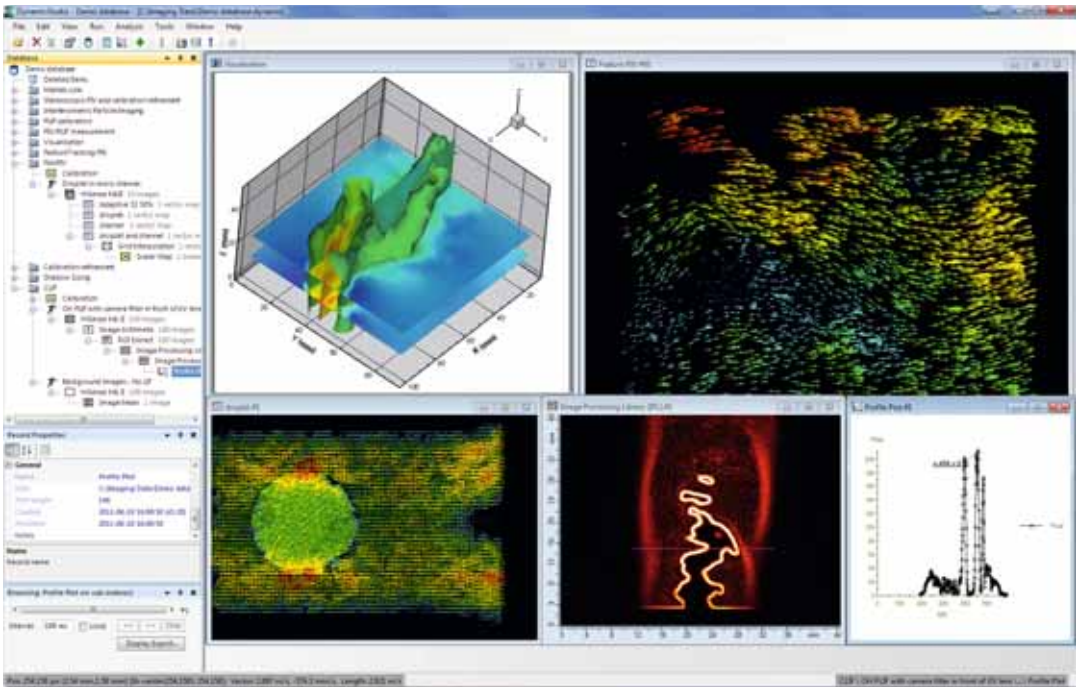


TR-PIV results form a swirling gas burner for turbine engines. Courtesy of Lund University, Sweden



Velocity field of a vortex and dv/dx directly computed by 2D LSM

Velocity field and iso velocity surfaces calculated by 3D LSM



The intuitive and flexible user interface of DynamicStudio showing several different processing results

Feature PIV

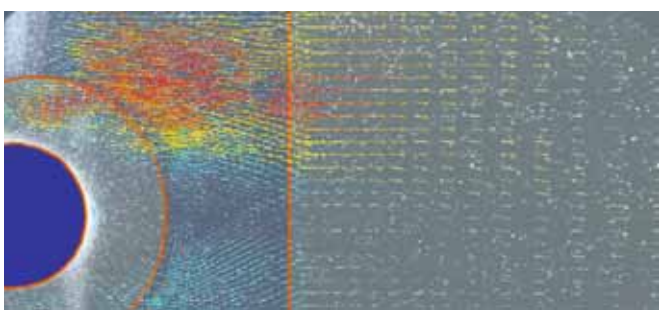
- A unique Lagrangian approach for velocity calculations, based on feature detection and tracking
- Vectors are only calculated where features or particles can be detected
- Features can be scaled down to single particles
- Provides Lagrangian history of particle movement

Data Visualization

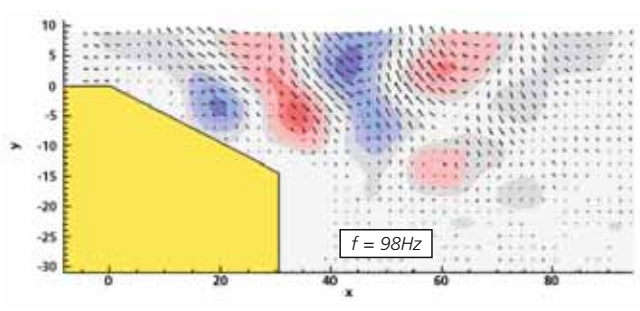
- New integrated Visualization module with advanced capabilities
- Create publishing quality 2D and 3D graphics and animations from your measured data
- No need for third party graphics programs
- No exporting and re-importing of data; all data are retained in DynamicStudio

Oscillating Pattern Decomposition (OPD)

- An innovative method for analysis of energy modes in spatio-temporal data
- Based on well-proven methods developed for flow pattern prediction in climatology
- Uncovers the dynamically dominant mechanisms, while using efficient noise removal by sophisticated POD filtering
- dentifies the stability, receptivity and sensitivity of velocity fluctuation modes
- Direct applicability in wind engineering
- Works with PIV, PLIF, CTA rakes data as well as other spatio-temporally resolved data



Flow and geometry adaptive PIV processing with FlexPIV



Data and analysis method courtesy of Prof. Vaclav Uruba, Institute of Thermomechanics, Prague, Czech Republic

About Dantec Dynamics

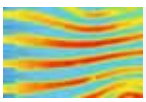
Dantec Dynamics is the leading provider of laser optical measurement systems and sensors for fluid flow characterization and materials testing. Since 1947 we have provided solutions for customers to optimize their product and component testing. Dantec Dynamics provides quality solutions for an extensive list of customers in the areas of:

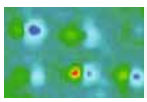

Fluid Mechanics


Thermal Comfort


Strain, Stress & Vibration


Particle Characterization


Microfluidics


Non-destructive Testing


Combustion Diagnostics


Process Control


Disatac Tachometers

Worldwide representation

From our six offices and more than 30 distributors worldwide we approach our customers individually. We examine the specific needs and find the best solution for you. For us you are a long-term partner in improving efficiency, safety and quality of life.
A list of representatives is available at our website.

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DANTEC DYNAMICS

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DANTEC DYNAMICS

Flow Field Diagnostics

Constant Temperature Anemometry Solutions

NOVA INSTRUMENTS

Boundary layer hotwire probe with gold-plated sensors.

Turbulence diagnostics is an important step in research and development because it has great impact in numerous applications from aerodynamics to passenger comfort. Hotwire anemometers provide the best spatial and temporal resolution for turbulence investigations.

Constant Temperature Anemometry (CTA)

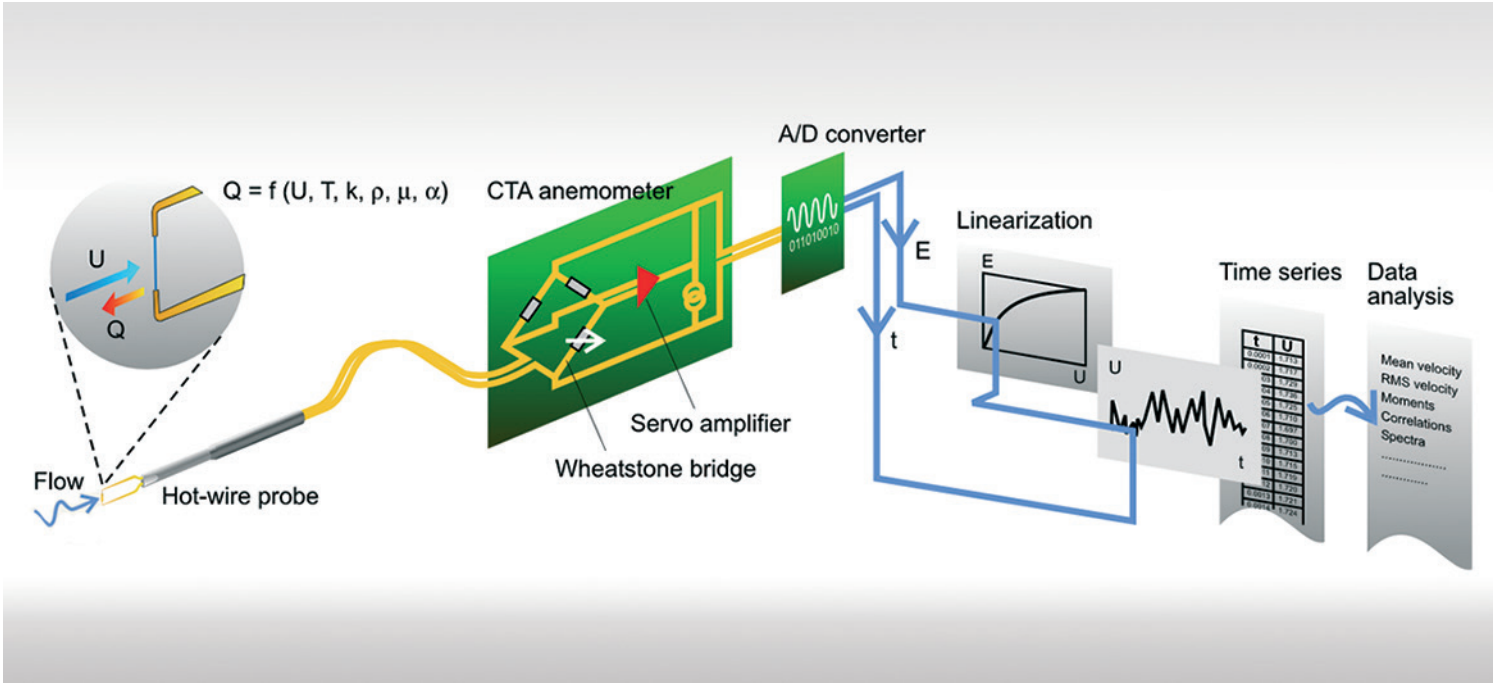
CTA is a well-established point measurement technique with commercial systems available for several decades. Application areas include temperature, shear stress, velocity and turbulence measurements in e.g. jets, boundary layers, transitional flows.

Even though the CTA technique is intrusive and its response is non-linear; it is still the best option for accurate turbulence investigations, boundary layer diagnostics, high-frequency temperature fluctuations and simultaneous multi-point velocity measurements.

We offer:

- High quality research grade anemometers
- Low cost, educational and mobile anemometers
- Automatic and manual calibration systems for air
- Manual calibration systems for water
- Probes with wire, fiber-film and film sensors
- Data acquisition and control systems
- Dedicated software package that reduces the burden of experiments; incl. hardware control, automated calibration and automated acquisition.

CTA Measurement Principle



The CTA measurement principle is based on heat transfer from a heated sensor.

The CTA measurement principle is based on the cooling of small sensors placed in the flow:

The temperature (resistance) of the sensor is kept constant by an advanced feedback control loop that contains an electronic bridge circuit. This way, the anemometer produces a continuous voltage that is proportional to the instantaneous flow velocity. The output signal is sampled with high resolution so the flow velocity is determined accurately both in the amplitude domain and in the frequency domain.

Three different anemometer systems cover a wide variety of applications, from extremely accurate turbulence investigations in a thin boundary layer to measuring mean wind profiles out in the open field. The MiniCTA systems are quite popular in field applications as well as for educational use.

Each anemometer system consists of a mainframe, CTA modules, calibration equipment, hotwire probes and accessories, a data acquisition and control system, and a dedicated software package.

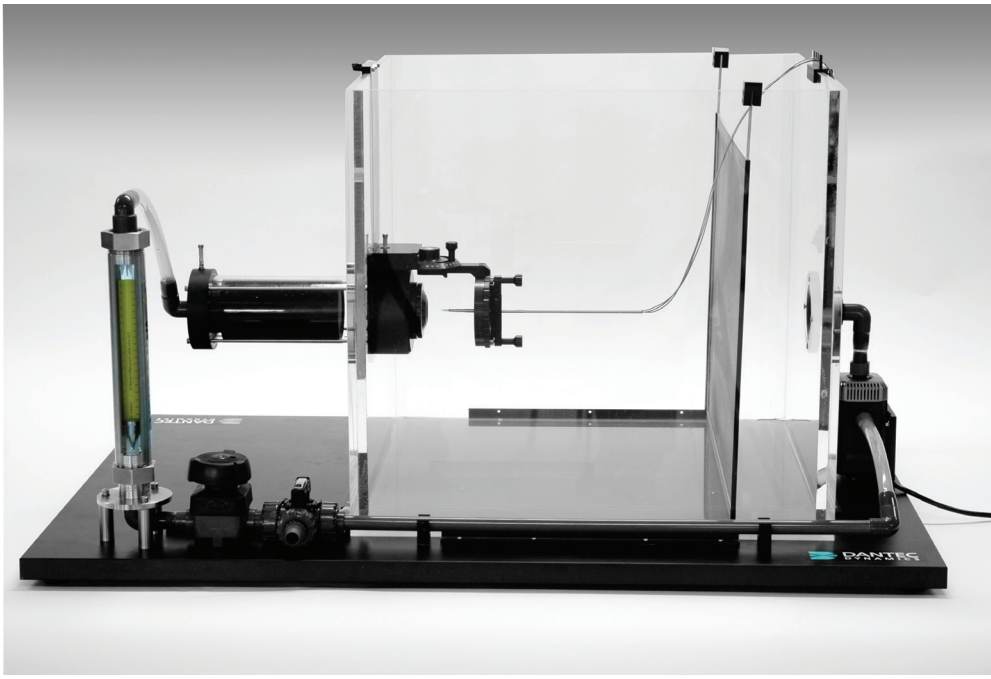
StreamLine Pro - the most reliable research-grade CTA system.

MultichannelCTA - the multiple channel version of the MiniCTA system.

MiniCTA - the most compact CTA system for educational use.

Calibration is Key in CTA Measurements

StreamLine Pro Automatic (Air) Calibrator.



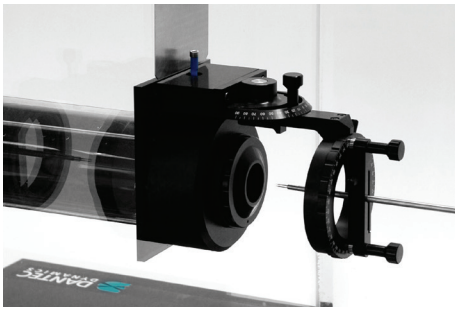
Water Calibrator.

An accurate CTA measurement requires an accurate calibration. With decades of experience Dantec Dynamics has designed an automatic and a manual calibrator for air applications and a water calibrator.

The air calibrators are able to produce speeds up to Mach 1 and the water calibrator up to 2 m/s, and the calibrators are delivered with exchangable nozzles to cover their individual velocity range. All calibrators are compatible with the Pitch/Yaw – Roll (PYR) manipulators, which are required for directional calibrations.

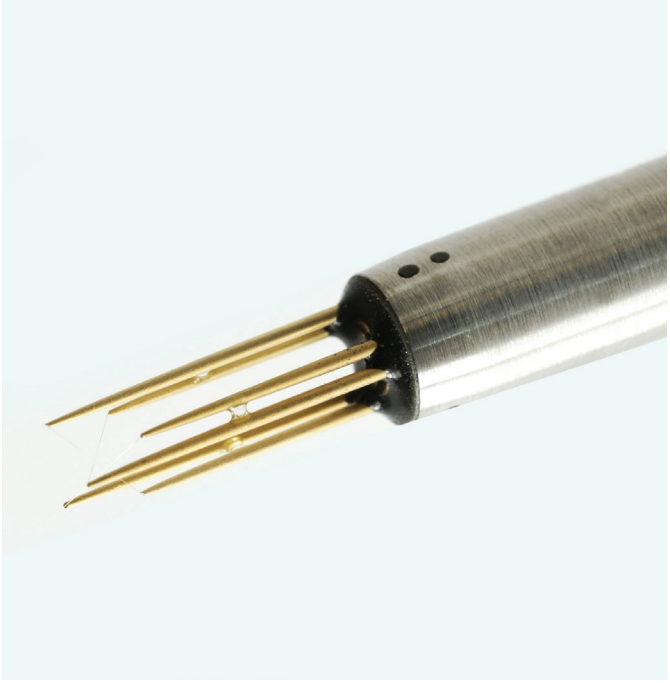
Directional calibrations are required for multiple-sensor hotwire and hotfilm probes. A single axis rotation (Pitch/Yaw) is sufficient for 2-sensor probes, whereas a two-axis rotation (Pitch/Yaw & Roll) is required for calibrating 3-sensor probes. These operations are made simpler by the manual and motorised PYR manipulators.

The motorised PYR manipulator is compatible with the air calibrators whereas the manual version is recommended for the water calibrator. Both versions are supported in the CTA software StreamWare Basic and StreamWare Pro.



Manual and motorized pitch-yaw manipulators allow probe rotation around two axes during directional calibration.

Probes



Triaxial Parallel-flow probe with gold-plated wire sensors.

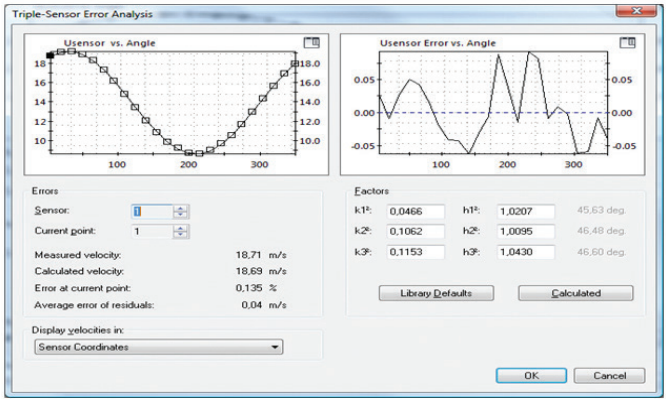
Triaxial cross-flow probe with fiber-film sensors.

Dantec Dynamics has a comprehensive probe program. The hotwire and hotfilm probes are a result of more than half-a-century design and manufacturing experience. The product range is complete with accessories: probe supports, mounting tubes and guide tubes.

Standard probes are available with different sensor materials for use in gaseous or liquid media, addressing different applications and challenges. For demanding applications where standard probes are not sufficient, custom designs can be provided upon request.

Dantec's probe manufacturing precision manifests itself during directional calibration events. For multi-sensor probes, the sensors should be placed perpendicular to each other in space to achieve a balanced directional sensitivity. This dictates the prong placement with tight manufacturing tolerances.

If the prong and sensor placement is close to ideal a low residual error during directional calibration is observed. The result is near-textbook values for the pitch and yaw coefficients and an accurate velocity measurement.



Dantec Dynamics' probe manufacturing precision manifests itself in directional calibration events.

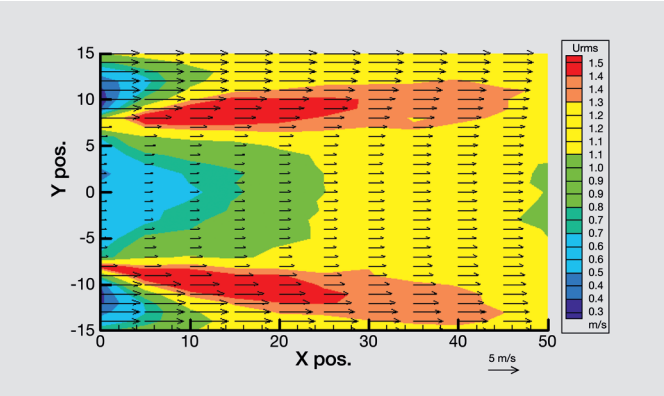
Thin film coating in Dantec Dynamics' clean room facility.

Software

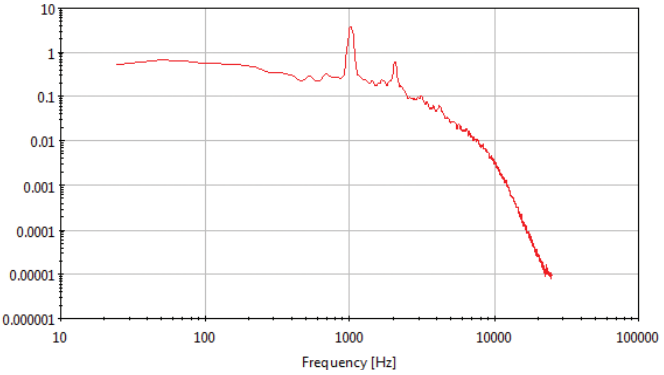
StreamWare Pro software has a modern look and an intuitive interface, which guides the user through system configuration, hardware setup, probe calibration, and data acquisition.

StreamWare Basic and StreamWare Pro are dedicated software platforms that help the user to design, organize and document CTA measurements as well as post process the results. StreamWare Basic supports MiniCTA and Multichannel CTA systems, and StreamWare Pro supports the StreamLine system family. They perform hardware set-up, automatic probe calibration, data acquisition, conversion and reduction. Raw and reduced data can be presented in StreamWare Basic and StreamWare Pro or they can be exported to other applications (e.g. Excel and TecPlot ®) for further manipulations.

CTA is still the preferred technique for turbulence investigations due to its unmatched frequency response. The power spectrum calculation in StreamWare Basic and StreamWare Pro provides a one-sided power spectral density per unit time. The computation combines features like block averaging, data windowing, zero padding and data overlapping in a smart fashion to reduce uncertainty inherent to Fourier analysis, while satisfying the Parseval's theorem for each signal block. The result is a clean power spectrum where dominant frequencies and harmonics are obtained.



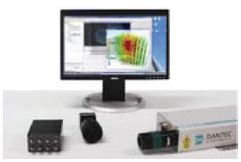
Flow field downstream of a cylinder in cross flow in Tecplot: mean velocity field & turbulence intensity.



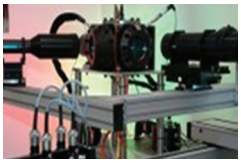
Power Spectral Density computation downstream of cylinder in cross flow, data courtesy of Technical University of Denmark.

About Dantec Dynamics

Dantec Dynamics is the leading provider of laser optical measurement systems and sensors. Since 1947 we have provided solutions for customers to optimize their component testing and products. Our large number of customers benefit from our quality solutions within:

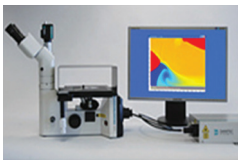


Fluid Mechanics

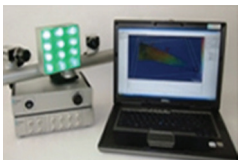


Spray and Particle Characterization

Combustion Diagnostics



Microfluidics



3D Shape Deformation, Strain and Vibration Measurement

Strain and Stress Measurement

Non Destructive Testing

DISATAC Tachometers

Thermal Comfort

Worldwide representation

From our six offices and more than 30 representatives worldwide we approach our customers individually. We examine the specific needs and find the best solution for you. For us you are a long-term partner in improving efficiency, safety and quality of life. A list of representatives is available at our website.

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DANTEC DYNAMICS

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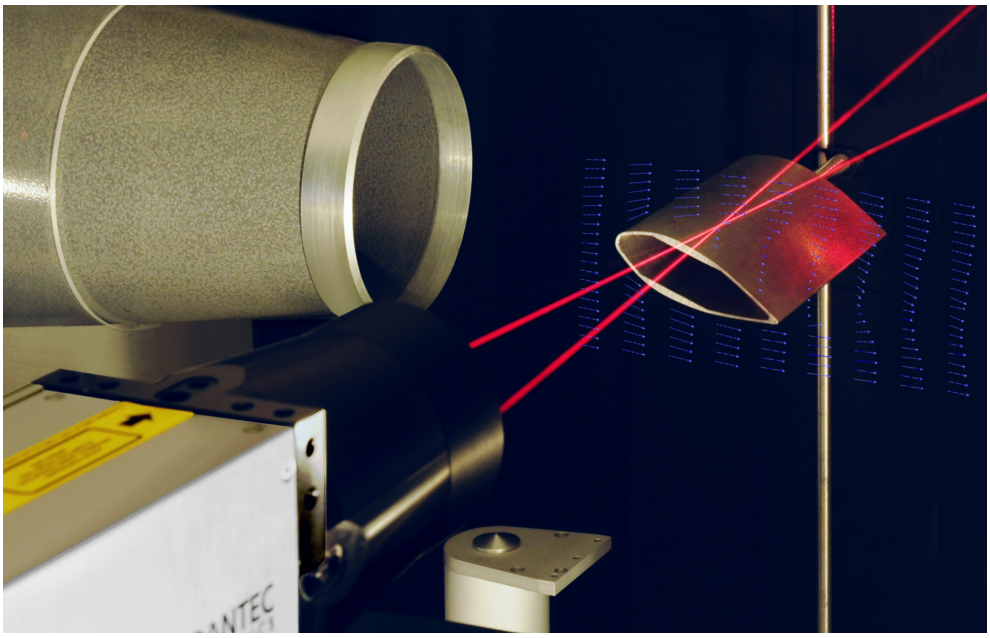
SOLUTION SHEET

DANTEC DYNAMICS

FlexLDA systems

Factory aligned and calibrated



FlexLDA system measuring the air flow around a wing profile

Pre-aligned and calibrated LDA solution for flow velocity measurements

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

The FlexLDA system is a full featured turn-key solution for working distances up to 500 mm and velocities up to 68 m/s. It uses compact lasers and Bragg cells integrated into the stable and robust design. The system is very easy to set up due to the factory aligned and calibrated optics. Signal processing is done by the well proven BSA (Burst Spectrum Analyzer) using robust real time FFT (Fast Fourier Transform) processing. 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 fast setup
- Calibrated to 0.11% uncertainty
- 1 and 2 velocity component configurations
- Measurement distances from 300 mm to 500 mm
- Robust real-time FFT signal processing
- On-line end-results thanks to real-time processing
- Extensive graphics and data exchange features
- Real-time display of signals, validation and data rate
- Wi-Fi, LAN or USB connection to PC

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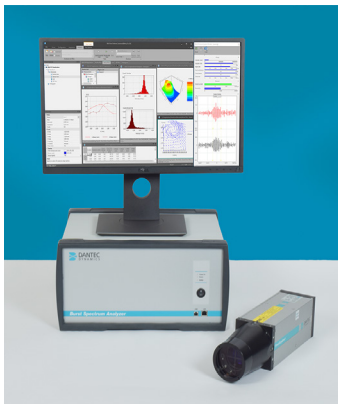
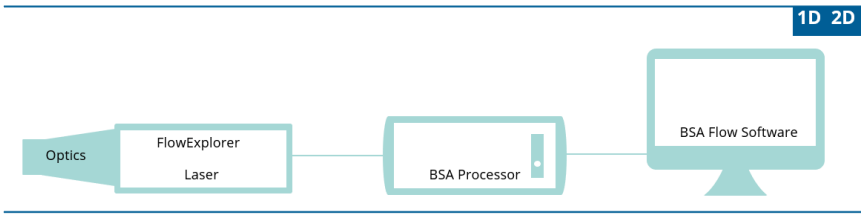
The FlexLDA solution

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: the 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 is possible in well-seeded flows, and the absolute accuracy of the measurement results are unmatched due to calibrated optics and signal processor performance. The solution is based on three core components: optics, signal processor, and software.

Configurations for one or two component measurements are available.



FlexLDA system including FlowExplorer optics, BSA processor and BSA Flow software.



1D and 2D FlexLDA configurations

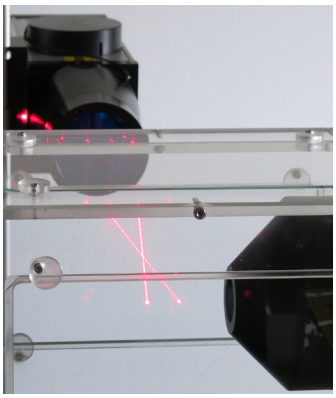
Optics

Calibrated LDA solution

Since the optical transceiver is factory aligned and calibrated, the FlexLDA 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.

The systems have a single optical head with one or two lasers, connected to a BSA processor with one or two channels.



Air jet experiment with FlexLDA

Processor

Fast & powerful all-in-one processor

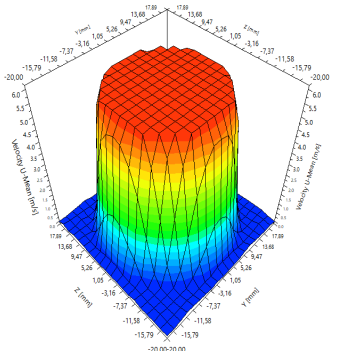
The BSA F100 processor is a fast and powerful all-in-one processor. With Ethernet, Wi-Fi and USB interfaces included, the processor can be connected to a PC via a local area network or a wireless or cabled connection. In large facilities or in situations where remote access is required, these features make it easy to have the processor near the experiment while keeping the PC at a greater distance away for safety and/or convenience.

The processor covers a velocity range up to more than 68 m/s depending on the optical configuration. Robust FFT (Fast Fourier Transform) processing is used.

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.

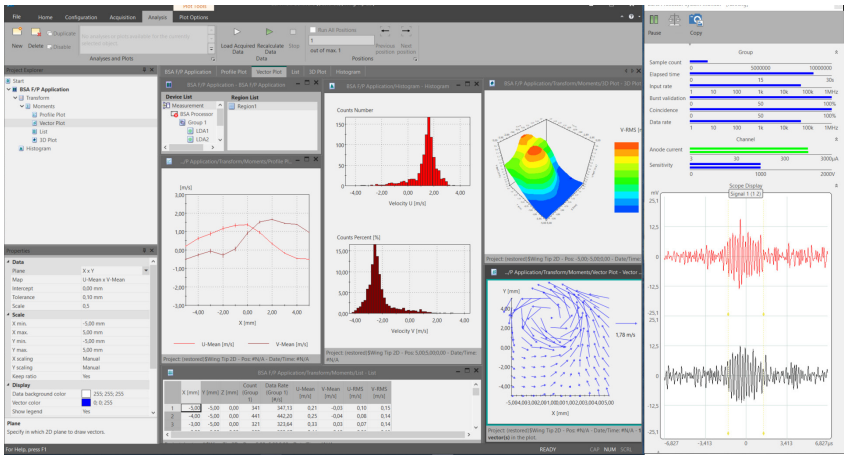
For more details on the signal processor, please refer to the data sheet on “Burst Spectrum Analyzer (BSA)” available at our website.



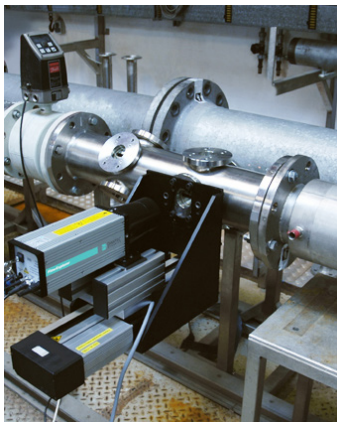
Plot of velocity profile in an air jet

Data Analysis

The most flexible and comprehensive software for LDA measurements



BSA Flow with Advanced Graphics add-on, included in the FlexLDA solution.

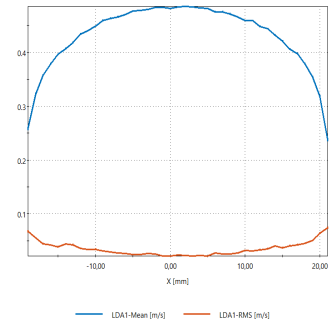


Calibration of a water flowmeter

The BSA Flow software is easy to use thanks to its workflow-based user interface 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 enable user-defined data analysis and display, dynamically updated during measurements.

Data analysis can be customized with a built-in Calculation module, with Python or via a MatLab link for ultimate flexibility. Graphical output includes vector plots, 2D line and scatter plots, and 3D plots. Both plots and numerical 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's performance and capabilities, please see the data sheet on "BSA Flow Software" available on our website.

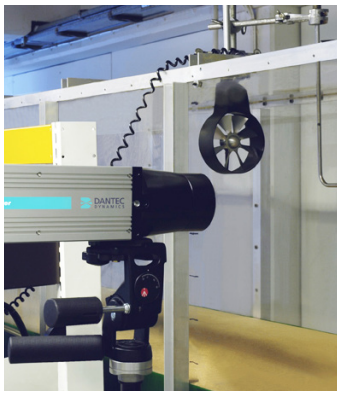


Plot of velocity profile in a turbulent pipe flow in water

FlexLDA configurations

The FlexLDA solution is being offered in the following 1D and 2D configurations.

Item no	Item name	Description
9061N0011	FlexLDA 1D	FlowExplorer 1D 90mW (660nm) BSA F100 1D 660nm BSA Flow Software Advanced Graphics Add-on Laser Alignment Eyewear Laser Protective Eyewear Front Lens for FlowExplorer (300 mm or 500 mm)
9061N0021	FlexLDA 2D	FlowExplorer 2D 90/70mW (660/785nm) BSA F100 2D 660/785nm BSA Flow Software Advanced Graphics Add-on Laser Protective Eyewear Front Lens for FlowExplorer (300 mm or 500 mm)



Calibration of a pitot tube and a flywheel anemometer

Options

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

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.

Processor upgrade: The BSA F100 processor can be upgrade to BSA F600 which offers 120 MHz max. frequency, allowing for measurements of higher velocities.

Software add-ons: Spectrum/Correlation Add-on, Cyclic Phenomena Add-on, Scripting and MATLAB link Add-on, LIF and Parametric Analysis Add-on. Please see separate data sheet on our website.

Traverse: A software-controlled automatic traversing mechanism with 1D, 2D or 3D capability for flow mapping can be added to the system. Several standard traverse controllers are supported in the software. Please see 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 the separate data sheets on our website.

Technical specifications

Optics	FlowExplorer
Laser	Diode
Laser power	90/70 mW (1D/2D)
Laser wavelength	660/785 nm (1D/2D)
Focal length	300, 500 mm
Measurement volume dimensions	0.09 x 0.09 x 0.92 mm^3 (300 mm focal length) 0.15 x 0.15 x 2.55 mm^3 (500 mm focal length)
Optics weight (excl. laser controller)	5 kg

Processor	BSA F100
Max. Velocity	>40 m/s (300 mm focal length) >68 m/s (500 mm focal length)
Data rate	>100,000 bursts/sec
Resolution	>16 bits

Software	Features
BSA Flow	Workflow-based user interface Real-time oscilloscope display of signals On-line display of data validation, data rate, coincidence rate, photomultiplier anode current Real-time end results thanks to multi-threading and decimation of displayed data 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 Export of data
Advanced Graphics Add-on	X-Y plots, vector plots, 3D plots, profile plots

DANTEC DYNAMICS Turn Measurements into Knowledge

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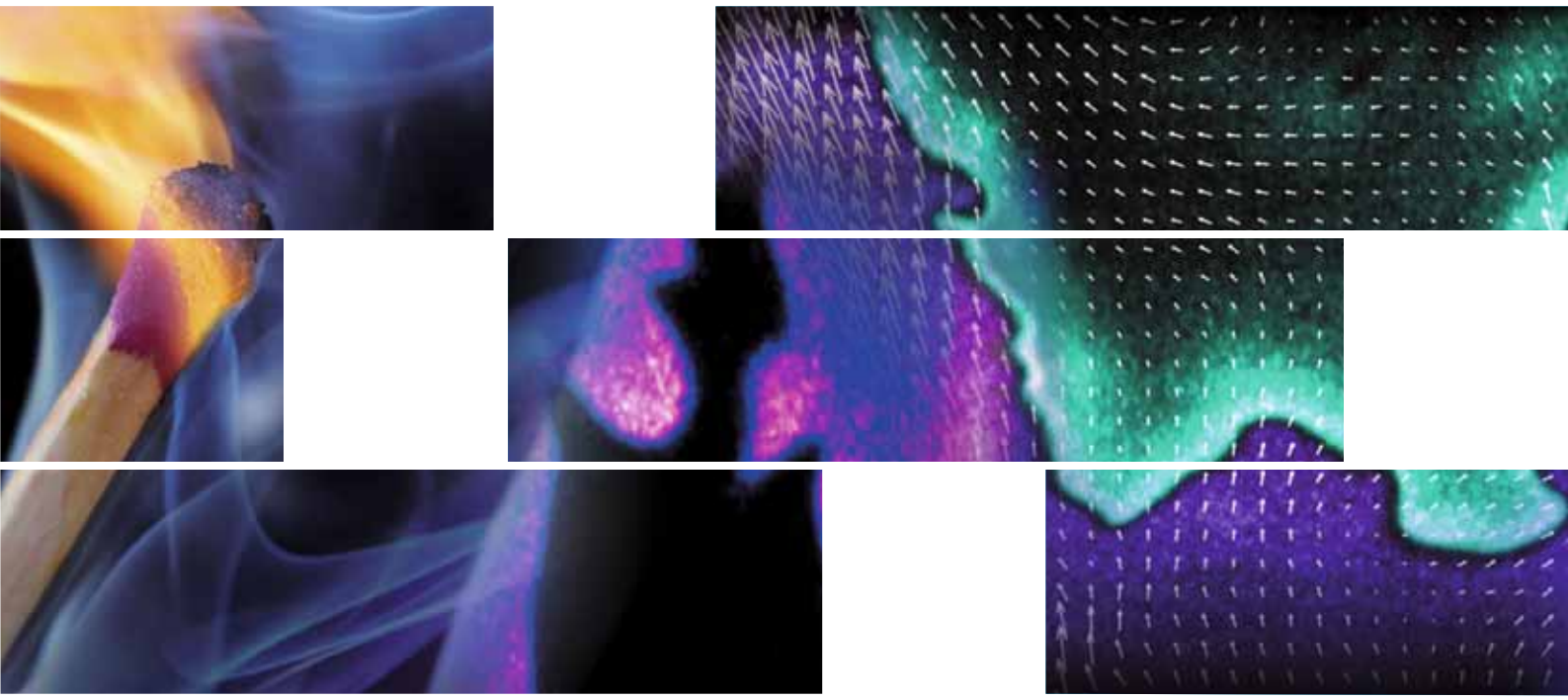
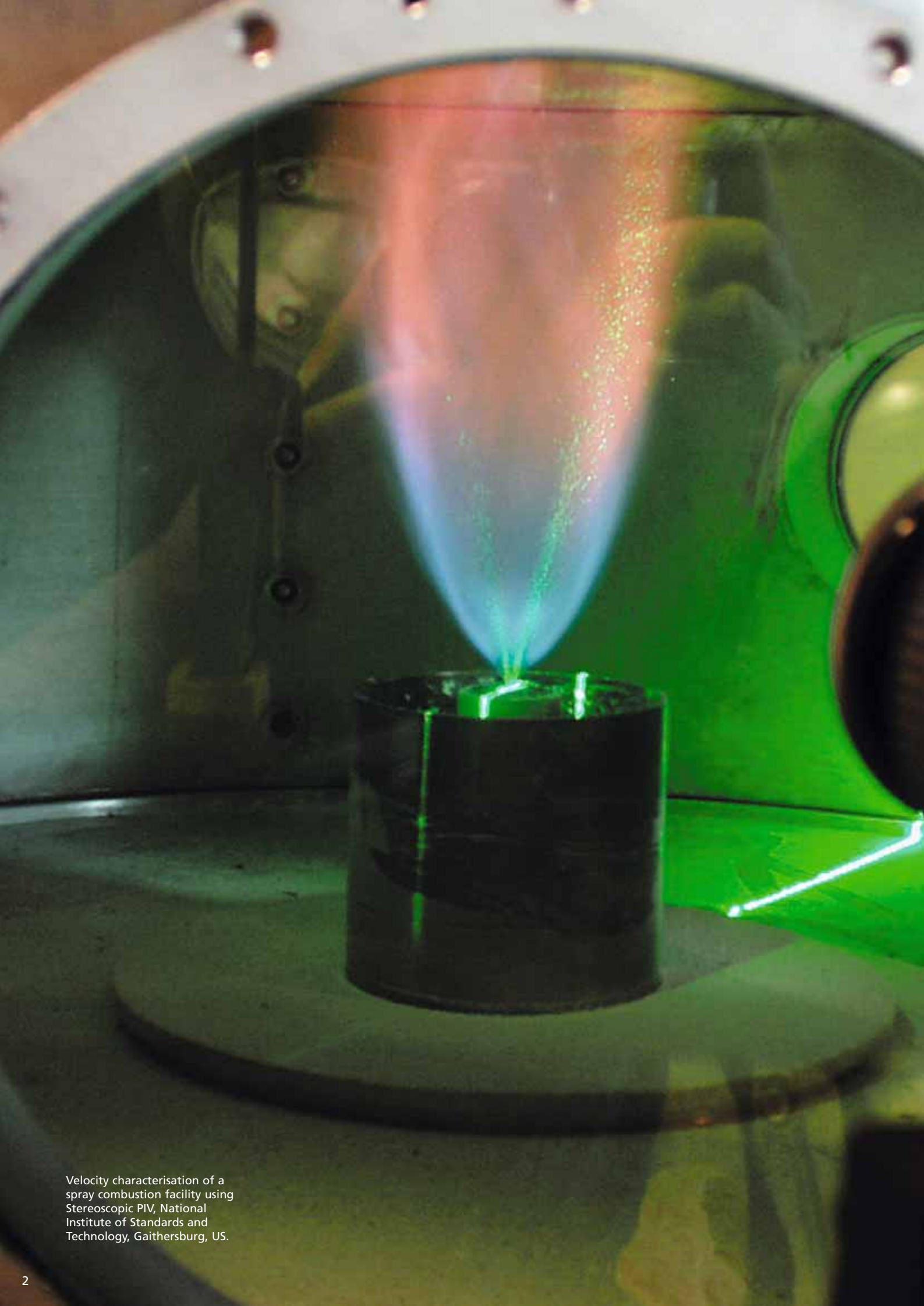


COMBUSTION DIAGNOSTICS

Advanced Optical Measurement Solutions

NOVA INSTRUMENTS



Velocity characterisation of a spray combustion facility using Stereoscopic PIV, National Institute of Standards and Technology, Gaithersburg, US.

Combustion processes are used in many modern technologies such as electrical power production, heating, and automotive and aircraft/space-shuttle propulsion. Laser diagnostic techniques can help improve our understanding of combustion processes and thus contribute to reducing the carbon footprint of mankind.

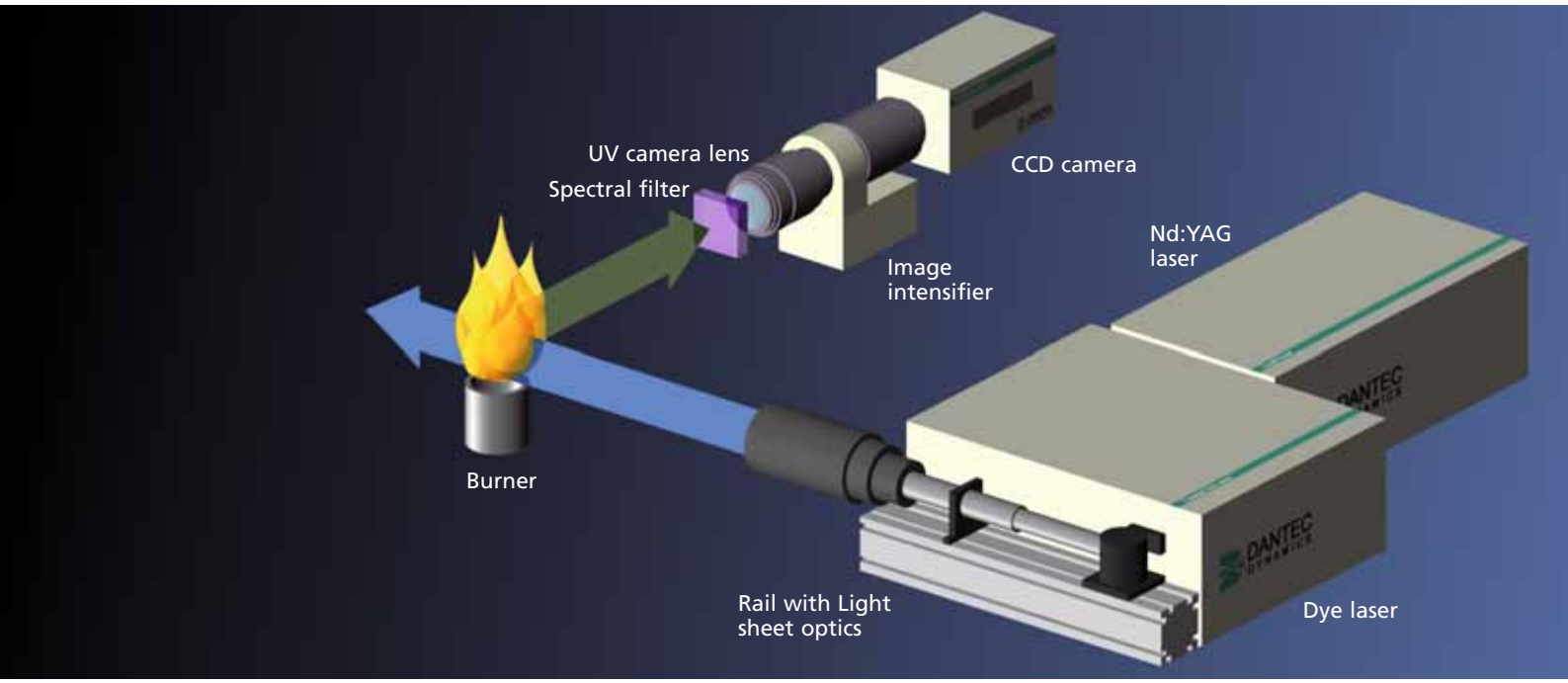
Combustion Diagnostic Systems

Dantec Dynamics offers a full range of combustion diagnostics measurement solutions that integrate advanced timing devices, state-of-the-art lasers, the latest camera and image intensifier technology with image acquisition and data analysis software. This makes the systems powerful yet easy to use, so that you can concentrate on the measurements.

The DynamicStudio software platform includes all the features - from instrument calibration routines and acquisition management to data analysis and presentation - to make your measurements successful. It combines a flexible database structure designed to handle vast amounts of data with a wide range of analysis modules, and it can be adapted to the numerous and different measurement situations that your laboratory might encounter, now and in the future.

All this is combined into complete systems that provide:
- Non-intrusive measurements
- High spatial and temporal resolution
- Modular systems allowing for easy upgrading to extend the system capabilities even further
- Data calibration
- Background subtraction and on-line monitoring and correction of laser pulse energy fluctuations
- Statistical analysis of data
- Visualisation of data and results

Detailed Investigations of Molecular Species using L



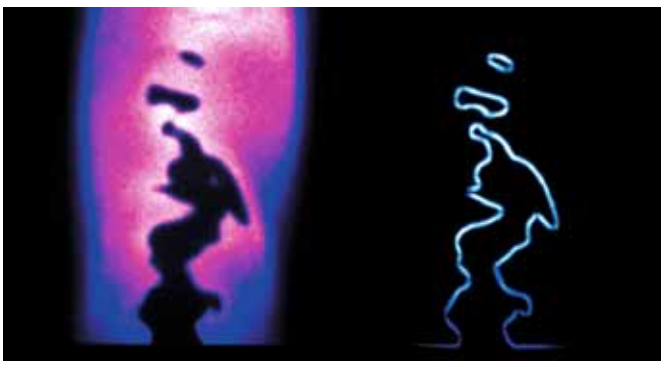
Combustion Radicals and Products Measurements by LIF

Laser-Induced Fluorescence (LIF) is the most powerful technique available today for experimental diagnostics of combustion processes. Based on the physics of interaction between light and individual molecules, the technique allows for species-selective measurements with high sensitivity.

Dantec Dynamics' highly advanced and flexible system for combustion LIF is capable of measuring a wide range of combustion radicals and products. It facilitates:

- Imaging of several combustion radicals
- Whole-field flame front visualisation by LIF of OH or CH
- Imaging of pollutant species such as NO and CO

In addition, high-speed OH LIF makes it possible to study temporal evolution of combustion processes.



OH LIF showing the area of the flame front and post-flame gases in a flame from a Bunsen burner (left) and the corresponding image after post-processing showing the location of the main flame front by means of gradient detection (right).

IF

An overview showing the principle of Dantec Dynamics' combustion diagnostic systems. The system shown here includes an advanced and flexible tuneable dye laser used for measuring a wide range of combustion species.

Fuel Visualisation by Tracer-LIF

By adding a fluorescent tracer species (e.g. acetone) to a non-fluorescent fuel, you can carry out diagnostics studies of the combustion as well as pre-combustion process. Dantec Dynamics' powerful yet easy-to-use tracer-LIF dedicated system enables you to study a wide range of applications, from open flames to internal combustion engines, for properties such as:

- Fuel distribution
- Ignition phenomena
- Fuel injection behaviour

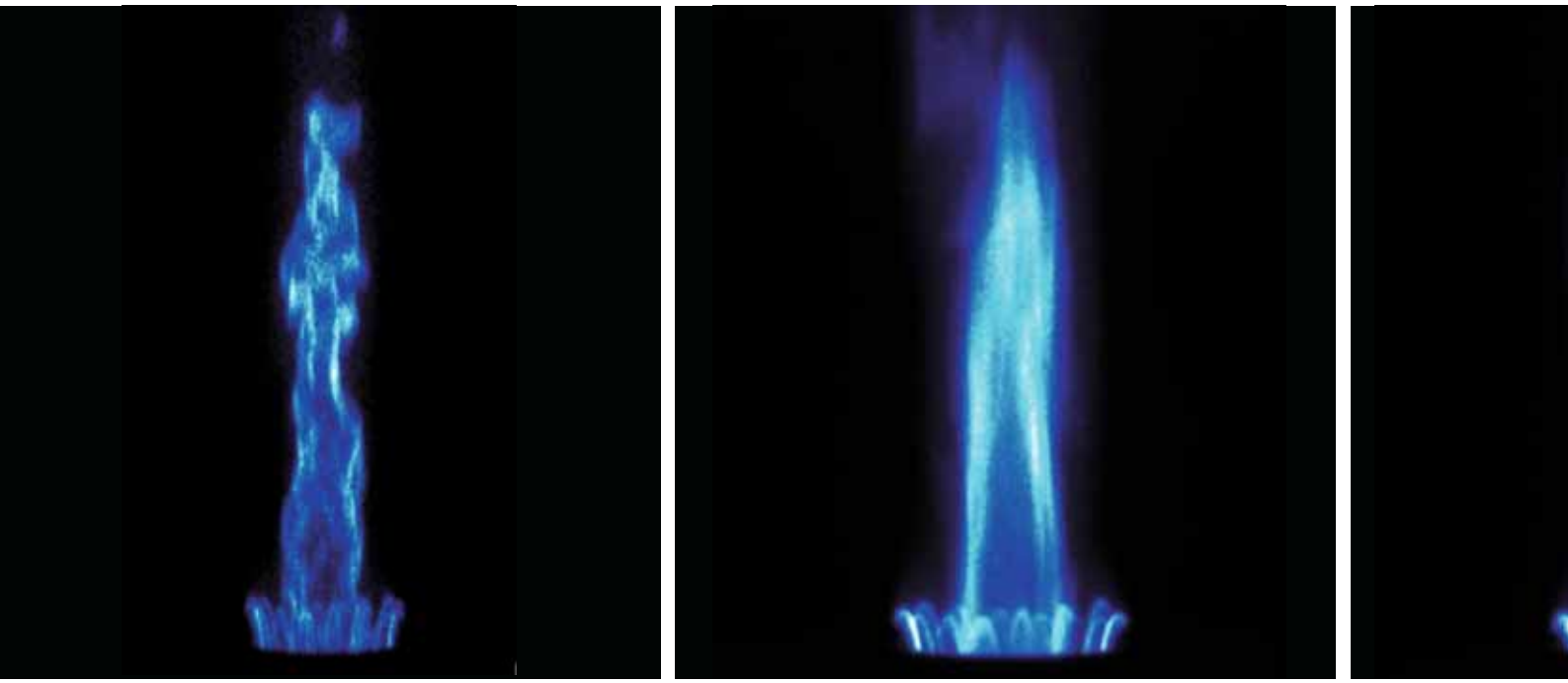
Fluid Dynamics and Flame Structures by Simultaneous LIF/PIV

The modular structure of Dantec Dynamics' systems allows you to control several different measurement systems from the same master PC. In this way, the processes under investigation can be studied in more detail by combining, for example, fuel visualisation with flame front tracking.

Naturally, velocity information from PIV equipment can be integrated for further advanced analyses combining combustion chemistry and fluid mechanics.

Simultaneous flow field, fuel mauve and OH green visualisation in a turbulent atmospheric flame. Courtesy of R. Collin and P. Petersson, Division of Combustion Physics, Lund University, Sweden.

Monitor all the Different Aspects of the Combustion

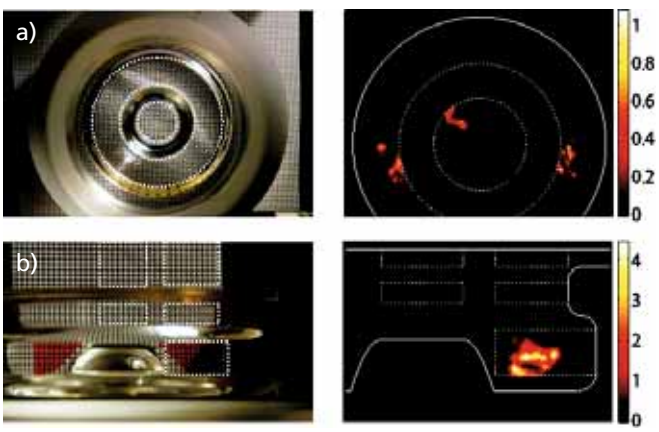


Soot Diagnostics by LII

Dantec Dynamics' system for Laser-Induced Incandescence (LII) is a solution for quantitative determination of soot volume fraction. The LII software provides access to advanced image calibration and analysis methods, as well as non-linear signal compensation algorithms for greater accuracy when working with sooty processes.

The system includes features such as:

- Numerical methods for calibrating line-of-sight, LII decay time and gas composition dependence of the LII signals
- User-friendly image processing interface with scientific accuracy to gain direct information on soot volume fraction (in ppm) and carbon concentration equivalent (in mg/cm^3)
- Methods for statistical analysis of LII results



The view through the optical piston from below (a) and from the side (b), together with single-shot soot-volume-fraction images. Courtesy of H. Bladh et al, Lund University.

n Process

OH* chemiluminescence from a slightly turbulent atmospheric flame at around 308 nm with exposure times of 100 µs, 1 ms and 10 ms respectively.

Temperature Mapping by Rayleigh Scattering

Light that is elastically scattered by molecules, Rayleigh scattering, is directly related to the density of the molecules. This can in turn be converted to temperature, making Rayleigh scattering a suitable tool for 2D thermometry in combustion research.

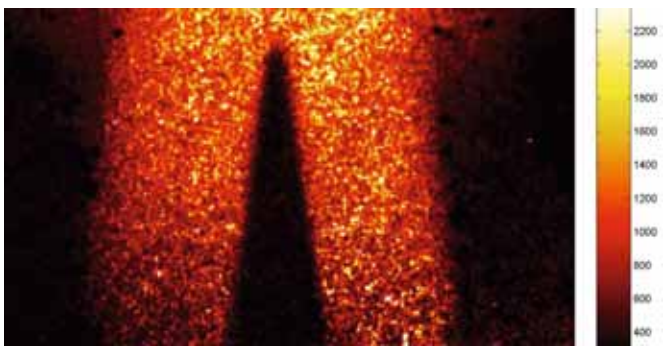


Photo showing the strong yellow glow from soot particles in a flame from a match. Temperature measurement using Rayleigh scattering performed in a stable conical flame. Courtesy of R. Collin, Division of Combustion Physics, Lund University, Sweden.

Chemiluminescence Imaging

Chemiluminescence imaging can be a valuable diagnostics tool for combustion processes. The technique relies on detection of the naturally emitted light from chemically excited species in the flame and does not require a laser source. This makes the technique cost-efficient as well as straightforward to use. With Dantec Dynamics' system, the technique can even be extended to time-resolved investigations using a high-speed camera and image intensifier, facilitating studies of the temporal evolution of many different combustion processes.

Your Partner for Progress

By partnering with Dantec Dynamics you will benefit from:

- The most diverse range of products and techniques to match your measurement requirements
- Access to the knowledge of our highly trained and competent staff with strong academic backgrounds
- The world leader with several thousand measurement systems in operation around the world at leading universities and companies
- Local support from our five subsidiary companies and a strong network of distributors

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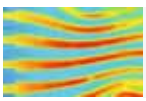
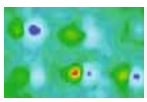
Fluid Mechanics


Thermal Comfort


Strain, Stress & Vibration


Particle Characterization


Microfluidics


Non-destructive Testing


Combustion Diagnostics


Paper Process Optimization


Disatac Tachometers

Worldwide representation

From our six offices and more than 30 representatives worldwide we approach our customers individually. We examine the specific needs and find the best solution for you. For us you are a long-term partner in improving efficiency, safety and quality of life.
A list of representatives is available at our website.

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