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)

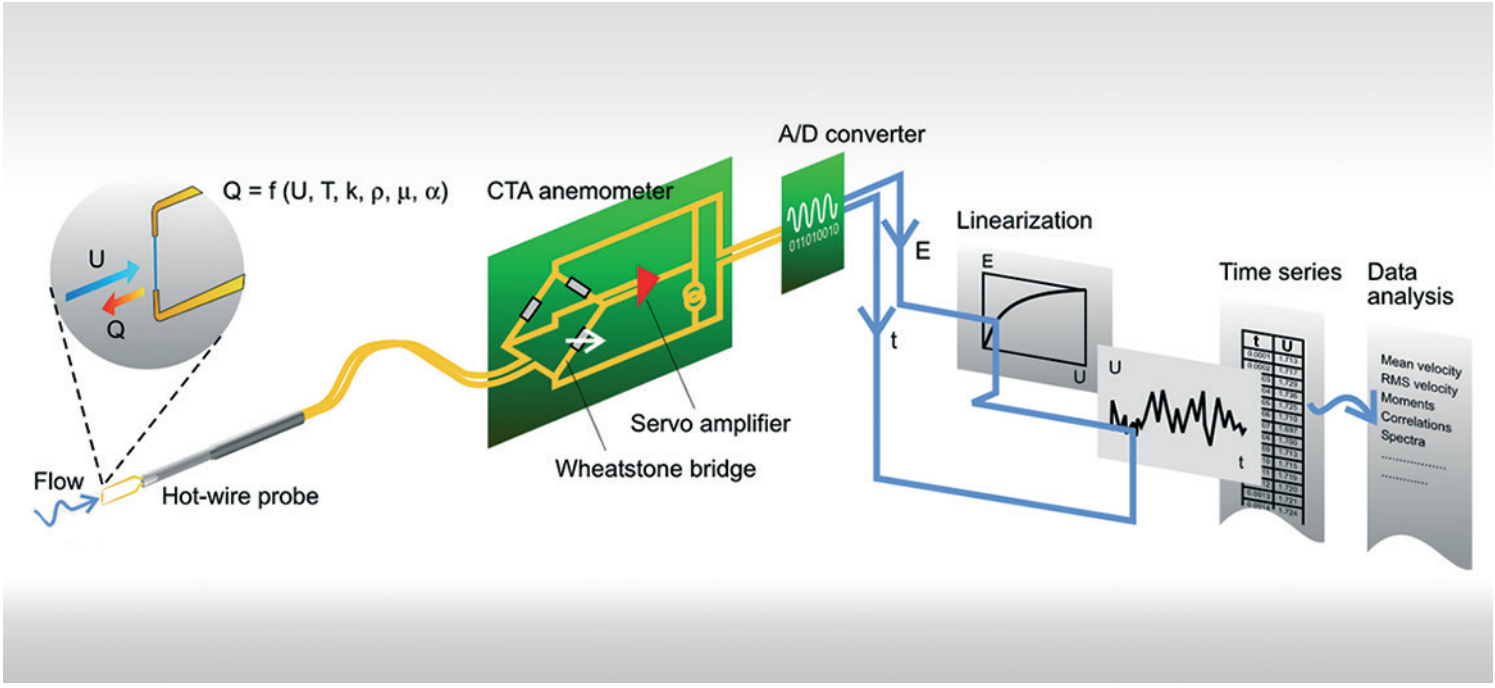
CTA is a well-established point measurement technique with commercial systems available for several decades. Application areas include temperature, shear stress, velocity and turbulence measurements in e.g. jets, boundary layers, transitional flows.

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.

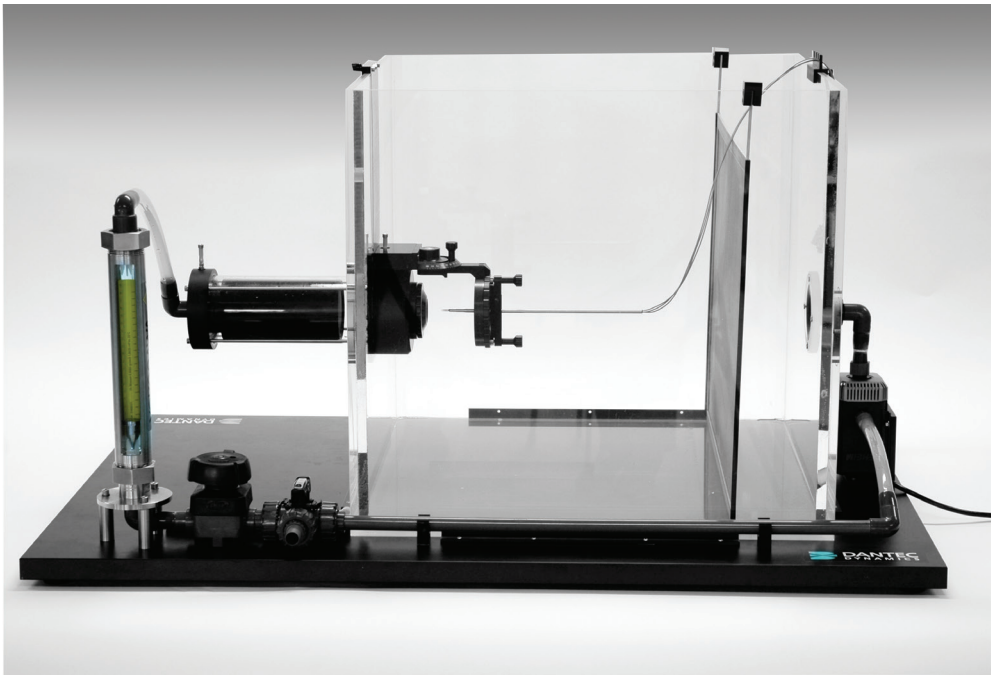
StreamLine Pro - the most reliable research-grade CTA system.

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.



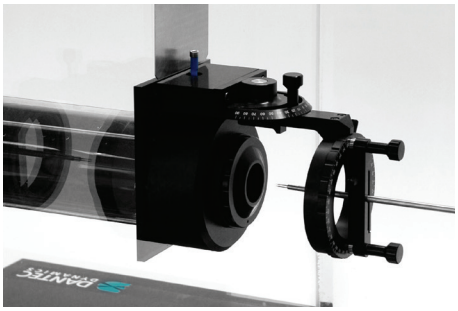
Water Calibrator.

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.

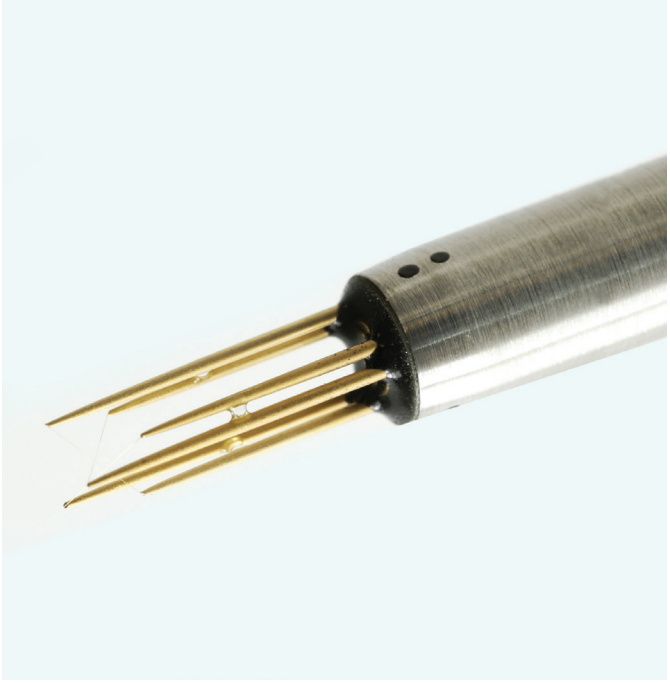
Directional calibrations are required for multiple-sensor hotwire and hotfilm probes. A single axis rotation (Pitch/Yaw) is sufficient for 2-sensor probes, whereas a two-axis rotation (Pitch/Yaw & Roll) is required for calibrating 3-sensor probes. These operations are made simpler by the manual and motorised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

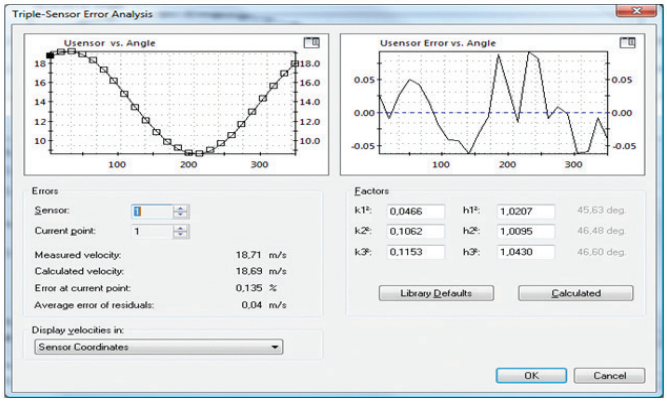
Triaxial cross-flow probe with fiber-film sensors.

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.

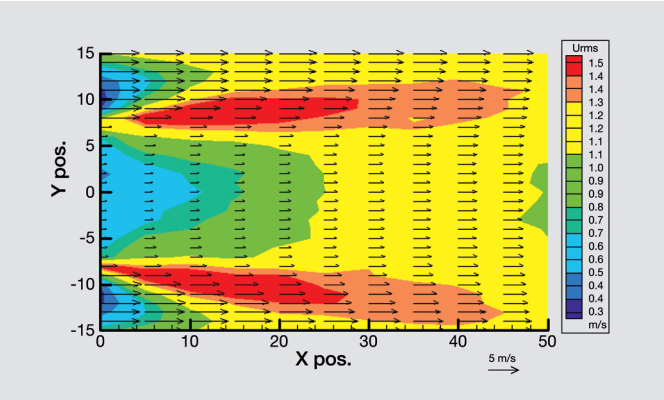
Thin film coating in Dantec Dynamics' clean room facility.

Software

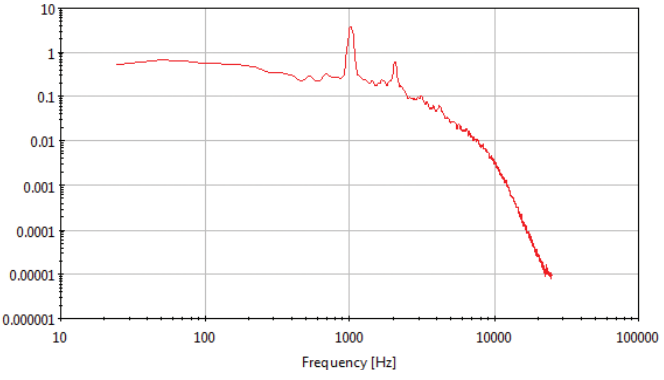
StreamWare Pro software has a modern look and an intuitive interface, which guides the user through system configuration, hardware setup, probe calibration, and data acquisition.

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.



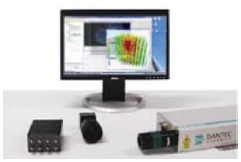
Flow field downstream of a cylinder in cross flow in Tecplot: mean velocity field & turbulence intensity.



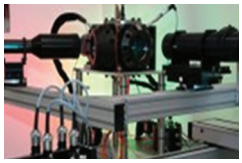
Power Spectral Density computation downstream of cylinder in cross flow, data courtesy of Technical University of Denmark.

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:

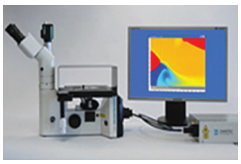


Fluid Mechanics

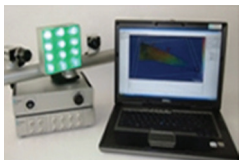


Spray and Particle Characterization

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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