StreamWare Basic

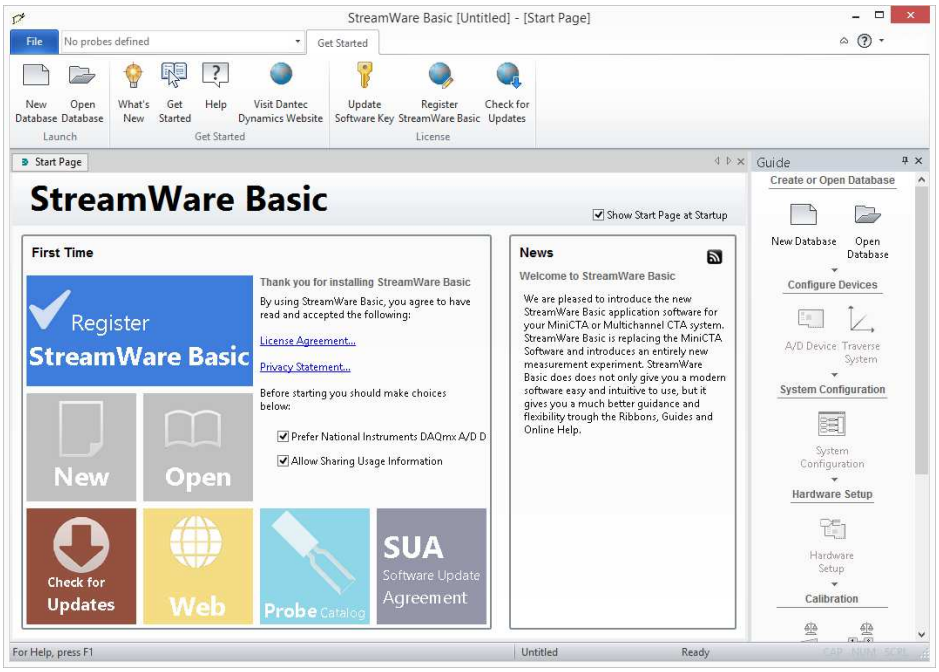
Software for MiniCTA / MultichannelCTA Systems

Applications

- Multi-point measurements of velocity and turbulence
- Measurement of fluctuating temperatures
- Gas and liquid flows
- Transient and cyclic flow phenomena
- 1-, 2- and 3-velocity components
- Both freestream and near-wall measurements
- High temperature environments
- Boundary layer transition
- Wall shear stress

Features

- Easy-to-use, easy-to-learn & up-to-date CTA software
- Velocity and directional calibration of probes
- Two-point and multichannel calibration
- Data acquisition and data reduction
- Temperature correction
- Modern database and graphical user interface
- Support of Dantec calibration & traversing systems
- Modern data display and export capabilities



StreamWare Basic with the new ribbon interface

Introduction

Constant Temperature Anemometer (CTA) technology is a well-established measurement technique with commercial systems available since 1958. The measurement principle is based on the cooling of small sensors placed in a 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 enough resolution to analyse the fluctuations in the frequency domain.

Even though CTA technique is intrusive and non-linear in response, it is still the best instrument for the accurate determination of high frequency flow fluctuations, boundary layer diagnostics, simultaneous multi-point velocity and temperature measurements.

Description

The MiniCTA and Multichannel CTA systems offer a cost-effective solution for measurement of flow and turbulence in applications with low to medium flow velocities and moderate fluctuation frequencies.

Both platforms contain the same circuit board and therefore share the same specifications for velocity channels. The MiniCTA system is the single-channel version and is ideal for new CTA users and for more experienced users demanding mobility. The MiniCTA system is also well suited for demonstration of CTA in undergraduate fluid dynamics laboratory classes.

MultichannelCTA systems offer more functionality than their single-channel counterparts. They are normally configured with a number of velocity channels and a temperature channel. Both systems are operated by the StreamWare Basic software, which performs set-up, automatic probe calibration, data acquisition, data conversion and data reduction.

DANTEC DYNAMICS

NOVA INSTRUMENTS

StreamWare Basic

StreamWare Basic is a complete software package running in a Windows environment that helps the user to design, organize and document the measurements as well as post process the results. The complete MiniCTA or MultichannelCTA system can be controlled by StreamWare Basic, which performs hardware set-up, probe calibration, data acquisition, conversion and reduction. Raw and reduced data can be presented in StreamWare Basic or they can be exported to other applications (e.g. Excel and TecPlot®) for further manipulations.

Database for organised measurements and results

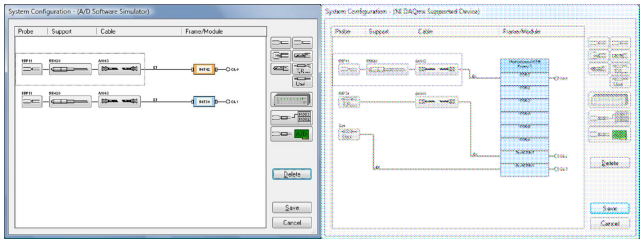
StreamWare Basic organizes the measurement setups and stores them in a dedicated database. The complete measurement task from configuration and experiment layout to acquiring, reducing and storing data is performed in an intuitive way. The user can go back to a data set and see the instrument configuration, electronic settings, measurement chain, and analysis sequence as an on-line notebook.

Default set-up parameters related to the actual probe are stored in dedicated libraries, as are drivers for a number of A/D boards and a traverse system. StreamWare Basic can communicate with the automatic calibrator and a traverse system via USB (or LAN), while analog data are acquired via an A/D board.

All set-ups, calibrations, experiment layouts and raw and reduced data are saved by the StreamWare Basic project manager, which puts you in full control and ensures traceability of results.

System configuration and hardware set-up

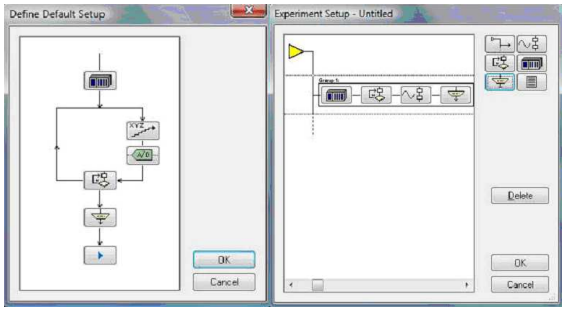
The hardware configuration is displayed graphically on the computer screen. With the graphical interface, a complicated system configuration becomes an easy task, and in addition, this provides a record of the system configuration of each experiment performed in the past.



System configuration graphical user interface supports both MiniCTA and MultichannelCTA systems

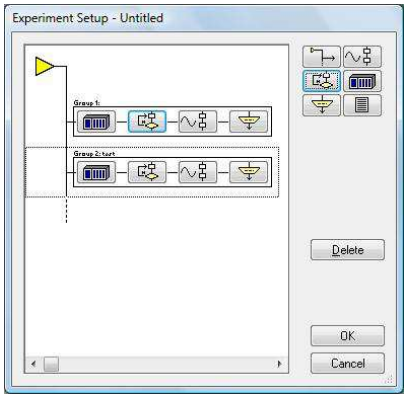
Default experiment set-up

A default experiment loop contains the set-up of anemometer & signal conditioner, traversing of the probe and acquisition of data. Finally, data are reduced in accordance with a predefined scheme utilizing the probe calibration.



Set-up is defined graphically before experiment

It is also possible to design more advanced experiments with conditional sampling, waiting loops, exchange of data with other equipment etc.



Advanced set up defining Hardware, Scheduling of data acquisition, Conversion & Reduction

Data conversion and reduction

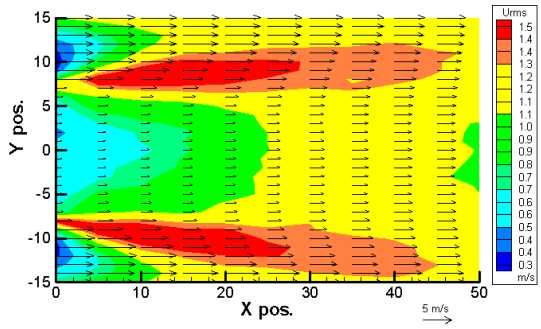
Raw data are converted into velocity samples and further decomposed into velocity components in the case of multi-sensor probes, based on the calibration data. Data reduction comprises analysis in both the amplitude and the time (spectral) domain selected in a data reduction dialogue box. Reduced data are stored separately and are always available for graphical presentation.

Correction for ambient temperature changes

StreamWare Basic contains routines for temperature correction of raw data, prior to linearization, based on temperature input from the system temperature probe. As the ambient temperature often varies during an experiment, this is an important feature that improves the overall measurement accuracy significantly.

Data export and presentation

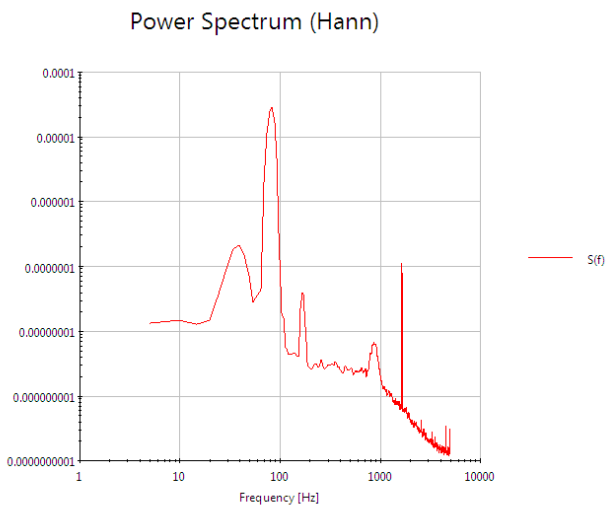
Based on time series acquired in one or several points in the flow statistics, mean velocity, turbulence intensity, Reynolds stresses and autocorrelation function can be calculated and displayed. Results can be displayed in StreamWare Basic or exported to other applications for further analysis or for advanced graphical presentation.



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

Turbulence Diagnostics

CTA is still the preferred technique for investigation of turbulence due to its unmatched frequency response. In the frequency domain, power spectra can be computed for analysis of the fluctuating flow characteristics. The power spectrum calculation in StreamWare Basic 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.



Block-averaged Power Spectral Density in the freestream of a small closed-return open-test section (Göttingen type) wind tunnel at 20 m/s. Calibration, measurement and processing performed using 54T29 Reference Velocity transducer, 54T42 MiniCTA unit, 55P11 Miniature wire probe and the StreamWare Basic software.

Additional information

For additional information and ordering please contact your Dantec Dynamics representative.

Dantec Dynamics undertakes a continuous and intensive product development programme to ensure that its instruments perform to the highest technical standards. As a result the specifications in this document are subject to change without notice.

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