Software for StreamLine / StreamLine Pro 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
- Automatic velocity & directional calibration of probes
- Multipoint & 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 Pro 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 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.

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 StreamLine Pro system is the next generation CTA based on the popular StreamLine system. Using the latest developments in signal processing technology, the newly improved StreamLine Pro provides the highest Signal-to-Noise Ratio and widest bandwidths of any commercially available CTA system. In addition to the improved high-pass filters, we have also increased the accuracy of the gain and offset setting, which benefits the user by providing increased measurement accuracy and flexibility. For fundamental fluid dynamics and turbulence research, these significant improvements are critical to successful results especially in the most challenging measurement applications.

The system is operated by the StreamWare Pro application software, which performs set-up, automatic probe calibration, acquisition of data, data conversion and data reduction.





StreamWare Pro

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

Database organised measurements and results

StreamWare Pro 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 communicates with StreamLine and a possible 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 project manager, which puts you into full control and ensures traceability of results.

System configuration and hardware set-up

The hardware configuration is displayed graphically on the computer screen. The probe library contains default set-up parameters for the CTA module inclusive signal conditioner, which may be optimized individually if necessary.



System configuration graphical user interface supports both StreamLine and StreamLine Pro 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. 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 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 on StreamWare Pro 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 frquency response. In the frequency domain, power spectra can be computed for analysis of the fluctuating flow characteristics. The power spectrum calculation in 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.



Power Spectral Density computation in StreamWare Pro downstream of cylinder in cross flow, data courtesy of Gjelstrup et. al. 2000; "Experimental verification of novel spectral analysis algorithms for LDA data".



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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. Publication No.: PI333v1



