



## noiseLAB Wind

### Wind Turbine Noise measurement system to IEC 61400-11 2012 Edition 3 2012

#### Introduction

noiseLAB Wind provides data recording and analysis used for wind turbine noise measurements. The PC-based program collects data from Wi-Fi connected microphones, wind turbine process parameters and meteorology data from anemometers.

#### Features

- Type 1 Microphones powered by National Instruments digitizers with wired (USB NI 9234, 9215 etc.) or WiFi connections to a central data collection computer.
- Acoustic Front end and associated signal processing in conformance to section 6 of IEC 61400-11. 2012
- Acoustic Measurements according to section 7. Sound Power and Tonal Audibility require optional modules.
- Wind speed measurements in conformance to Section 8.2
- Interface to analog and digital anemometers from [Schiltknecht](#) and [Risø](#) anemometers.
- RS-232 interface to selected Vestas and Siemens wind turbine control systems for real time logging of process parameters. Custom interfaces available for other turbines
- Analog interface to wind turbines with analog outputs for process parameters
- Input of Wind Turbine Power Curve for automatic detection of “legal” operating wind speeds.
- Input of Wind Shield correction table
- Real time logging of raw waveforms to disk ([tdms](#) format)
- Logging of noise measurements (Leq, 1/3 octave spectra, FFT spectra) to disk with associated win bin information.
- Real time viewing of input data
- Real time viewing of histograms of measurements as a function of wind speed bins.
- Real time scatter plots
- Measurements to IEC 61400-11 Editions 2 and 3 Danish MST 1284 and MST 1518.
- Data storage in Excel and [tdms](#) for maximum post processing flexibility.
- FFT Spectra, 1/3 octave Spectra (A weighted and Linear), Wind Turbine parameters, wind speed and direction, derived parameters as per IEC 61400-11.
- FFT spectra output for Tone Analysis to ISO 1996-Annex 2 using [noiseLAB Professional](#).
- Options:
  - Wind Binned Tone Analysis to IEC 61400-11
  - Wind Binned Sound Pressure Level and Sound Power calculations to IEC 61400-11
  - Measurement Uncertainty Calculations to IEC 61400-11
  - Customized interfaces to digital outputs from wind turbine control systems.
- Multi-core processor enabled for higher speed.
- Windows XP to Windows 7 compatible.
- Customized configurations available on request.

#### DELTA

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## Benefits

### Benefits of system

- The system is tested and independently audited to conform to applicable standards.
- Wireless microphone connections simplify cabling and set-up.
- Storage of raw time waveforms permits greater data integrity, audit, and flexibility of post-processing options.
- Drivers for selected turbine control systems automatically parse data.
- Gain and offset settings for anemometers improve accuracy.
- Correction tables for windshield improves accuracy.
- Robust data recording for high file integrity in case of system crash.
- Works with off-the-shelf hardware for ease of configuration and upgrade possibilities.
- Real Time wind binning lets the user monitor the progress of the measurement.
- Real time scatter plot lets the user view any parameter(s) to permit real time auditing of the integrity of the measurement.
- Automatic detection of "legal" wind speeds based on pre-loaded power curves.

All references to sections of IEC 61400-11 are to the 2012 edition of the standard.

Specifications subject to change.

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## Ordering information

Contact [cth@delta.dk](mailto:cth@delta.dk)

[www.noiselab.dk](http://www.noiselab.dk)

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noiseLAB Wind is available a customized solution. Contact us for more details.

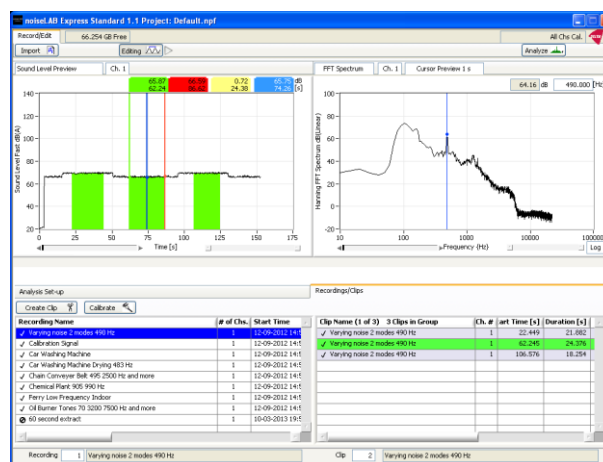
The full editions of noiseLAB are also available via the above web-site.

## About DELTA

noiseLAB Wind is developed by [DELTA](http://delta.dk), building a on rich tradition of 70 years of expertise in acoustics, psychoacoustics, and noise measurements. DELTA has broad practical experience in wind turbine measurements and has made significant contributions to IEC 61400-11 for wind turbine noise measurements.

## For further information please contact

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## System Configuration

### noiseLAB Wind may be sold

- As a turn-key system solution including installation and training
- As an “a la carte” solution where selected components are available. The items marked with a \* are only as part of a turn-key solution from DELTA.

All systems and components require a review for correct configuration and other conditions by DELTA before an order will be accepted.

### Turn-key System:

#### 1. The system consists of

- One or more acoustical measurement stations with one or more microphones with associated accessories.
- One or more analog measurement stations for interface to anemometers, other instruments or analog wind turbine control signal outputs.
- One or more Meteorological masts (analog or RS-232 output)
- For each of the above measurement stations
  - Data Acquisition hardware
  - Wired (Ethernet or USB), or Wi-Fi connection to a central data collection computer
- Central Data Collection Computer
- Optional interface(s) to Wind Turbine Control System.
- Data Acquisition and post-processing software.
  - noiseLAB Wind
  - noiseLAB Professional
  - Sound Power/Sound Level Analysis
  - Tone Analysis
  - Measurement uncertainty Calculation
- Installation, Training and Support.

### System Components

	Description	Type
<b>HARDWARE</b>		
*	Microphone Preamplifier	GRAS 26CA
*	Microphone	GRAS 40AE
*	Microphone Calibrator	GRAS 42AB

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	Primary Wind Screen as per IEC 61400-11 Section 6.1.5	DELTA
	Hemispherical Wind Screen with Calibration as per IEC 61400-11 Section 6.1.5	DELTA
*	Measurement Board as per IEC 61400-11 Section 6.1.5	DELTA
	4-Channel, 100 kS/s/ch, 16-bit, $\pm 10$ V Analog Input Module for interface to analog signals from turbine instrumentation, wind masts and other analog sources.	NI-9215
*	Anemometer	Schiltknecht
*	Cup Anemometer	Windsensor P2546A Anemometer
*	4-Channel, $\pm 5$ V, 51.2 kS/s per Channel, 24-Bit IEPE Digitizer with built in powering for IEPE microphones. Max two GRAS 26CA preamplifiers per module due to power constraints.	NI-9234
*	PXI Chassis with modules for precision synchronized measurements. Not required for standard IEC standard measurement. (Contact DELTA for details and custom configuration information)	National Instruments
*	NI WLS/ENET-9163 Ethernet Carrier (for NI-9215 or NI-9234)	NI-9163
*	Wireless Router (must be selected for Country specific regulatory compliance)	Acksys WLg-ABOARD/NP
*	Wireless Access Point (must be selected for Country specific regulatory compliance)	Acksys WLg-XROAD/N
*	Flat Panel Antenna (Small) Line of sight right up to 500 m: 5GHz 23dBi Outdoor Panel Antenna	TL-ANT5823B
*	Directional Antenna (Large) Line of sight right up to 1000 m 5GHz 30dBi Outdoor Grid Parabolic Antenna	TL-ANT5830B
*	Omni Directional antenna	
*	Antenna Cables	
	Wind Turbine Process Control Digital Interface: Custom Quote based on turbine manufacturer, physical interface, and protocols.)	

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	BNC Cables and Connectors	
*	Data Collection Computer: Windows 7, 8 GByte memory, and 1 Terabyte hard disk (USB-3 if external disk). Minimum 256 GByte SSD drive.  Contact DELTA for CPU requirements depending on channel count and other parameters.	
	<b>SOFTWARE</b>	
	noiseLAB Wind Software (Data Acquisition and wind binning) to IEC61400-11 Edition 2 and 3 and Danish MST 1284 and 1518 standards	DELTA
	noiseLAB Professional (Full Edition) for ad hoc analysis and tone analysis to IEC 1996 Annex 3	DELTA
	Sound Power/Sound Level Analysis Software (for post-processing of files from noiseLAB Wind) to IEC 61400-11	DELTA
	Tone Analysis Calculations (for post-processing of files from noiseLAB Wind) to IEC 61400-11	DELTA
	Measurement Uncertainty Calculation to IEC 61400-11 Edition 3.	DELTA
**	Training	DELTA
	Installation	DELTA
	Maintenance and Support	DELTA

\* Indicates product only available for turn-key installations.

\*\*Training is mandatory for turn-key installations and for customers using the systems for Certification.

\*\*\*Products may not be re-sold, leased, or transferred to other parties without the written accept from DELTA.