sensor
electronic

Edition 10.1

Operator's Manual

Wind Tunnel for Calibration of Low Velocity Anemometer Probe v.6 with rotation stand

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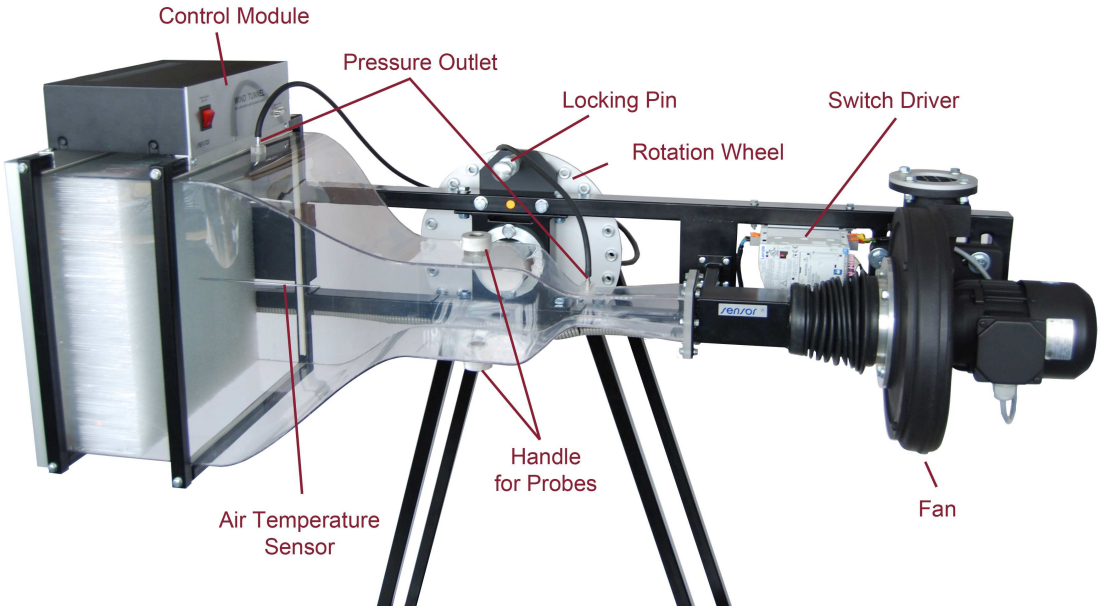
1. SHORT DESCRIPTION

The wind tunnel enables calibrating of anemometer sensors in the range of very low velocities. Generating the laminar reference flow in which sensors are calibrated is possible thanks to a suitably shaped measuring pipe of square diameter. The measuring pipe is made of transparent Simolux plastic, which allows it to be calibrated by means of a laser dopler anemometer. The shape of the measuring pipe is so matched that it ensures both the highest possible measuring sensitivity of the instrument at low velocities and the proper fitting of its maximum measuring range to the fan parameters and to the measuring range of the micromanometer.



A separate Switch Driver controls a fan used for precise and steady flow generation. The wind tunnel is equipped with a control module which comprises barometric pressure and air temperature measuring units, AD converter with two analog inputs, RS232 interface and power supplies adaptors. An RS232 output enables the computer to control and calculate the flow velocity in the wind tunnel.

A Laser Doppler Anemometer is used as a reference meter during the calibration of the wind tunnel. The calibration characteristic of the wind tunnel, i.e. the velocity in the tunnel as a function of the static pressure difference across the external sections and the air density, is approximated by a polynomial equation. The accuracy of the velocity approximation is better than ±0.003 m/s. The tunnel requires measuring the pressure difference in the range 0-2000 Pa with a resolution 0.01 Pa. Using the precise micromanometer Furness Controls FCO510 (http://www.furness-controls.com), which is equipped with an RS232 output, makes it possible to automatically control the velocity in the wind tunnel and calibrate the anemometer probe.

The wind tunnel is equipped with a stand with 360º rotation mechanism which allows rotating the frame with the measuring pipe in respect to the centre of symmetry of the measuring section at the step of 15° and makes possible to calibrate of velocity sensors in airflows with different but known direction, i.e. horizontal, upward, downward, etc. In this way the impact of natural convection flow generated by the heated sensor on the accuracy of the measurement is diminished. The frame position is fixed by a spring Locking Pin on a special Rotation Wheel mounted on the immobile steel stand.

2. TECHNICAL DATA

cross inside dimensions of the measuring pipe:	125×125 mm
velocity range:	0.05÷5 m/s
accuracy:	0.005 m/s for the range 0.05÷0.5 m/s
	1% for the range 0.5 ÷5 m/s
maximum range of pressure difference:	0÷2000 Pa

3. CONTROL MODULE

The Control Module contains the elements that are necessary for correct operation of the tunnel. It is comprised of: air temperature unit, barometric pressure unit, A/D converter with two analog differential inputs, serial communication RS232 module and AC/DC adapters.

There are on the front panel: main power supply ON/OFF switch and sensor input socket.
The sensor input socket allows the connecting:

- SensoAnemo transducer from AirDistSys 5000 measuring system (via connecting cable CC1)
- two instruments with analog output 0-10V (via connecting cable CC2)
- transducer from HT-400 measuring system (via connecting cable CC3)

On the back panel, there are: on the right side - socket for connecting a computer port RS232 and socket for connecting a micromanometer; in the centre - socket to connecting the Switch Driver and Air Temperature Sensor; on the left side – sockets for main power supply and fan power supply.

4. ADDITIONAL COMPONENT

Precision Micromanometer FC0510

In order that all properties of the tunnel and the software can be exploited the Micromanometer Furness Controls FC0510 of the range 0÷2000 Pa is required to be associated with the tunnel. Using the micromanometer with a serial output RS232 makes it possible to run automatic control of velocity and automatic calibration procedures.

If the micromanometer is planned to be used one must set up the following in the internal menu:

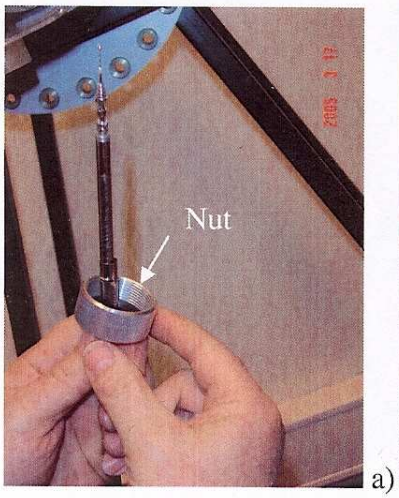
- 'RS2232 Format Menu':	BaudRate	= 9600
	Parity	= Even
	Margin	= 00
	DecimalPoint	= '.'
- 'Data Loger':		
'Logging Parameters':	LoggingTrigger	=Switch
	LoggingTimeInterval	=0001 Seconds
	StoreResultTo	=RS232
	StoreMainReading	=Yes (display D.P.)
	StoreWindow1	=No
	StoreWindow2	=No

On the front panel one should set up:
- MODE so that D.P. (Differential Pressure) is displayed
- RANGE so that 200.00 AUTO is displayed
- AVERAGE so that is inactivated

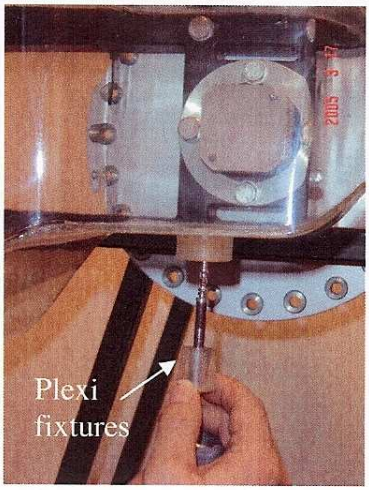
While co-operating with the tunnel the micromanometer should be constantly in the READ state.

6. PLACING AND POSITIONING THE MEASURING PROBE

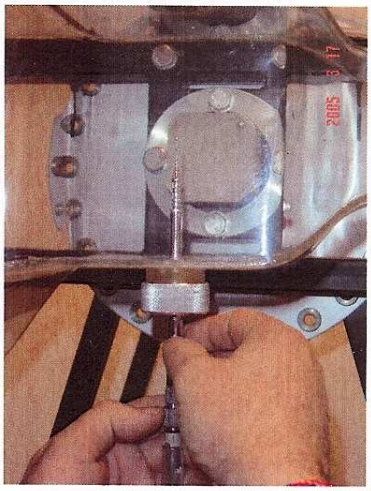
1. Unscrew the nut where the probes will be installed.
2. Choose the right plastics clamps, which will keep the probe in the measuring pipe, depending on the diameter of the probe holder.
3. Remove the protective basket from the probe.
4. Keep the measuring element covered by the shielding tube.
5. Insert the nut from the wind tunnel through the probe.
6. Loose the clamp screw on the shielding tube, which covers the probe.
7. Move the shielding tube to the lower end of the probe holder. Now the velocity sensor (the sphere at the end of the probe) will be exposed (see Figure a).



a)



b)


c)

8. Put the plastic clamps (plexi fixtures) on the probe holder (above the shielding tube) and hold them tight (Figure b).
9. Very carefully insert the probe into the measuring pipe of the wind tunnel in this way, so the velocity sensor (e.g. the sphere for spherical probe) was perfectly in a centre of the section (Figure c).
10. Tight the nut.

7. ACCESSORIES

PS - Power Supply Cable
RS1 - Data communication cable for connecting with the RS232 computer port
RS2 - Cable for connecting with a micromanometer
CC1 - Connecting cable for SensoAnemo transducers (measuring system AirDistSys 5000)
CC2 - Connecting cable for two instruments with analog output 0-10V
CC3 - Connecting cable for transducers of measuring system HT-400
PT - Pressure tube
PF - Cone-shaped plastic clamps for fixing probes (diameter 6, 7, 8 mm and two without hole)
S8 - Screw for assembling of rotation stand
HDR - handle for hole drilling in plexi fixture