# IC231- Lab 8 – Wind tunnel

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*In this lab you will learn how to interface a digital pressure sensor to Raspberry Pi and to conduct different types of differential pressure measurements*

## Learning outcomes

In this lab, you will learn…

- …how to select an appropriate sensor using datashets
- …how to measure windspeed using the pitot-static-tube principle
- …how to characterize a wind-tunnnel

## Instructions

This lab is built upon the last lab, where you worked with the differential pressure sensor. This time you will use it to implement a pitot-static tube windspeed sensor with application in a wind tunnel.

## Tasks:

1. For the first task, assume we do not have a sensor yet. The goal is to find a differential pressure sensor that enables to measure the wind speed up to 10 m/s using the Pitot-static tube. On that basis, find an **analog sensor** with the **output in Volts**. Describe in the report the key features of the sensor. Show a detailed feasibility analysis (etc. calculations) how your selected sensor is suitable for the task and what would be the key specs if applied to a wind tunnel (e.g. min./max. windspeed detectable etc.)

2. Analyze the function of a flow straightener. Connect the pressure sensor to the two pressure tubes, so that you can measure the difference between stagnation and static pressure. Which tube measures stagnation pressure and which tube measures static pressure? Place the tubes at least five different vertical locations and create a vertical flow field map with and without the flow straightener.
   **Logistic details:** In the lab there are four wind tunnels with and four without flow straightener. You may club with another group and exchange two types of wind tunnel.

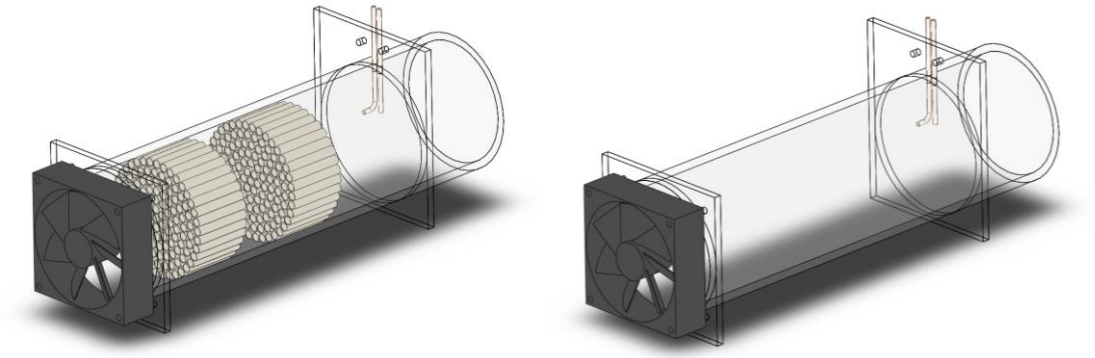

*Figure 1: 3D model of wind tunnel with (left) and without (right) flow straightener*

3. Determine the power efficiency for both types of wind tunnel. Measure the input power vs. the wind speed using two vertical points. Determine the point of maximum efficiency. The **maximum voltage supply** on the fans is **7 V.**

## Tasks completion criteria:

1. Select one analog sensor
2. Measured the flow profile of both tunnels
3. Acquire the raw data with different data points for efficiency measurement