Spirometer peak flow

Technician and teacher sheet

Apparatus

Spirometer.

Pressure filter fitted

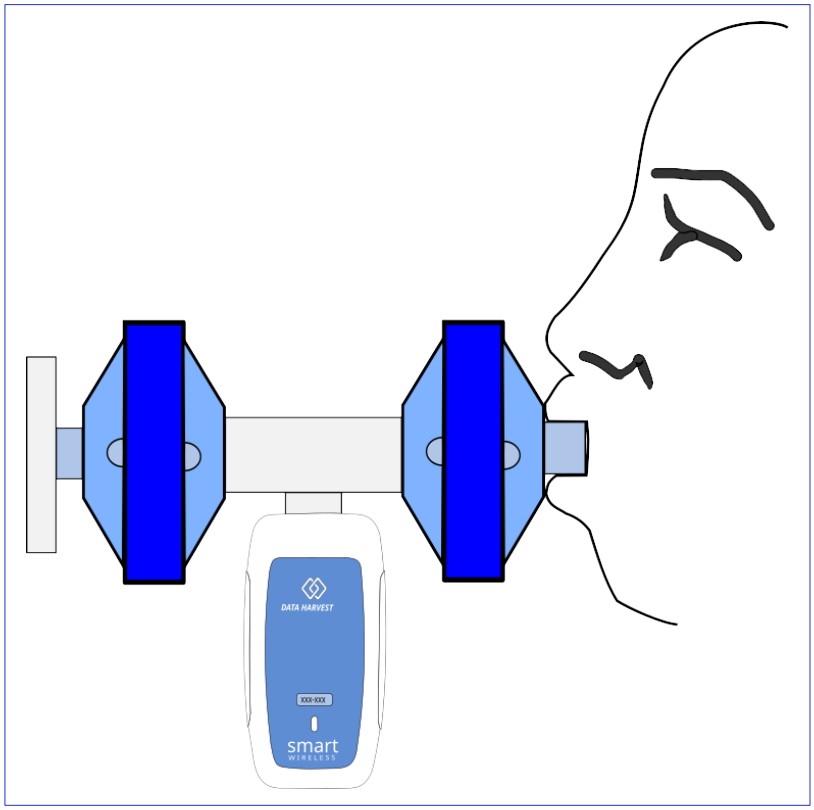
1 x filter per person to be tested

Data recording setup.

You need to go fast to get the best results, 50ms intersample or shorter.

A trigger of something like rises above 0.2 l/s

See practical notes for more detail.



A spirometer is a device that measures breathing patterns, lung capacities and function. The Spirometer measures accurately the flow of air through the device. This investigation will allow you to calculate the various lung capacities that can be measured.

The spirometer flowhead contains a sheet of resistance material that restricts the flow of air; the resistance to the air flow creates an increase in pressure across it. The increase in air pressure is measured via two air lines, one inside the flowhead and one inside the instrument body. An air pressure sensor is used to measure the changes in air pressure.

In the diagnosis of asthma and other lung complaints a measurement of the lung function is made and compared to a database of normal values. The percentage you deviate from normal values in the test is used to determine the degree

of problem and the type of problem, appropriate treatment can then be decided upon.

Peak flow rates are also used in sports training either to indicate the improvement in total body fitness during the training period or to watch for the onset of exercise induced asthma. Peak flow is also considered to be an indicator of potential.

In this exercise the subject will try to create lung function data for analysis. The Spirometer has not been calibrated for medical / diagnostic use and the instructor is not normally trained in fully interpreting the results. Any results should be regarded as demonstration of a principle and not to have any clinical significance.

The test will require you to take a very deep breath in followed by a very rapid forced expiration. This manoeuvre can cause some individuals discomfort and should not be undertaken by chronic asthmatics, individuals with bronchitis, lung infection or diagnosed lung disease.

Practical advice

The blue flowheads contain a bacterial and viral filter to prevent cross contamination. It is recommended that each user has their own flowhead and they should be marked to identify them. They are not washable; the filter material will felt and clog if immersed in water. One of the flowheads is “semi-permanent” it is to be used many times and it provides the resistance that creates the pressure change in the device. The fixed flowhead should have the circular guard fitted to make a strong visual reminder that it is not to be used for breathing into.

Assembly of the protective ring to the reference flowhead is shown

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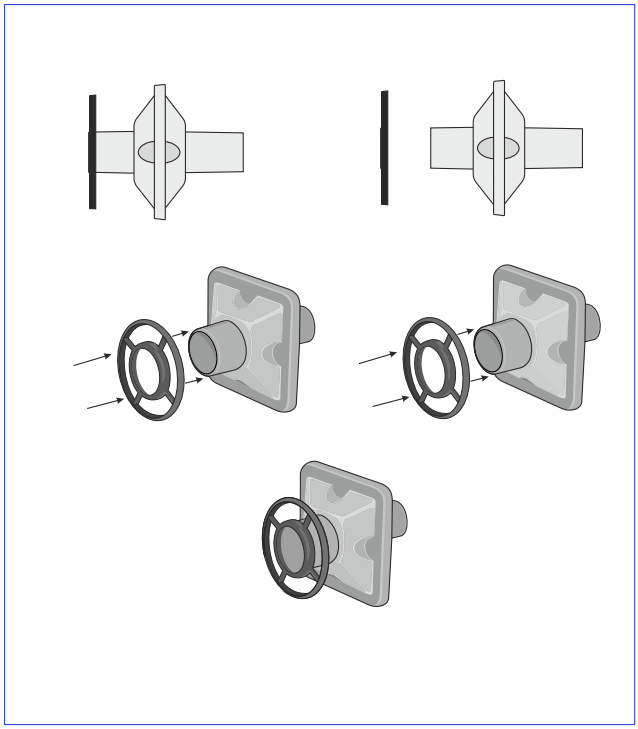


Measurement procedure

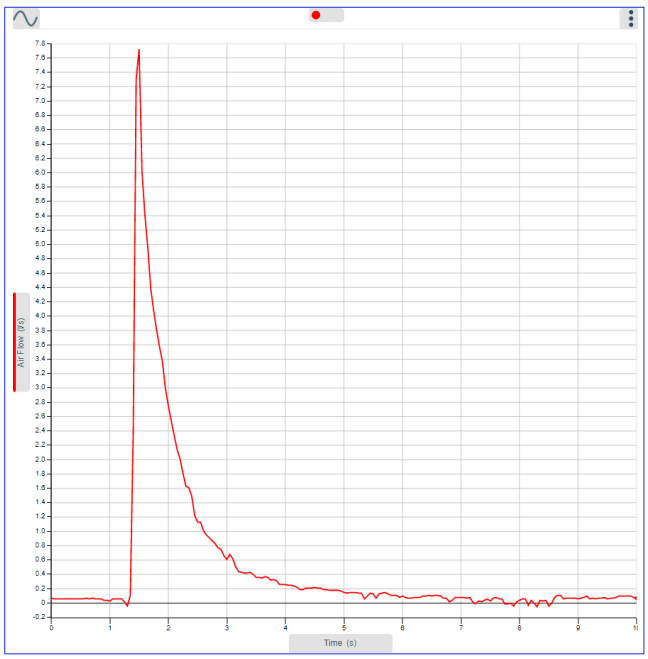
The procedure to record lung volumes / efficiencies is not instinctive and may require practice by the test subject. It is recommended that they try a few sample logs before attempting to collect “real” data. Breathing through the apparatus is unnatural and takes adjustment. Don’t snatch at the breathing or rush to complete.

It may take a few attempts before successfully collecting data; do not over practice the manoeuvre can be quite stressful.

Abbreviation	Defined	How measured	Typical values
FEV1	Forced expiration volume after 1 second	Volume of air expired after 1 second	83% of FVC
FEV2	Forced expiration volume after 2 seconds	Volume of air expired after 2 seconds	91% of FVC
FEV3	Forced expiration volume after 3 seconds	Volume of air expired after 3 seconds	97% of FVC
FEV6	Forced expiration Volume after 6 seconds	Volume of air expired after 6 seconds	100% of FVC
FVC	Forced Vital Capacity	Volume of air expired out from the beginning of the manoeuvre to the FEV6 volume plateau	
FET	Forced expiration volume	Time taken to reach FVC from start of expiration	
FEV1/FVC	Forced expiratory volume divided by forced vital capacity		80 -85%

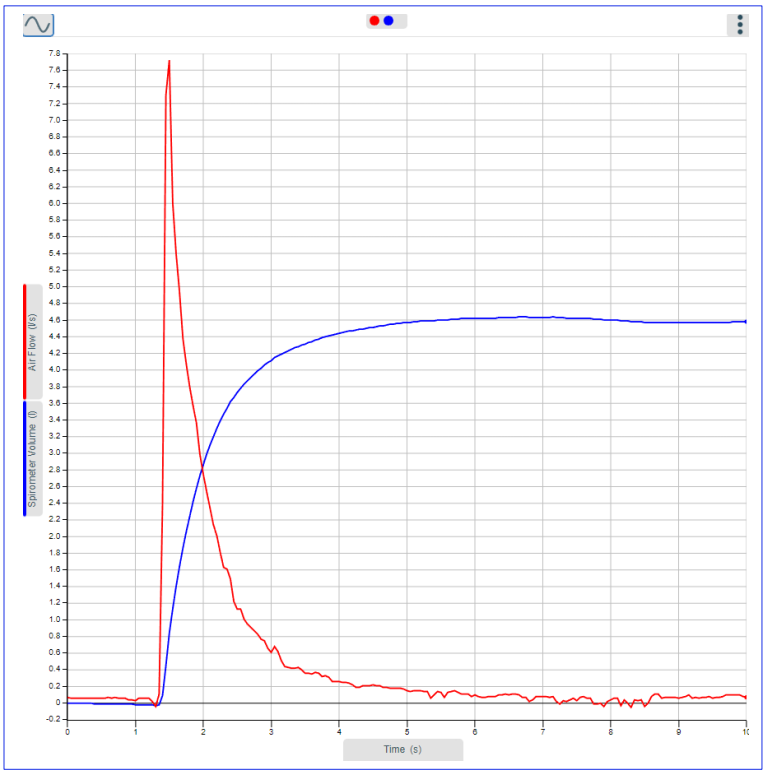
Note: Values quoted have been reproduced from published and freely available literature. They represent values found in normal patients, i.e. patients with no breathing problems. Most people (normal) have some form of diagnosable breathing problem, they simply have not reached a point that they consider it is worth visiting a medical practitioner.

As a rough guide, a fully fit athlete would approach normal values (assuming they were not exercising to correct a health problem). A smoker would fall below the normal values.



An example of a forced exhalation over 10 seconds, most people will struggle to get to 10 seconds!

The data needs to be corrected from simple flow to volume. Use calculate > spirometer > flow to volume



Volume and flow both shown, scale set to min - max

Software knowledge required.

- Connect spirometer to the software.
- Use a triggered setup to get comparable data (optional)
- Use tare to zero the flow before data collection.
- Use flow to volume tool
- Use Drift correction tool
- Use values to extract required data