Health problem addressed
Pulmonary function analyzers measure the performance of a patient’s respiratory system, especially for outpatient or presurgical screening. These systems measure the ventilation, diffusion, and distribution of gases in the lungs. They are used to help assess patients with conditions like chronic obstructive pulmonary disorder (COPD).

Product description
Pulmonary function analyzers are designed to assess the volume, airflow, and derived parameters through the respiratory tract of adults and older children. These devices typically include a spirometry instrument (e.g., pneumotachometer, bellows, rolling-seal-type spirometer), a computer, a gas analyzer, and an electronic unit with computerized capabilities and appropriate software. In addition to diagnostic spirometer measurements, they may measure parameters such as functional residual capacity, diffusing capacity of the lungs for carbon monoxide, and airway resistance. The analyzers are intended to provide a baseline for ventilatory function as well as identify respiratory impairments. Some systems include a total-body plethysmograph for measuring lung volume and Raw.

Principles of operation
Spirometry instruments measure the volume of gases exhaled by the patient (i.e., volume changes of the lungs) either by volume displacement or flow sensing methods. Spirometers measure the volume directly; these devices include water-seal bellows and rolling-seal spirometers, or the flow of gas that is integrated to yield volume. Such flow sensing instruments can employ a pneumotachometer, a hot-wire anemometer, or a turbinometer. Some analyzers incorporate computers with software that permits customized reports or the inclusion of specialized predictive equations for normal function.

Operating steps
The operator selects the desired parameters to be measured or follows a procedure protocol; a spirometry instrument is held to the patient’s mouth in order to measure exhaled breath. Results are displayed onscreen and may be stored or printed out.

Reported problems
Computer software can be a significant source of error, and a manufacturer should be able to document the computational algorithms of its software and demonstrate its accuracy. Problems related to equipment failures of spirometers are uncommon; some may result from misuse of a properly functioning analyzer. The mouthpiece or tubing on a spirometry instrument can provide a warm, moist environment favorable to the growth and transmittal of disease-causing microorganisms.