

SERIES 1120 FLOW / VOLUME SIMULATOR

Generate Spirometry, Peak Flow Meter and Breathing Waveforms

HIGHLIGHTS

- Produces all of the ATS spirometry waveforms and peak flow meter waveforms
- Modes for spirometry, steady state flow and continuous breathing waveforms
- Utilities for generating user defined waveforms
- Graphic display of flow and pressure signals
- Save data files for further analysis
- Built-in pressure sensor for measuring pressure drop across a device under test, ± 10 inH₂O range
- Built-in pressure sensor for measuring flow with optional pneumotach flow meter
- Barometric pressure sensor and cylinder pressure sensor for correcting flow due to compression
- Flow capability of 16 L/sec.
- Volume capacity of 8.5 L
- Optional heat and humidification for BTPS testing
- 115 or 230 VAC 50-60 Hz power required
- Bench top size, 36 inches (91.5 cm) long x 14 inches (35.5 cm) wide x 7 inches (18 cm) high

FEATURES

The Series 1120 Flow / Volume Simulator is a **servo motor driven piston pump** that can be **used for testing spirometry products and other respiratory devices**. It is designed to be used in product development and manufacturing test applications. The Flow / Volume Simulator operates in three modes. The exhale waveform mode is used to test spirometry devices using the **ATS waveforms, peak flow waveforms or custom waveforms**. The steady flow mode can be used to generate steady state flows over a wide range of flow rates. This mode can be used to test and calibrate flow meters. The breathing waveform mode can be used to produce a continuous inhale / exhale flow waveform that simulates breathing. All of the modes provide graphs for the flow and pressure signals. Data collected during the test can be saved to a file for additional analysis.

Built-in pressure sensors measure the barometric pressure and cylinder pressure during the tests. The pressure data is used to correct the calculated flow for gas compression. Another differential pressure sensor is provided for connection to pressure taps on or near a device under test. This pressure reading can be used to **determine the flow resistance of the device being tested**. An optional Hans Rudolph, Inc. Pneumotach can be attached to the outlet of the Flow / Volume Simulator. A pressure sensor is provided to measure



the differential pressure at the pneumotach so that a measured flow signal can also be graphed and recorded.

Two graphs are used to display the flow and pressure data that is collected. The flow graph can display the calculated flow based on the piston position, measured flow from the pneumotach and the target flow from the desired waveform. The pressure graph can display the cylinder pressure and auxiliary pressure signals. Both graphs can be dynamically scaled and panned to allow the user to zoom in and view specific parts of the waveforms or see the complete waveform. Printouts of the graphs can be made.

SPIROMETRY TESTING

In the exhale waveform mode the Flow / Volume Simulator will generate all of the ATS waveforms for testing spirometry products. Custom waveforms can be created using supplied utilities. The waveforms can be scaled up or down to adjust the waveform for different flows and volumes. Different starting positions for the piston allow you to change the internal volume.

PEAK FLOW METER TESTING

The waveforms defined by EN 13826 for testing peak flow meters can be produced. The simulator has been tested by Physikalisch-Technische Bundesanstalt (PTB)

in Berlin and certified for use in testing peak flow meters. PTB is the German national metrology institute providing scientific and technical services.

STEADY FLOW

The steady flow mode can be used to check the calibration of a flow meter or provide a constant flow for spirometer calibration. The volume delivered can be adjusted up to 8.5 liters. The desired flow rate can be set from 0.1 to 16 liters per second. You can select either inhale or exhale flow direction. The pressure and flow data collected during the test is displayed on the graphs after the test.

BREATHING WAVEFORM

A breathing waveform can be created using the supplied utilities and then used to create a simulated breathing flow pattern. The amplitude and breath rate are adjustable so you can simulate different breathing with the same waveform file. The breathing waveform can be run once or repeated continuously.

OPTIONS AND ACCESSORIES

Custom modifications to the Flow / Volume Simulator are available. Contact Hans Rudolph, Inc. for information on custom systems.

The basic part number, 113266, does **not** include the PC required for operation of the Flow / Volume Simulator. A computer with a USB port is required and Windows 2000/XP operating system is required. **A computer with the software installed is available as an option.**

Additional options include a **non-heated pneumotach**

for measuring outlet flow. The pressure sensor required for converting the differential pressure to flow is included in the base system. A **heated pneumotach** is also provided as an option. The heated pneumotach is recommended if the humidification system is used. If the heated pneumotach option is ordered the heater control is added to the Flow / Volume Simulator.

The **Heated Air** option can be added to the Flow / Volume Simulator to heat the air in the cylinder. This can be used to raise the air temperature to simulate actual exhaled air temperature.

A **humidification system** can be added to humidify the inhaled air to better simulate actual exhaled air conditions for spirometry testing. You must also order the Heated Air option if you order the Humidification option.

ORDERING INFORMATION

P/N	Description
113266	Series 1120 Flow / Volume Simulator
113274	Computer for Flow / Volume Simulator
201424	Non-Heated Pneumotach, 112192-4813 and Connector 200125-7001
201450	Heated Pneumotach, 112947-3813, Connector 200125-7001 and Internal Heater Control
DR1168A	Heated Air, Cylinder Heater and Control Unit
DR1168B	Humidification for inhaled air
201488	Plastic transit case with foam lining for shipping and transport

