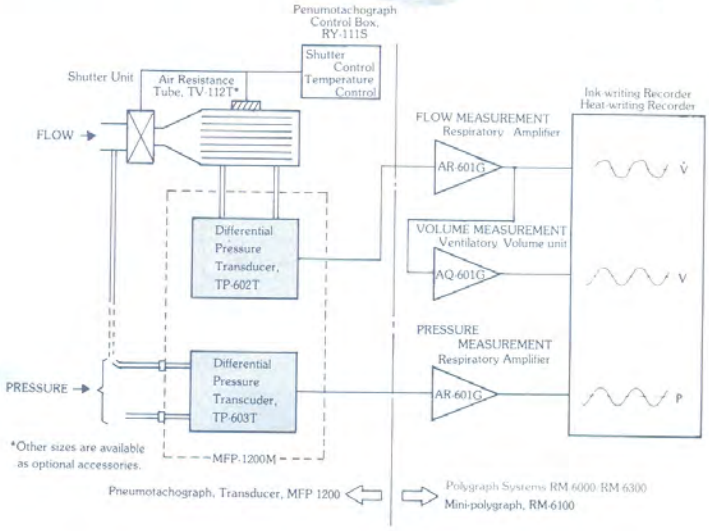
PNEUMOTACHOGRAPH TRANSDUCER model MFP-1200

Primarily Used for Pulmonary Function Test from The View Point of Breathing Dynamics.

The pneumotachograph transducer is exclusively designed for use in clinical tests and/or experimental measurements of the pulmonary functions from the ventilatory dynamics' view point as well as respiratory physiological studies'. In such applications, pulmonary parameters would include lung compliance, pulmonary resistance air-way resistance, respiratory pressure, respiratory air-flow and lung volume. The following block diagram shows an example combination of the Polygraph Systems, RM-6000/6300 or Mini-Polygraph, RM-6100 as a complete pneumotachograph.

The pneumotachograph transducer is composed of a Fleisch-type air resistance tube (TV-112T), a pneumotachograph main unit (MFP-1200M) including a differential pressure transducer (TP-602T) for flow measurement, a differential pressure transducer (TP-603T) for pressure measurement, and a pneumotachograph control box (RY-111S).

The air resistance tube (TV-112T) is designed to be equivalent to the Fleisch No. 3 air resistance tube. The air resistance tubes equivalent to the Fleisch No. 0, 1 and 2 tubes are respectively available as optional accessories. The control box (RY-111S) is designed to control the heater built-in the air resistance tube to keep the inside dry and control the operation of the built-in electromagnetic shutter.

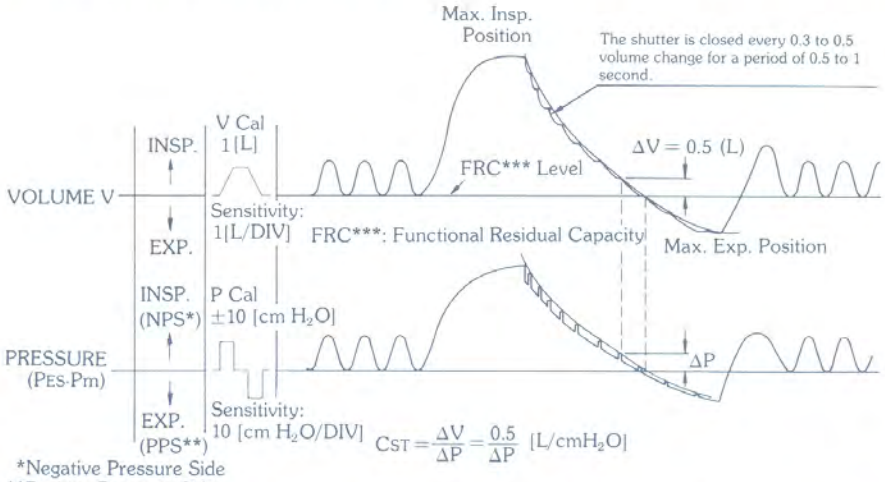


APPLICATIONS

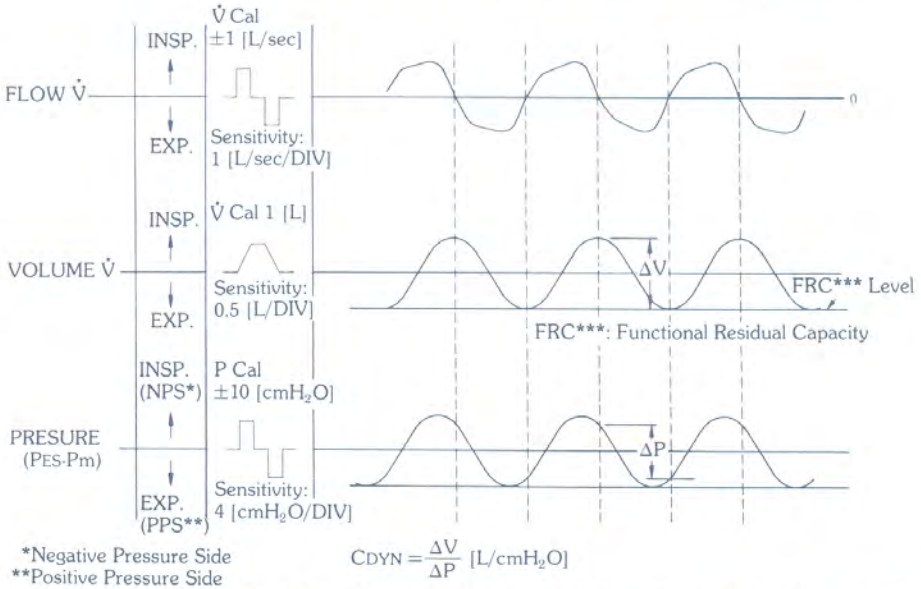
1. Pulmonary Function Test from the View Point of Ventilatory Dynamics:

(1) Lung Compliance Measurement

Both dynamic and static lung compliance measurements are possible by measuring the relative parameters of the intra-esophageal pressure, which sensitively reflects intrapleural pressure, and the lung volume, which is obtained by electrical integration of the respiratory air-flow velocity.



Waveforms Taken by Static Lung Compliance (Cst) Measurement



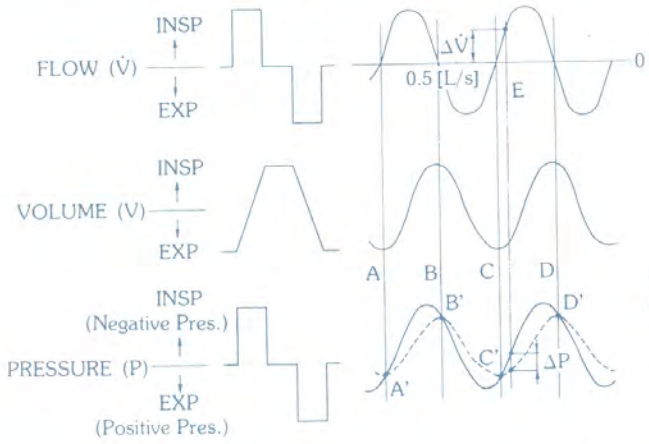
Waveforms Taken by Dynamic Lung Compliance (Cdyn) Measurement

(2) Pulmonary Resistance Measurement

Pulmonary resistance is practically derived by simultaneously recording the three parameters of respiratory flow (V̇), volume (V), and esophageal pressure (Pes). Resistance can then be calculated using the geometrical solution technique.
In the recording, draw four perpendicular lines of A, B, C and D, and name the intersections with the PRESSURE wave, A', B', C' and D', respectively.

Superimpose the VOLUME wave over the PRESSURE waveform to align the four intersections A', B', C' and D' with the VOLUME wave. Draw a perpendicular line E whose root is defined by a point of 0.5 [L/s] of the FLOW wave. Then, the difference ΔP between the PRESSURE and moved VOLUME waveforms equals the pulmonary resistance.

Pulmonary Resistance $RL = \frac{\Delta P}{\Delta \dot{V}} = \frac{\Delta P}{0.5}$ [cm H_2O/(L/s)]



Waveforms Taken by Pulmonary Resistance Measurement

2. Respiratory Physiological Studies and Experiments:

As the MFP-1200 provides necessary data for measurements of the following three parameters, it may be widely applicable to the field of respiratory physiological studies and experiments.

(1) Respiratory Pressure Measurement
Respiratory pressure as intra-esophageal pressure can be measured in combination with an esophageal balloon catheter.

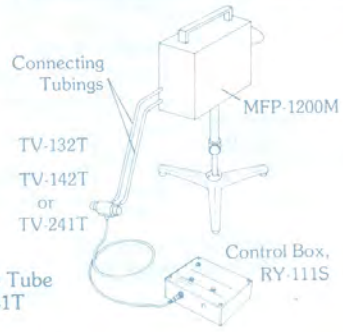
(2) Respiratory Air-flow Velocity Measurement
This velocity can be measured by a combination of the Fleisch-type air resistance tube and the built-in high-sensitive differential transformer.

(3) Ventilatory Volume Measurement
This volume is obtained by electrical integration of the parameter of the air-flow velocity.

Sizes and Applications	Model	Measuring Range (L/s)	Resistance (mmH_2O/L/s)	Internal Space (mL)	Fleisch No.
Standard (adults)	TV-112T	0.2 to 5	1	120	3
Medium flow (children or medium size animals)	TV-122T	0.1 to 2	2.5	50	2
Small flow (newborn babies or small size animals)	TV-132T	0.05 to 1	6	20	1
Micro flow (small size animals)	TV-142T	0.02 to 0.5	20	4	0
Micro flow (rats or guinea pig)	TV-241T	0 to 0.02	1mmH_2O/10 mL/s	0.6	Lily type

Optional Air Resistance Tubes

To extend applications of the pneumotachograph transducer, three sizes of optional air resistance tubes are available other than the standard model (TV-112T). The inside of all the air resistance tubes is automatically controlled at 38° C by a built-in electric heater.



Installation of Air Resistance Tube TV-132T, TV-142T or TV-241T

SPECIFICATIONS for MFP-1200

1. **Pressure Measurement:**
   1) **Measuring Range:** −5 to +50cmH_2O
   2) **Maximum Sensitivity:** 1V/0.5cmH_2O or greater
   3) **Non-linearity:** 10% full scale or better
   Note: The above data is obtained in combination with a Respiratory amplifier, AR-601G.

2. **Flow Measurement:**

Technical Items \ Air Resistance Tubes	Air Resistance Tubes Used	
	Standard	Optional
	TV-112T (Fleisch No. 3)	TV-122T (Fleisch No. 2)
1) Over-all Characteristics: a) Measuring Range;	5L/sec.	2L/sec.
b) Sensitivity:	approx. 400(μV/V)/(L/s)	approx. 1000 (μV/V)/(L/s)
2) Resistance:	1mmH_2O ±20%/L/sec.	2.5mmH_2O ±20%/L/sec.
3) Volumetric Space:	approx. 120mL	approx. 50mL

Notes: 1) The over-all characteristics are obtained in combination with the Respiratory Amplifier, AR-601G.
2) The volumetric space includes the space of the guide tube.

3. **Air Resistance Tube Temperature Control Characteristics:**
   1) **Preset Temperature:** 38° C, ±3° C
   2) **Temperature Error:** ±3° C
   3) **Warm-up Period:** a) 3 minutes, or less at 20° C ambient temperature
      b) 10 minutes, or less at 0° C ambient temperature
   4) **Heater Element:** Cord-shape heater
   5) **Heater Voltage:** 24V AC
   6) **Heater Current:** 18 VA
   7) **Temperature Control System:** Zero-cross switching by means of the combination of a thermistor temperature detector and a bi-directional triode thyristor.
   8) **Power Requirements for RY-111S:** 100, 110, 117, 125, 220 or 240V AC, 50 or 60Hz, approx. 45VA

4. **Dimensions and Net Weight:**

	Dimensions (mm)	Net Weight
MFP-1200M	390W x 540H x 390D	10kg
RY-111S	250W x 110H x 200D	2kg

STANDARD ACCESSORIES

1. For Pneumotachograph Transducer, MFP-1200M

1) Mouthpiece, for adults ..... 2 pcs.
2) Mouthpiece, for children ..... 1 pc.
3) Nose clip ..... 1 pc.
4) Esophageal balloon catheter, with a connection fitting, for esophageal internal pressure measurement ..... 1 pc.
5) Esophageal balloon catheter, without a connection fitting, for esophageal internal pressure measurement ..... 1 pc.
6) 3-way 2-gang stopcock, 955-10 ..... 1 pc.
7) Connection tubing, 1.5m long ..... 2 pcs.
8) Bellows ..... 1 pc.
9) Mounthpiece ring ..... 2 pcs.
10) Coupler ..... 1 pc.
11) Dust cover for the MFP-1200M ..... 1 pc.
12) Accessory bag ..... 1 pc.

2. For Pneumotachograph Control Box, RY-111S

1) Shutter remote switch ..... 1 pc.
2) Power cord ..... 1 pc.
3) Ground lead ..... 1 pc.
4) Fuse, slow-blowing ..... 2 pcs.
   1A for 100 to 125V line
   0.5A for 220 to 240V line
5) Screw driver, Philips (+) 3mm ..... 1 pc.
6) Accessory bag ..... 1 pc.