Сердечно-сосудистые волновые насосы

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Cardiovascular Waveform Pump

The Cardiovascular Waveform Pump (former name Pulsatile Blood Pump) simulates the ventricular hemodynamic waveform of the heart. It features silicone rubber-covered heart-type ball valves and smooth flow. Only inert materials like silicone rubber, acrylate, and PTFE contact the fluid. The pumping head is easy to take apart and reassemble and can be sterilized. It can be used for circulating emulsions, suspensions, and non-Newtonian fluids such as blood. Actuation of the ball check valves will result in some hemolysis over time when using blood or blood cell doped solutions but acute use with these solutions in mock circulatory loops can be performed. Four different models are available with minute volumes of 1 - 200 ml, 10 ml – 2 L, 80 ml – 6 L, 150 ml – 10 L. It is ideal for testing flow circuits and medical devices that require ventricular hemodynamic flow morphology.

Tubing listed in the table below for connection to inlet and outlet pump ports. Other formulations and sizes as well as are available.

Item No.	Description
52-9552	Cardiovascular Waveform Pump Model 1407
55-1838	Cardiovascular Waveform Pump Model 1405
72-1027	Tygon® E-3603 Tubing, 15.2 m (50 ft) Length, 7.9 mm (5/16 in) ID, 11.1 mm (7/16 in) OD; for Models 1405 & 1407
55-3321	Cardiovascular Waveform Pump Model 1421
72-1032	Tygon® E-3603 Tubing, 15.2 m (50 ft) Length, 11.1 mm (7/16 in) ID, 17.5 mm (11/16 in) OD; for Model 1421
55-3305	Cardiovascular Waveform Pump Model 1423

Item No.	Description
72-1033	Tygon® E-3603 Tubing, 15.2 m (50 ft) Length, 12.7 mm (1/2 in) ID, 17.5 mm (11/16 in) OD; for Model 1423

DETAILS

The Cardiovascular Waveform Pump (former name Pulsatile Blood Pump) simulates the ventricular hemodynamic waveform of the heart. It features silicone rubber-covered heart-type ball valves and smooth flow. Only inert materials like silicone rubber, acrylate, and PTFE contact the fluid. The pumping head is easy to take apart and reassemble and can be sterilized. It can be used for circulating emulsions, suspensions, and non-Newtonian fluids such as blood. Actuation of the ball check valves will result in some hemolysis over time when using blood or blood cell doped solutions but acute use with these solutions in mock circulatory loops can be performed. Four different models are available with minute volumes of 1 - 200 ml, 10 ml – 2 L, 80 ml – 6 L, 150 ml – 10 L. It is ideal for testing flow circuits and medical devices that require ventricular hemodynamic flow morphology.

Features

- Reproduction of the ventricular hemodynamic waveform including temporal phasing of systole (dispensing) and diastole (refilling).
- Durable construction for hours of continuous operation.
- 4 flow rate range models, Minute volumes:
  - 1 - 200 ml, 10 ml – 2 L, 80 ml – 6 L, 150 ml – 10 L
  - Variable phasing for Models 1421 and 1423 (see specifications table)
- Suitable for acute studies with bloodA, ideal for simulated blood solutions, other non-Newtonian solutions as well as aqueous solutions.

A. When using blood or blood cell doped solutions hemolysis will occur over time and is affected by the mechanical closing of valves, stroke rate and potentially the fluid pathway. The user is advised to determine change in hematocrit and/or free hemoglobin at various time points during the pumping of these solutions.

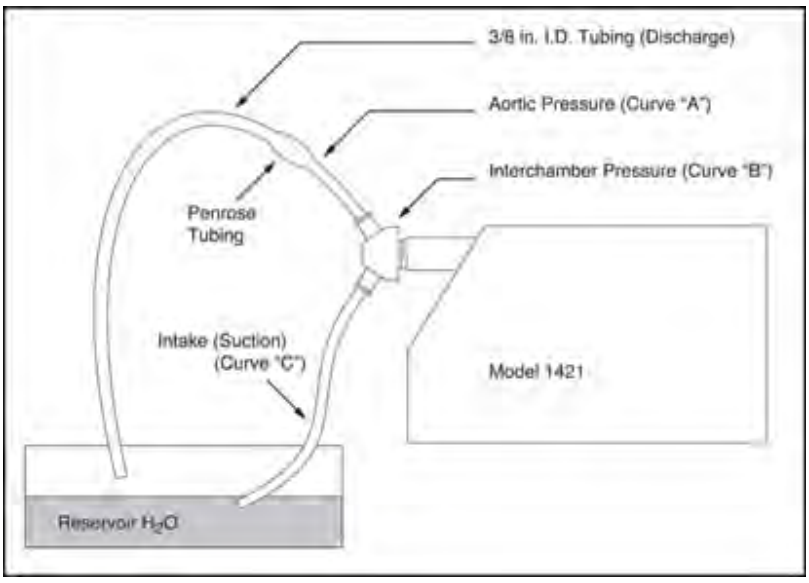
Pump Mechanism

A positive piston actuator and ball check valves provide the proportioning action. The product of stroke rate times stroke volume is an accurate indicator of the flow rate. Positive piston action prevents changes in flow rates, regardless of variations in resistance or back pressure. The piston always travels to the end of the ejection stroke, independent of the volume pumped.

We offer turnkey solutions including tubing, connectors, pressure transducers, flowmeters and data acquisition platforms to complete your experimental setup.

Test Setup with Pressure and Flow Values

A simple setup is presented in the figure below with a small compliance device (Penrose tubing).

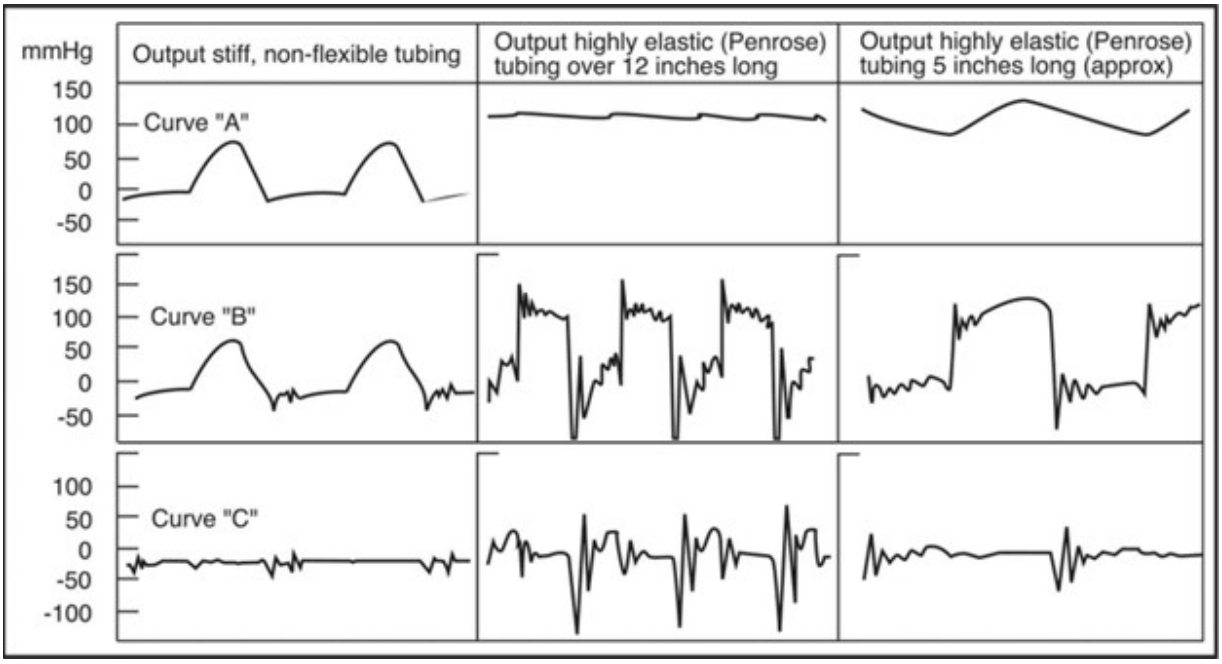


Pressure Curves

The shape of the output pressure curve is a function of both the pump action and the characteristics of the external system on the output fluid circuit. The following set of curves were obtained with Model 1421, using water as the pumped medium. In the tests, pressure transducers were inserted in three locations and continuous records obtained under varying conditions.

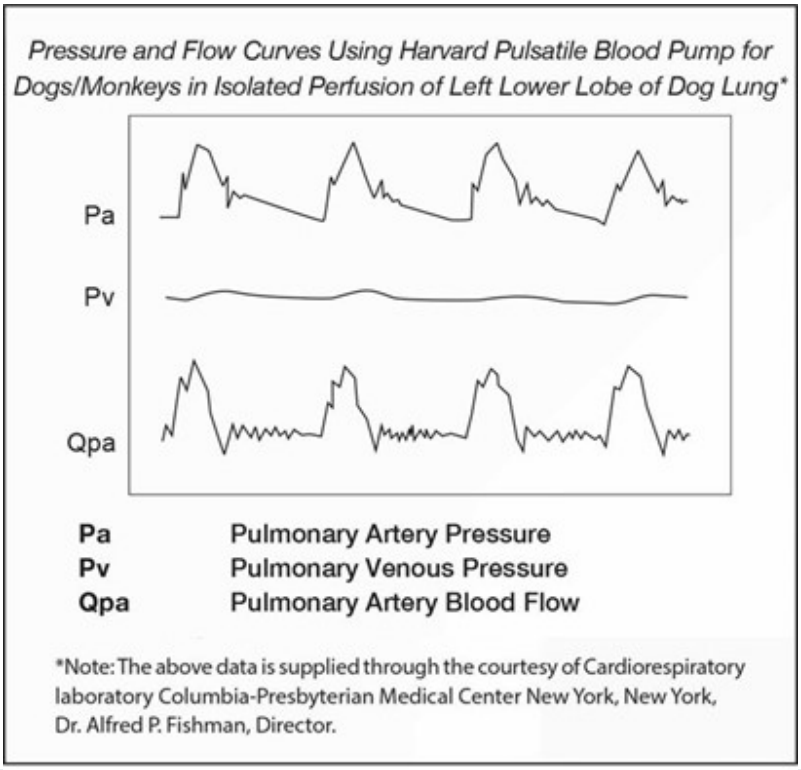
Varying the peripheral resistance, stroke rate, stroke volume and phase ratio allows for creation of a wide range of output flow and pressure characteristics.

- Curve A Pressure just beyond the output valve
- Curve B Pressure within the pump chamber
- Curve C Pressure just before the intake valve



Ex Vivo Organ Perfusion

An example of ex vivo organ perfusion pressure and flow values obtained from a dog lung lobe perfusion.



SPECIFICATIONS

Item #	52-9552	55-1838	55-3321	55-3305
Model No.	1407	1405	1421	1423
Stroke Volume Adjustable	0.05 to 1.0 ml	0.5 to 10 ml	4 to 30 ml	15 to 100 ml
Rate Stroke/Minute	20 to 200	20 to 200	20 to 200	10 to 100
Minute Volume Stroke Volume x Rate	1 to 200 ml	10 to 2,000 ml	80 to 6,000 ml	150 to 10,000 ml
Phasing*	Fixed Phase	Fixed Phase	Adjustable Phase	Adjustable Phase
	35% systole	35% systole	35 to 50% systole	35 to 50% systole
	65% diastole	65% diastole	65 to 50% diastole	65 to 50% diastole
Port ID	0.25″ (6.35mm)	0.25″ (6.35mm)	0.375″ (9.52mm)	0.5″ (12.7mm)
Port OD	0.325″ (8.26mm)	0.325″ (8.26mm)	0.44″ (11.18 mm)	0.56″ (14.22mm)
Tube ID	8 mm (0.31 in)	8 mm (0.31 in)	11 mm (0.437 in)	14 mm (0.551 in)
Dimensions H x W x D	312 x 156 x 250 mm (12.3 x 6.1 x 9.9 in)	312 x 156 x 250 mm (12.3 x 6.1 x 9.9 in)	500 x 212 x 337 mm (19.7 x 8.4 x 13.4 in)	500 x 212 x 337 mm (19.7 x 8.4 x 13.4 in)
Weight	7.3 kg (16 lb)	7.3 kg (16 lb)	13.6 kg (30 lb)	14.5 kg (32 lb)
Voltage	115 VAC, 50/60 Hz or 230 VAC, 50/60 Hz UK and EU Models	115 VAC, 50/60 Hz or 230 VAC, 50/60 Hz UK and EU Models	115 VAC, 50/60 Hz or 230 VAC, 50/60 Hz UK and EU Models	115 VAC, 50/60 Hz or 230 VAC, 50/60 Hz UK and EU Models

* Phasing = percentage of one cycle dispensing (systole) or refilling (diastole) pump piston

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