ATS Laboratories
A CIRS Company
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Doppler Flow Phantoms
Models 523, 523A, 524 & 525

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Made in USA

INTRODUCTION

The Doppler Flow phantoms provide a reliable means of evaluating a Doppler Flow Imaging System's ability to detect the location and direction of flow, flow velocity and sensitivity.

The phantoms are constructed of a rubber-based tissue mimicking material. This material extends the useful life of the phantom by avoiding problems due to melting, freezing, dehydration and breakage from dropping, which are commonly associated with hydrogel (water-based) phantoms. By eliminating these problems, the durability, quality and reliability of this product is guaranteed for three years.

The acoustic properties of all biologic and non-biologic materials are affected by temperature variations. Most diagnostic imaging systems and tissue-mimicking phantoms are calibrated at room temperature, commonly referred to as 23°C. To ensure measurement accuracy ATS incorporates a thermometer strip affixed to the outside surface of the phantom.

The sound velocity of most diagnostic imaging systems is calibrated to 1,540 meters per second (mps), the assumed average velocity of sound through human soft tissue. The rubber-based tissue-mimicking material has a sound velocity of 1450 mps at 0.5dB/cm/Mhz (measured at 3.5MHz) at room temperature (23°C).

The rate of fluid flow through the phantom when measured by a Doppler imaging system is not affected by the differences in sound velocity, therefore, distortion of these measurements will not occur.

Product Description

Model 523 and 523A
Cardiac Doppler Flow Phantom

The Models 523 and 523A tissue mimicking doppler flow phantoms contain four flow channels of varying diameters simulating the deep vasculature, such as the cardiac and abdominal vessels. Two fixed-angled scan surfaces maintain a constant angle between the sound beam and the ATS Model 707 Doppler Test Fluid flowing through the phantom.

The Model 523 and 523A differ only in the angle of the fixed scanning surface. The scan surfaces of the Model 523 are angled at 45° and 60°, permitting continuous scanning at depths ranging from 5 to 18 cm. In the Model 523A the scan surfaces are angled at 18° and 56°, permitting continuous scanning at depths ranging from 3 to 17 cm.

Model 524 and 525
Peripheral Vascular Doppler Flow Phantom

The Models 524 and 525 tissue mimicking doppler flow phantoms contain four flow channels simulating superficial vasculature. The simulated vessels are located 15.0 mm below the scan surface. Built-in scanning wells are provided to permit the use of water or a low viscosity gel as acoustic coupling agents.

The differences between the Models is the type of flow channels. The Model 525 contains four 8.0 mm diameter flow channels, with built in stenosis at 0, 50, 75 and 90% areas of occulsion. Whereas, the Model 524 contains four flow channels with diameters 2, 4, 6, & 8 mm, without stenosis.

If the user requires depths greater than 15 mm, we recommend the use of our Model 528 scanning wedge. The wedge is constructed of the same tissue mimicking material as the doppler flow phantoms and provides an additional 50 mm of scanning depth.

Test Performed

- Flow Velocity
- Sensitivity at varying depths
- Maximum Penetration
- Location of Flow
- Demonstration of the effects of stenosis (Model 525)

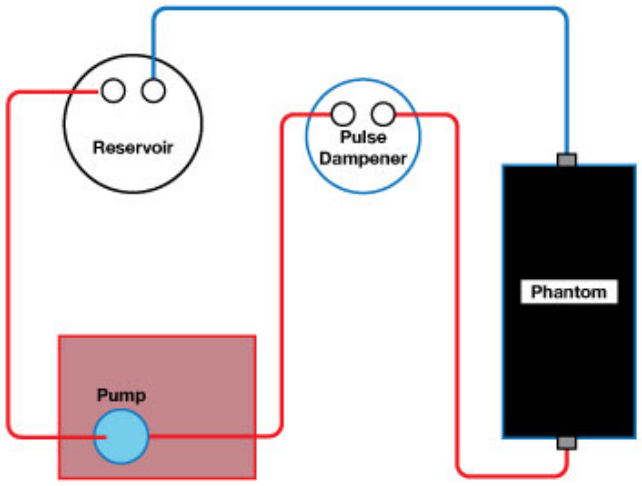
Specifications

Tissue Mimicking Material

Type	Urethane Rubber
Freezing Point	<-40°C
Melting Point	>100°C
Attenuation Coefficient	0.5 dB/cm/Mhz (measured at 3.5Mhz)
Speed of Sound	1450 mps at 23°C

General

	Model 523	Model 523A	Model 524	Model 525
Overall Dimensions	22x14x10 cm	32x14x10 cm	22x14x10 cm	22x14x10 cm
Weight	13.4 lbs (6.1 Kg)	15.2 lbs (6.9 Kg)	6.5 lbs (2.9 Kg)	6.5 lbs (2.9 Kg)
Housing Material	PVC	PVC	PVC	PVC
Scan Surfaces	2	2	1	1
Scan Surface Dimensions	17.5x11.25cm @45° 15.0x11.25cm at 60°	25.5x12.0cm at 18° 9.5x12.0cm at 56°	17.5x9.8 cm	17.5x9.8 cm
Flow Channels				
Type	Circular	Circular	Circular	Circular/Stenosis
Number of Channels	4	4	4	4
Diameters (mm)	2, 4, 6, 8	2	4	8
Scan Surface Depths	5.0-16.0cm at 45° 5.0-18.0cm at 60°	3.0-11.0cm at 18° 4.0-17.0cm at 56°		
Maximum Fluid Pressure – psi (Kg/cm)	15 psi (1.05 Kg/cm)	15 psi (1.05 Kg/cm)	15 psi (1.05 Kg/cm)	15 psi (1.05 Kg/cm)
Connector	Aluminium Barb	Aluminium Barb	Aluminium Barb	Aluminium Barb



Set-Up Procedure

Equipment and Material Required

- Doppler Flow Pump Model 769
- Model 769DF Doppler Fluid

Procedure

1. Select a clean, flat, stable working surface.

2. Check to make sure all of the above equipment/materials are available.

3. Set-up the Doppler Flow Pump according to the manufacturers directions.

4. Arrange the system components to provide easy access during a testing procedure. The phantom should be positioned near the pumping system.

5. Using the PVC tubing, connect one end of the tubing to the flow channel connector on the outlet side of the phantom and place the opposing end in the return side of the fluid reservoir. Secure the tubing to the fluid reservoir to ensure it will stay in place when the system is activated.

6. Using a second piece of PVC tubing, connect one end to the desired inlet channel on the phantom and the opposing end of the tubing to the Pumping System.

7. Gently shake the Doppler Fluid to ensure any material which may have settled to the bottom is combined with the solution. Open both gallons and fill the fluid reservoir.

NOTE: In the operation of any flow phantom it is likely that some air bubbles will enter the fluid stream; either through cavitation in areas of expanded diameters or entrainment of air at a fitting or connector. For these reasons a large reservoir is required. As the pump begins to circulate the test fluid through the system, entrapped air bubbles will enter the fluid and be pumped into the return side of the reservoir.

A large reservoir will allow enough time for the entrapped air bubbles to separate from the returning test fluid. The air bubbles may appear as foam and will float on the top of the test fluid on the return side of the reservoir.

NOTE: WHEN USING WITH THE MODEL 769 DOPPLER FLOW PUMP, THE PRESSURE WILL NOT EXCEED 9 PSI, EVEN AT THE MAXIMUM FLOW RATE OF 750 ML/S. **IF YOU NOTICE AN OBSTRUCTION IN THE FLOW CIRCUIT, IMMEDIATELY TURN OFF THE PUMP**.

The phantom is now ready for performance testing.

CARE RUBBER-BASED PHANTOMS

For best results the phantom should be kept clean at all times and stored at room temperature. In particular a build-up of dried coupling gel on the scan surface should be avoided. The phantom may be cleaned with warm water using a lint free cloth. Particularly stubborn stains and dirt may be removed with a mild household cleaner. The use of petroleum solvents should be avoided since they may adversely react with the rubber-based material.

WARRANTY

Statement of Warranty:

ATS Laboratories, Incorporated warrants this rubber-based phantom for it's lifetime from the date of delivery to the purchaser, that the Phantom is free from functional defects in materials and workmanship. The lifetime of this phantom is estimated to be 10 years from the date of manufacturing. If ATS Laboratories, Incorporated, deems the phantom to be defective, at its sole option, the Phantom will be repaired or replaced free of charge, in a reasonable amount of time.

ATS shall not be otherwise liable for any damages, including but not limited to incidental damages, consequential damages, or special damages.

There are no express or implied warranties which extend beyond the warranties as stated below.

Conditions of Warranty:

1. The defect must be reported and the Phantom returned within the warranty period.

2. The Phantom must be packaged properly to avoid damage during shipping.

3. All transportation charges will be paid by the purchaser.

Invalidation of Warranty:

1. If the phantom has been altered or repaired other than by ATS Laboratories, Incorporated.

2. If the phantom has been subject to abuse, misuse, negligence or accident.

3. If the purchaser has exposed the Phantom to petroleum solvents.