



Caution

Don't mark on the phantom with pen or leave printed materials on its surface.
Ink marks on the phantom will be irremovable.

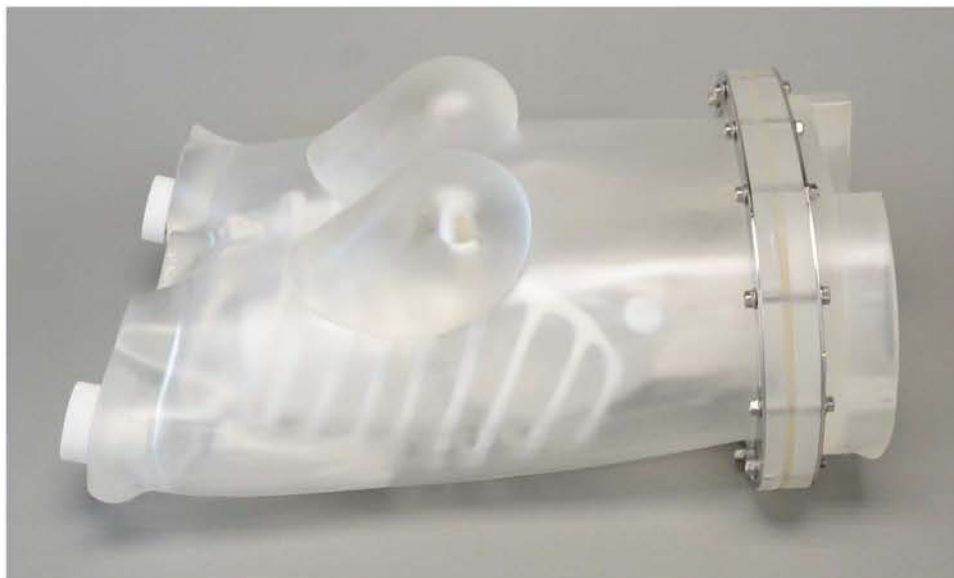
PH-63

Thorax Phantom for RI



Contents

- General information p.1-4
- Preparation p.5-17
- After training p.18-20



Phantom specifications

Do not use this phantom in any different way than described in this instruction manual. The manufacturer can not be held responsible in case of damage to the phantom or equipment caused by wrong use. In order to avoid damage due to pressure changes during transport, this product is delivered with loosened screws. Please fasten the screws before usage.

Specifications

- Verification of myocardial imaging through the use of various RI solution densities
- Myocardial infarction can be depicted
- By inserting RI solution into the lungs, liver and kidneys, the effect of these organs on the heart can be recreated.
- Hot spots can be filled with FDG/RI solution to verify tumor sizes, densities and placements

Caution

Handle with care

The materials of the phantom are a special composition of resin. Please handle with care at all times.

The surface may change color

The phantom may change color over time. However, this has no effect on the performance of the phantom.

Keep away from heat and moisture

Keep the set at room temperature, away from heat, moisture and direct sunlight.

Don't mark on the phantom with pen

Don't mark on the phantom with pen or leave printed materials in the surface. Ink marks on the phantom will be irremovable.

Please review the assembly procedure in advance

This will help ensure smooth preparation for the experiment.

Rinse all parts with water after use

If colored solution is used, the color may remain on the surface of the parts. In case of discoloration, gently wipe the surface with a damp cloth.

Remove all screw caps and plugs during storage

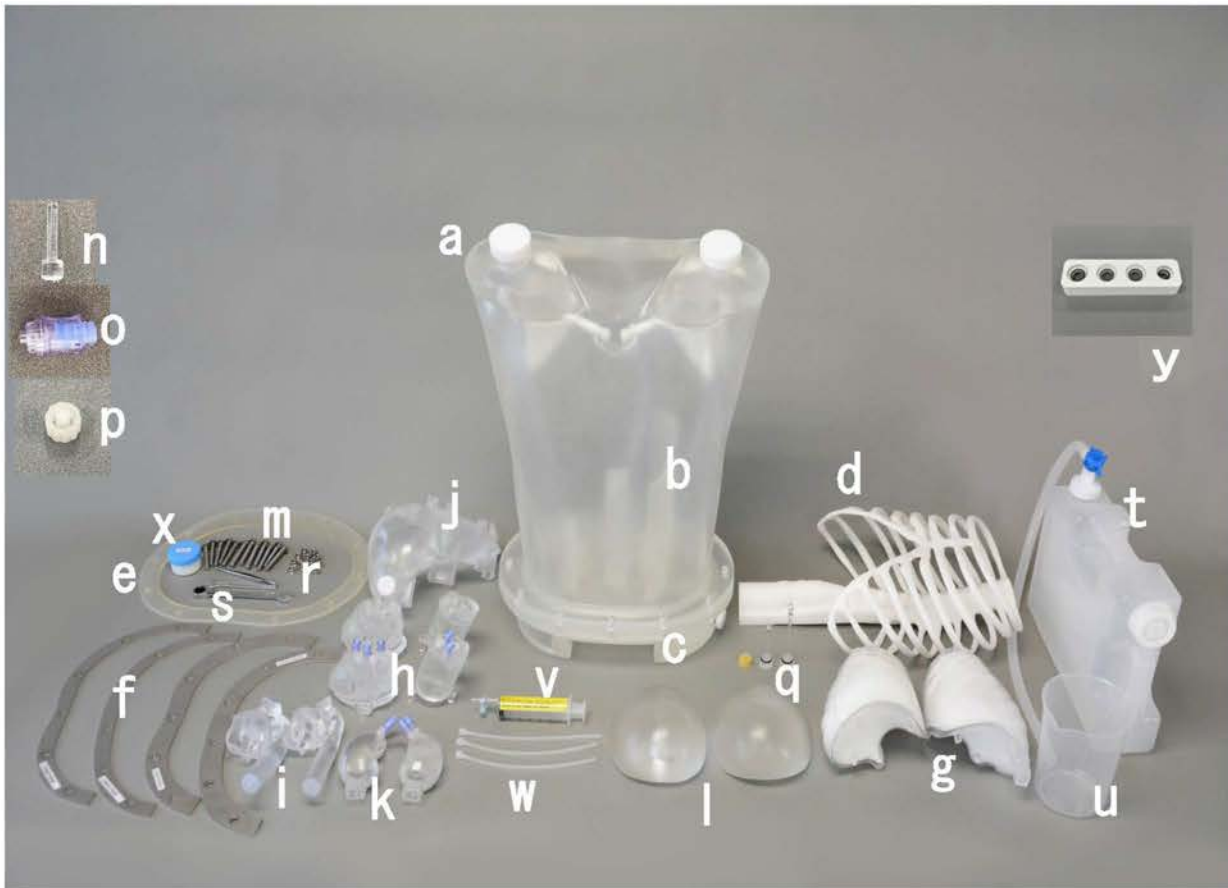
This is to prevent the components from being damaged due to changes in temperature or atmospheric pressure.

Securely attach all ports and plugs before use

Follow the procedures from page 10 to ensure that all required components are properly installed.

Set includes

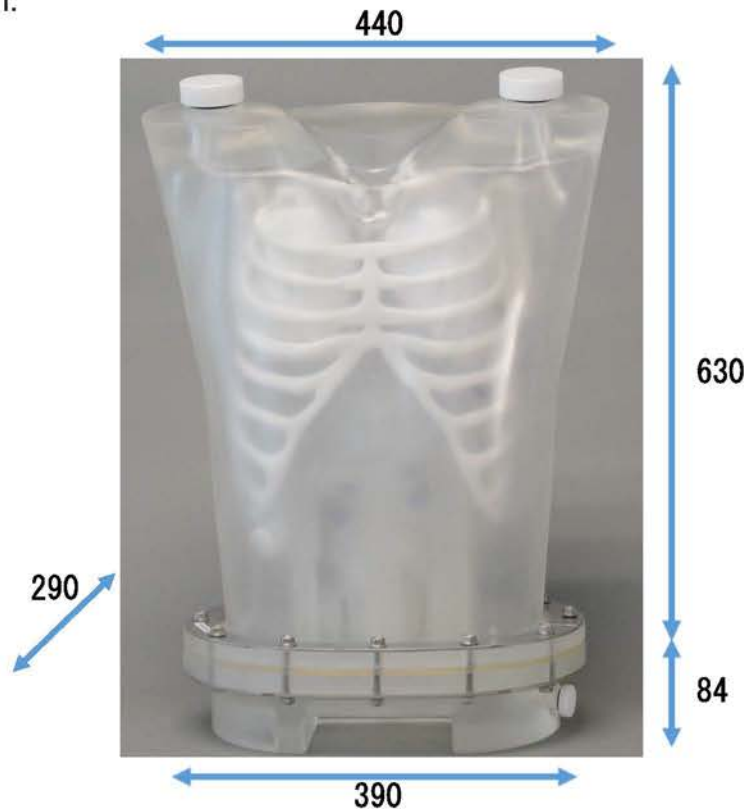
Make sure that all components are complete before using the phantom.



a. thorax	.....1	n. plastic pins	.....6
b. supporting bars	.....6 types	o. surplug	..... 11
c. base	.....1	p. screw plug	.....5
d. rib cage and spine	.....1	q. hot spots	..... 3 types
e. silicon sealing gasket	.....1	r. pincette	..... 1
f. metal frame	..... 2 pairs	s. wrench	.....2
g. lungs	..... 1 left, 1 right	t. water tank	..... 1
h. hearts	.....4 types	u. beaker	..... 1
i. aorta	.....2 types	v. syringe	..... 1
j. liver	.....1	w. tubes	.....3
k. kidneys	..... 1 left, 1 right	x. vaseline	..... 1
l. breast attachment	..... 1 left, 1 right	y. screw cap holder	..... 1
m. bolts and nuts	..... 12 sets		

Phantom specifications

Phantom size in mm:



1. Materials

- soft tissue: transparent polyurethane
- bones: material that provides proper attenuation when using RI solutions
- lungs: material with a density of 0.4g/cm^3 (can be filled with RI solution)

2. Weight

- empty: approx. 21kg / 46.2lb
- completely filled: approx. 40kg / 82.6lb

3. CT values

- bones: 370HU
- lungs: -700HU
- organ shell: 75HU, 1.13g/cm^3 density

4. Recommended radiation dose

- myocardium, liver, kidneys: 80KBq/ml
- lungs: 30KBq/ml

5. Hotspots can be installed in the liver, lungs and breast

Phantom specifications

6. Organ volumes

Organ		Filling volume	Note
geometric-type heart (normal)	ventricle	44. 3ml	
	myocardium	82. 8ml	
geometric-type heart (abnormal) with infarction	ventricle	44. 5ml	
	myocardium	82. 1ml	
	infarction		0.7ml x 2pc
anatomical-type heart (normal)	right ventricle	31. 6ml	
	left ventricle	42. 0ml	
	myocardium	83. 6ml	
anatomical-type heart (abnormal) with infarction	right ventricle	31. 3ml	
	left ventricle	42. 5ml	
	myocardium	82. 2ml	
	infarction		0.7ml x 2pc
liver		1377. 6ml	
lungs	right	456. 8ml	relative density 0.4
	left	411. 3ml	relative density 0.4
kidneys	right	102. 0ml	
	left	103. 3ml	
hot spots	for lungs/ liver	short	0. 3ml
		long	0. 3ml
	for breasts		0. 3ml

Setup

1. Insert the supporting bars into the base.



2. Put the kidneys on the respective bars and fix with plastic pins.



3. Fill the kidneys with liquid (see p. 9 - 10)



4. Prop the liver on its supporting bar and fix with plastic pin.



Setup

5. Fill the liver with liquid (see p. 9, 11)



6. Fill the heart with liquid (see p. 9, 12, 13)



7. Combine heart and aorta



8. Fill the lungs with liquid (see p. 9, 14)



Setup

9. Fit the heart between the lungs.



10. Set the heart and lungs above the liver.



11. Put the rib cage over the organs and insert the spine into the base.



12. Lay the sealing gasket on the base.



Setup

13. Prepare the metal frames

* the broad frame is the upper frame, the slimmer one is the lower frame



14. Cover the rib cage and organs with the thorax, set the metal frames and put the bolts through the holes.



15. Use the wrench to fasten with nuts.

* as fastening too much may damage the phantom, please be careful



16. Setup complete.

* as the thorax will be filled with liquid as well the phantom will become heavy. Always carry with two people.



Preparation

Filling the organs with RI solution or water

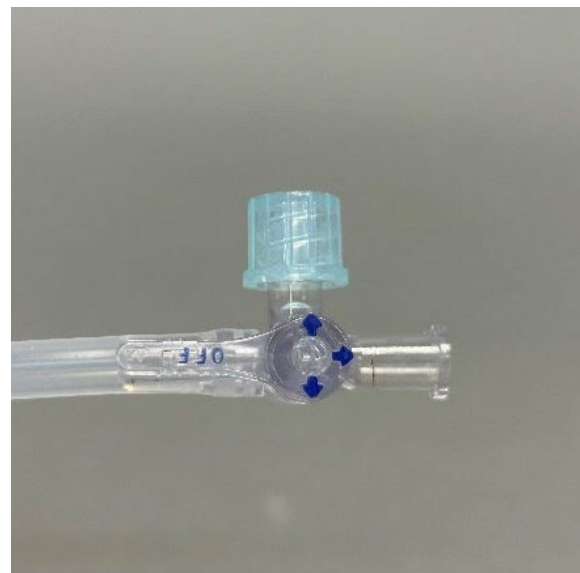
Filling the organs

⌘ Caution : Please follow the below safety advice

- Fill the phantom with 2 or more people
- When not filling, make sure to always close the three-way stopcock to avoid leakage
- As there is a possibility of liquid scattering, make sure to empty the phantom in a place where that is not an issue
- Before filling with RI fluid, test with water if there is any leakage
- If there is leakage, try detaching and reattaching the connections
- When using RI fluid, do not fill directly with a syringe, and not while a tube is attached to the drainage port as there is a risk of overflowing
- Fill slowly and carefully, in small amounts, as there is a risk of damaging the phantom by applying too much pressure when filling too rashly
- When using RI solution, make sure that there is no risk of radiation exposure before emptying the phantom



OPEN

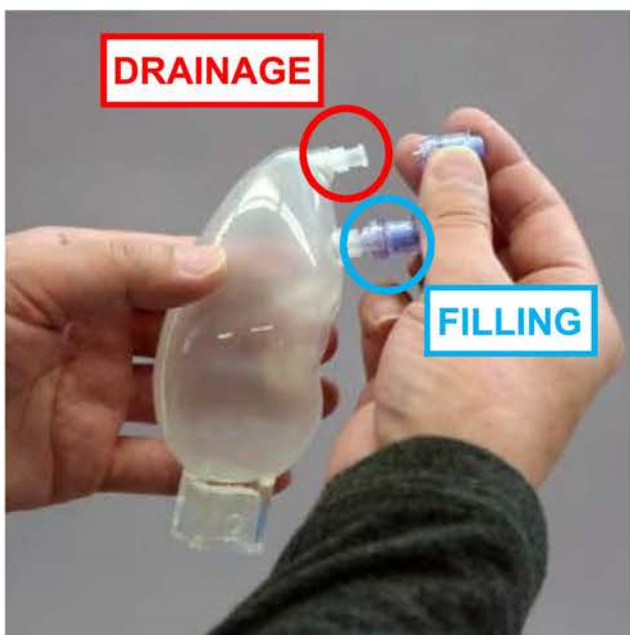


CLOSED

Filling the organs

1. Kidneys

- Prepare the tubes (one each for filling, one for draining) as well as the syringe and 2 surplugs per kidney.
 - * Make sure that the three-way stopcock is closed.
- Attach one of the surplugs to the draining port (the upper port) of the kidney.
- Afterwards, connect the tube to the surplug.
- Connect another surplug to the lower filling port and attach the tube with the three-way stopcock.
- Fill the syringe and insert the tip into the filling tube, then open the three-way stopcock and slowly inject the liquid into the tube.
 - *When the kidney is completely filled, excess liquid will flow out through the drainage tube. We recommend placing the end of the drainage tube in the beaker.
- After confirming that no air is left in the kidney, close the three-way stopcock.
 - * If the air can't be completely removed from the kidney by normal means, tilt it slightly to help remove the air.
 - * Do not try to fill with more liquid after the kidney is completely filled as this could lead to damage to the phantom.
- Remove the tubes from the surplugs.
 - * There is no need to remove the surplugs from the kidneys.



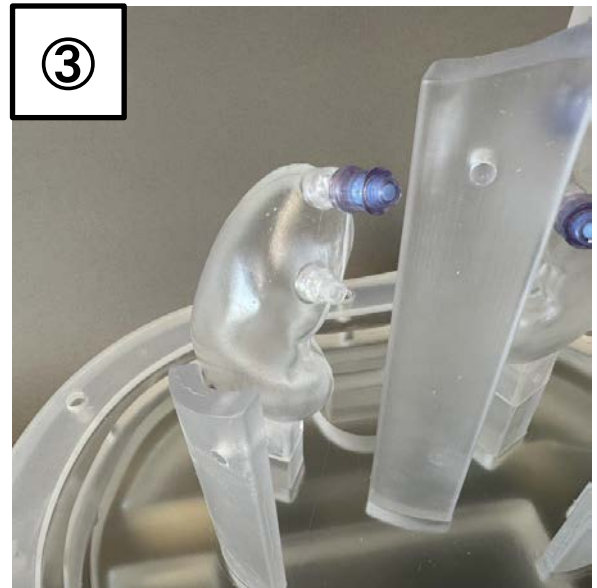
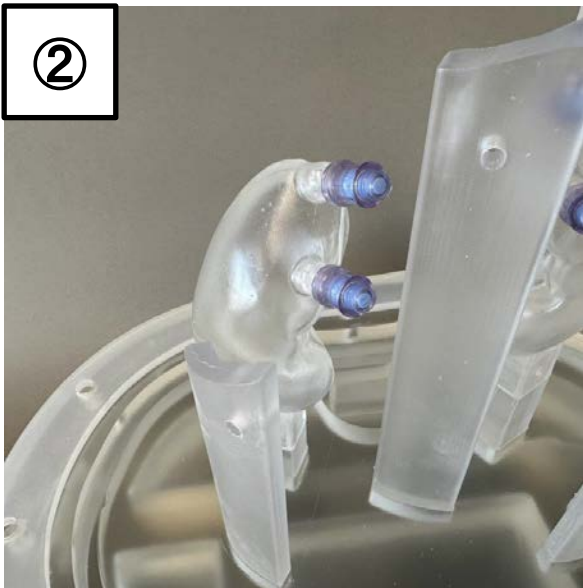
Preparation

Filling the organs with RI solution or water

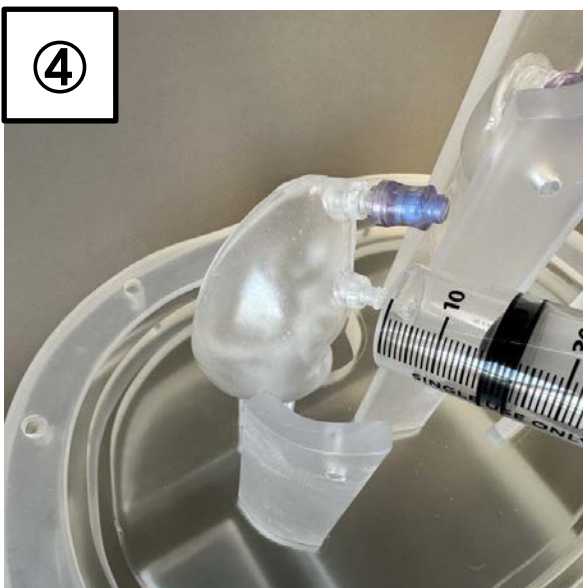
Filling the organs

1-2. Kidney

- ① Prepare 1 silicon tube, 1 syringe with three-way stopcock and the kidney container.
✘ Remove the three-way stopcock from the syringe.
- ② Fill the kidney with water (only fill the volume of the kidney minus the amount of RI fluid planned to insert).
- ③ Remove the surplug from the bottom filling port.



- ④ Connect the syringe filled with RI fluid to the filling port.
- ⑤ Connect the silicone tube to the upper drainage port.



Preparation

Filling the organs with RI solution or water

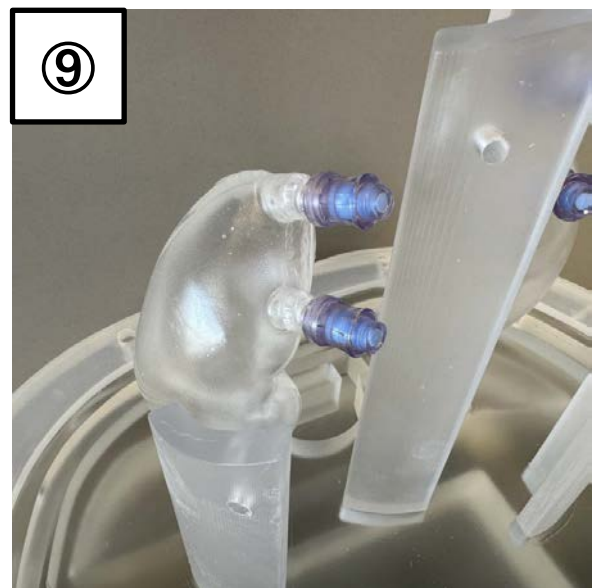
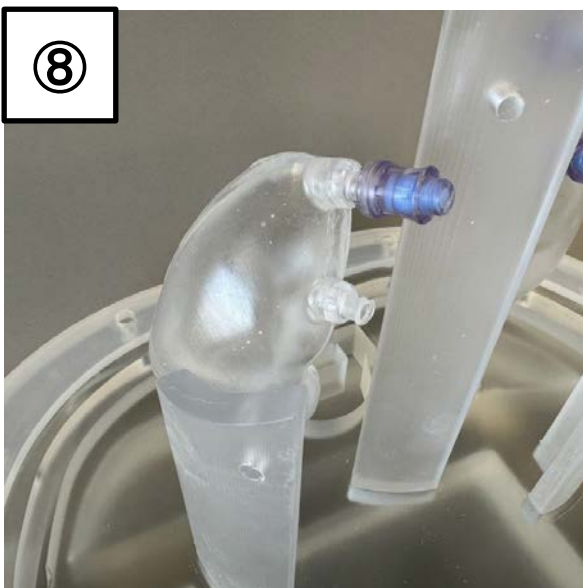
Filling the organs

1-3. Kidney

- ⑥ Fill with RI fluid.
✘ **Make sure there are no air bubbles trapped inside**
- ⑦ After filling, remove the tube from the drainage port.
✘ **If you remove the syringe first, there is a risk of spilling**



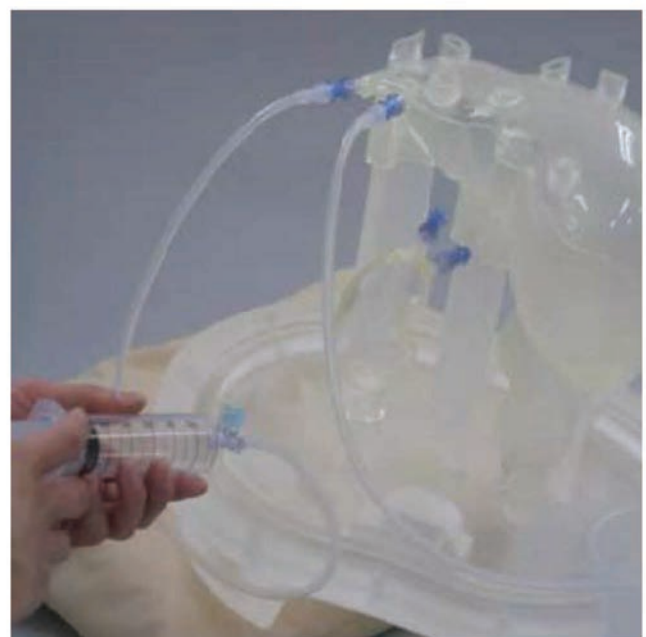
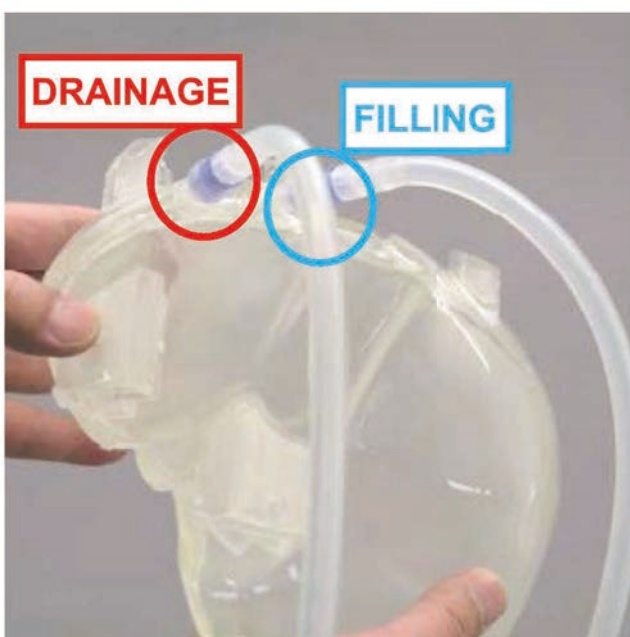
- ⑧ After removing the silicone tube, remove the syringe.
- ⑨ Finally, attach the surplug to the filling port.



Filling the organs

2. Liver

- Prepare the tubes (one each for draining and for filling), syringe and 2 surplugs.
 - * Make sure that the three-way stopcock is closed.
- Connect one surplus to the drainage port.
- Afterwards, connect the drainage tube to the surplus.
- Connect the other surplus to the filling port and attach the filling tube to the three-way stopcock.
- Fill the syringe and insert the tip into the filling tube, then open the three-way stopcock and slowly inject the liquid into the tube.
 - * When the liver is completely filled, excess liquid will flow out through the drainage tube. We recommend placing the end of the drainage tube in the beaker.
- After confirming that not air is left in the kidney, close the three-way stopcock.
 - * If the air can't be completely removed from the liver by normal means, tilt it slightly to help remove the air.
 - * Do not try to fill with more liquid after the liver is completely filled as this could lead to damage to the phantom.
- Remove the tubes from the surplugs.
 - * There is no need to remove the surplugs from the liver.



Preparation

Filling the organs with RI solution or water

Filling the organs

2-2. Liver

- ① Prepare 1 silicon tube, 1 syringe with three-way stopcock and the liver container.
✘ Remove the three-way stopcock from the syringe.
- ② Fill the liver with water (only fill the volume of the liver minus the amount of RI fluid planned to insert).
- ③ Remove the surplug from the filling port.



- ④ Connect the syringe filled with RI fluid to the filling port.
- ⑤ Connect the silicone tube to the drainage port.



Preparation

Filling the organs with RI solution or water

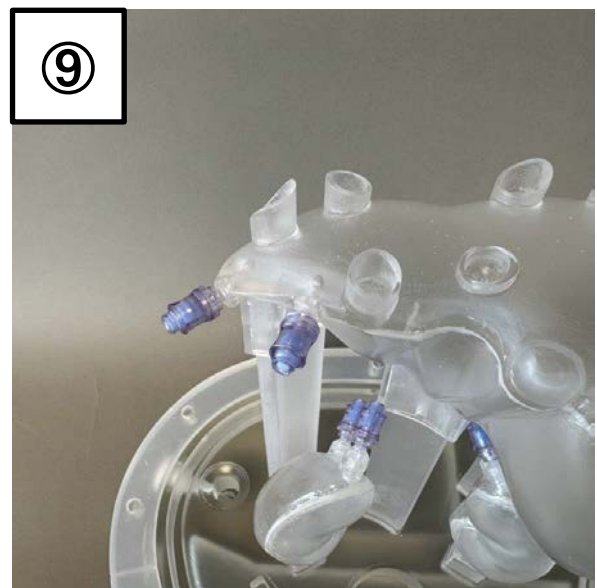
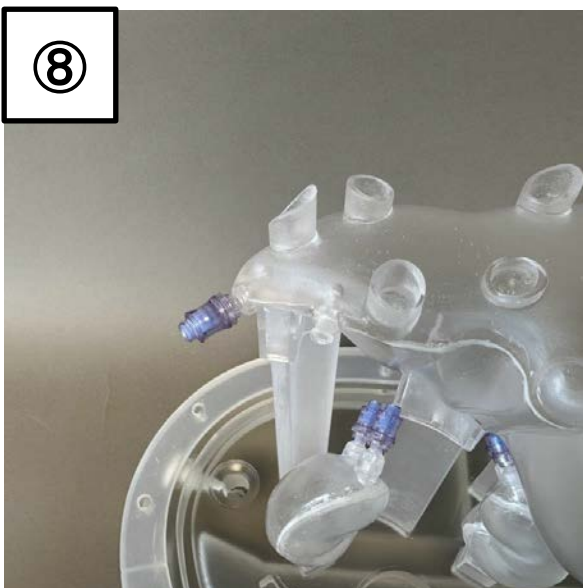
Filling the organs

2-3. Liver

- ⑥ Fill with RI fluid.
✘ **Make sure there are no air bubbles trapped inside**
- ⑦ After filling, remove the tube from the drainage port.
✘ **If you remove the syringe first, there is a risk of spilling**



- ⑧ After removing the silicone tube, remove the syringe.
- ⑨ Finally, attach the surplug to the filling port.



Filling the organs

3-1. Heart

a) Anatomical type

- Prepare the tubes (one each for filling and draining), the syringe and 4 surplugs.

✘ **Make sure that the three-way stopcock is closed**

- Attach the connector of the draining tube to the draining port of the left ventricle.
- Connect the surplug to the filling port and attach the filling tube.
- Insert the syringe into the tube, open the three-way stopcock and slowly inject the liquid.

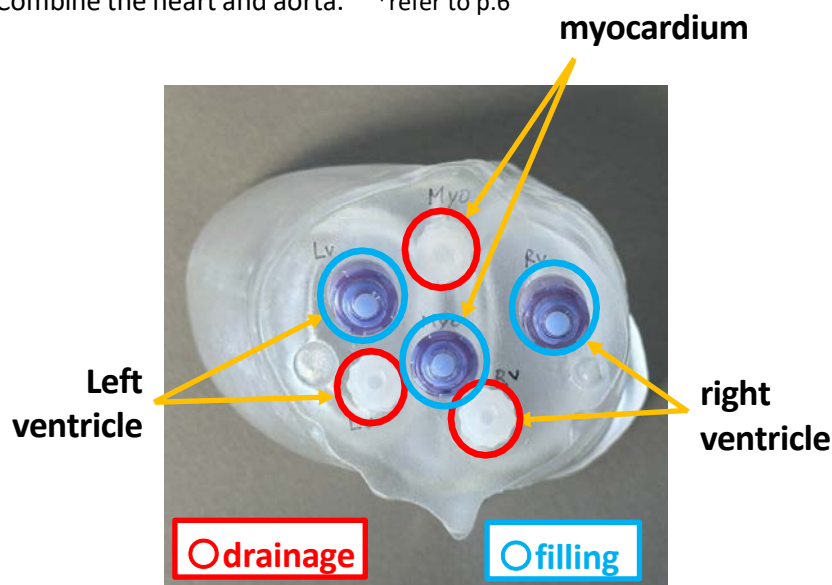
✘ **When the ventricle is completely filled, excess liquid will flow out through the drainage tube. We recommend placing the end of the drainage tube in the beaker**

- Close the three-way stopcock after confirming that no air is left in the ventricle.

✘ **If the air can't be completely removed from the ventricle by normal means, tilt it slightly to help remove the air**

✘ **Do not try to fill with more liquid after the ventricle is completely filled as this could lead to damage to the phantom.**

- Remove the connectors attached to the ports.
- Close the draining port with a screw plug.
- ✘ **The surplug on the filling port does not need to be removed**
- Repeat the same steps for filling the right ventricle and myocardium.
- Combine the heart and aorta. *refer to p.6



Preparation

Filling the organs with RI solution or water

Filling the organs

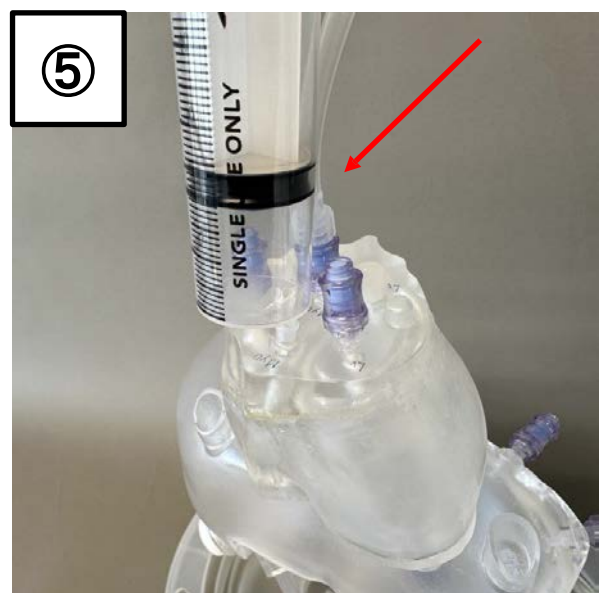
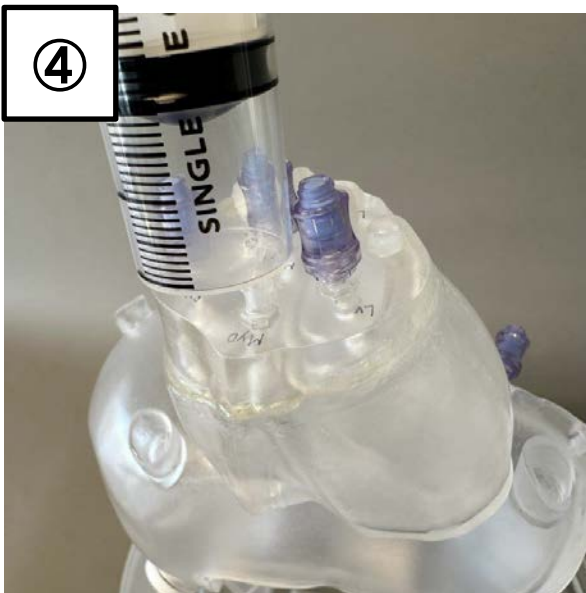
3-2. Heart

※ The photos are from the anatomical type but the geometrical type follows the same procedure

- ① Prepare 1 silicon tube, 1 syringe with three-way stopcock and the heart.
※ Remove the three-way stopcock from the syringe
- ② Fill the heart with water (only fill the volume of the heart minus the amount of RI fluid planned to insert).
※ For the heart, the filling procedure differs from the other organs
- ③ Remove the surplug from the drainage port.



- ④ Connect the syringe filled with RI fluid to the draining port.
- ⑤ Connect the silicone tube to the filling port.



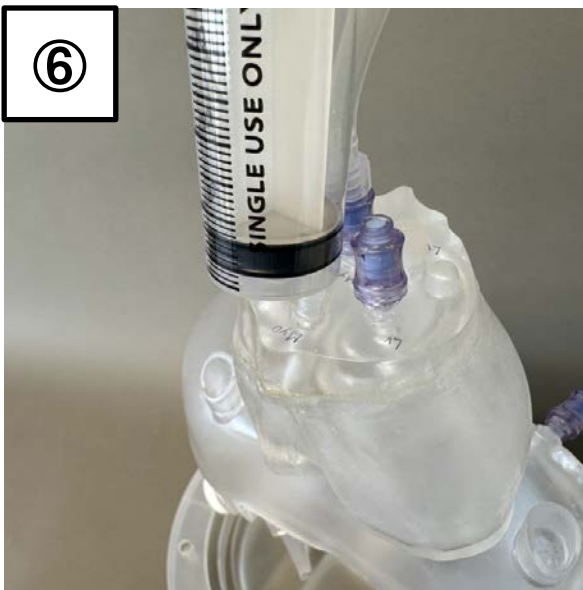
Preparation

Filling the organs with RI solution or water

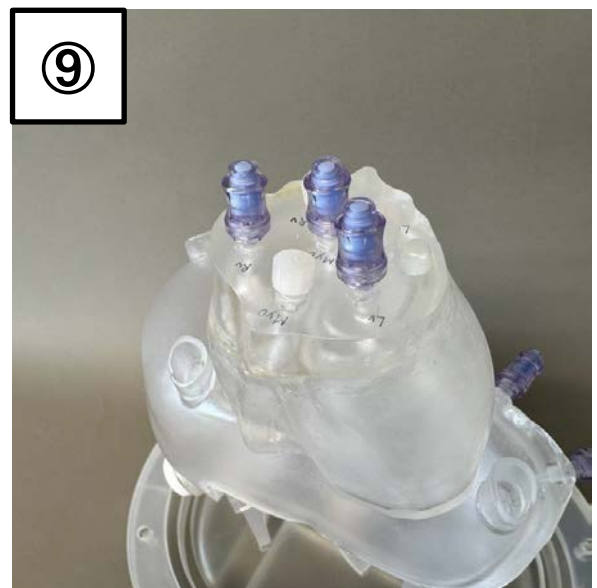
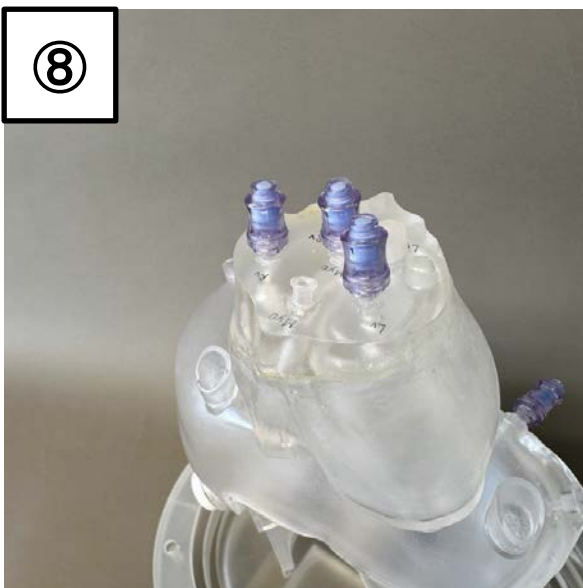
Filling the organs

3-3. Heart

- ⑥ Fill with RI fluid.
✘ **Make sure there are no air bubbles trapped inside**
- ⑦ After filling, remove the tube from the filling port.
✘ **If you remove the syringe first, there is a risk of spilling**



- ⑧ After removing the silicone tube, remove the syringe.
- ⑨ Finally, attach the surplug to the drainage port.



Preparation

Filling the organs with RI solution or water

Filling the organs

3-4. Heart

b) Geometrical type

- Prepare the tubes (one each for filling and draining), the syringe and 3 surplugs.

✘ **Make sure that the three-way stopcock is closed**

- Attach the connector of the draining tube to the draining port of the ventricle.
- Connect the surplug to the filling port and attach the filling tube.
- Insert the syringe into the tube, open the three-way stopcock and slowly inject the liquid.

✘ **When the ventricle is completely filled, excess liquid will flow out through the drainage tube. We recommend placing the end of the drainage tube in the beaker**

- Close the three-way stopcock after confirming that no air is left in the ventricle.

✘ **If the air can't be completely removed from the ventricle by normal means, tilt it slightly to help remove the air**

✘ **Do not try to fill with more liquid after the ventricle is completely filled as this could lead to damage to the phantom.**

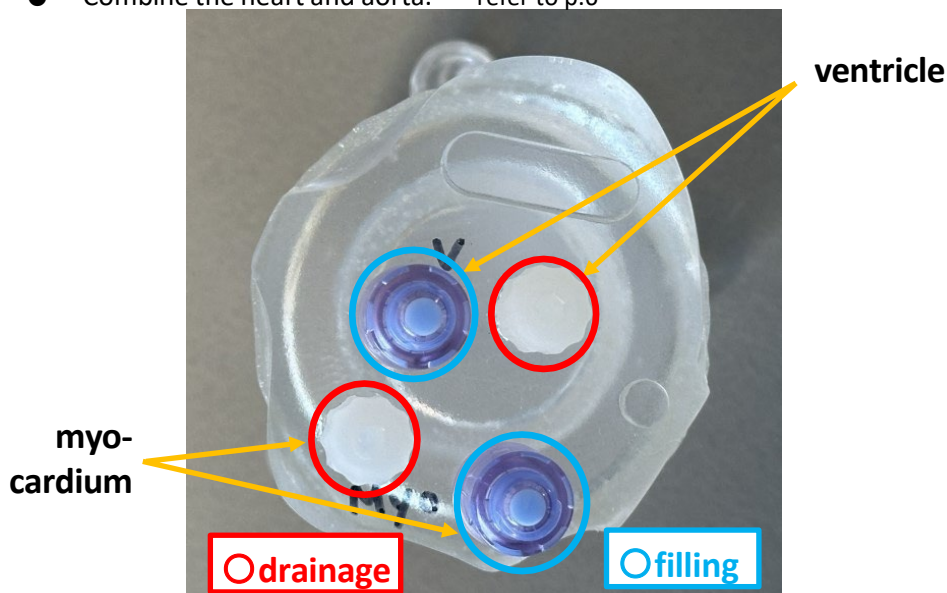
- Remove the connectors attached to the ports.

- Close the draining port with a screw plug.

✘ **The surplug on the filling port does not need to be removed**

- Repeat the same steps for filling the myocardium.

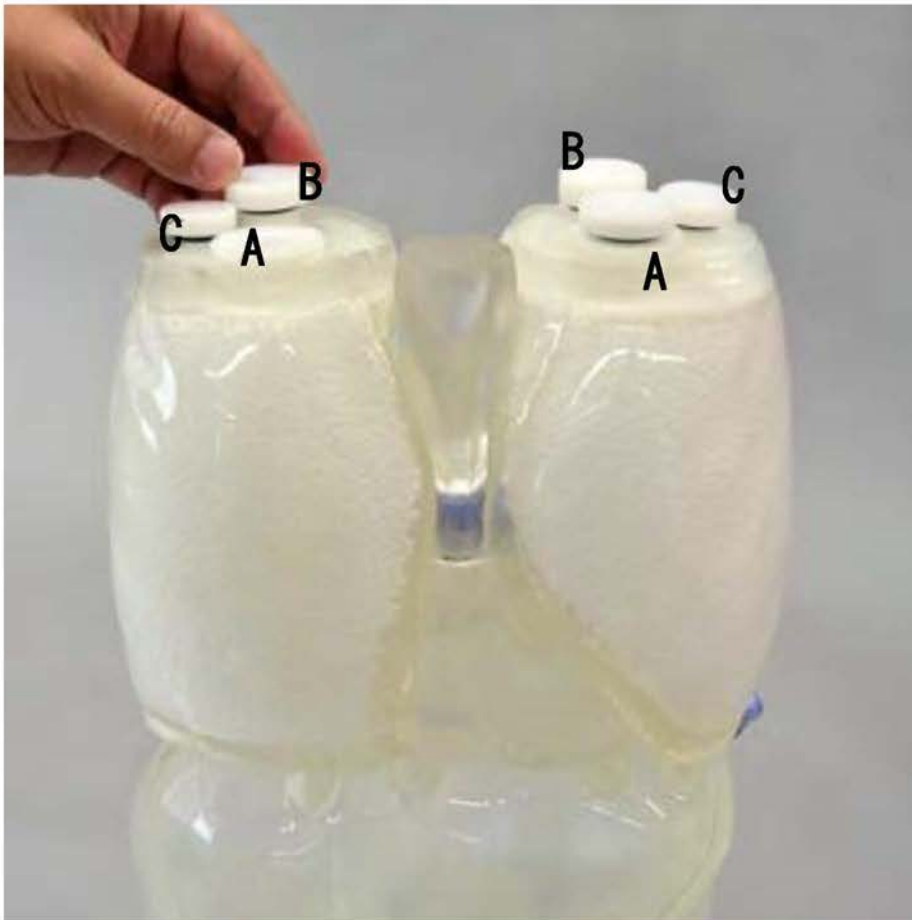
- Combine the heart and aorta. *refer to p.6



Filling the organs

4. Lungs

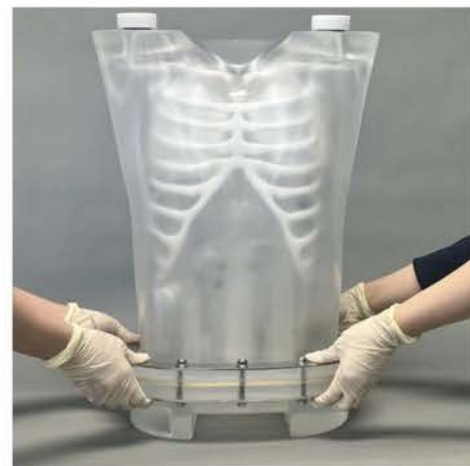
- Prepare the syringe.
- Remove the bolt from port A and and loosen the one on port B, so that the air can escape.
 - * Do not touch the C port.
- Fill through port A using the syringe.
 - * If the air can't be completely removed from the lungs by normal means, tilt it slightly to help remove the air.
 - While filling, do not touch any of the other bolts. As the material of the lung parts has a lower density than the liquid, they will spill.
- Screw the bolts on port A and B back on when completely filled.



Filling the organs

5. Thorax

- Prepare the water tank.
- Put the thorax in the sink.
- Open one of the shoulder ports.
- Fill using the water tank.
- Close the port after confirming that there is no air left inside the thorax.
 - * If the air can't be completely removed from the thorax by normal means, tilt it slightly to help remove the air.
 - * Do not fasten the screw plug too strongly as this could lead to damage.
 - * as the he completely filled phantom is heavy (approx. 40kg), always carry with at least two people.

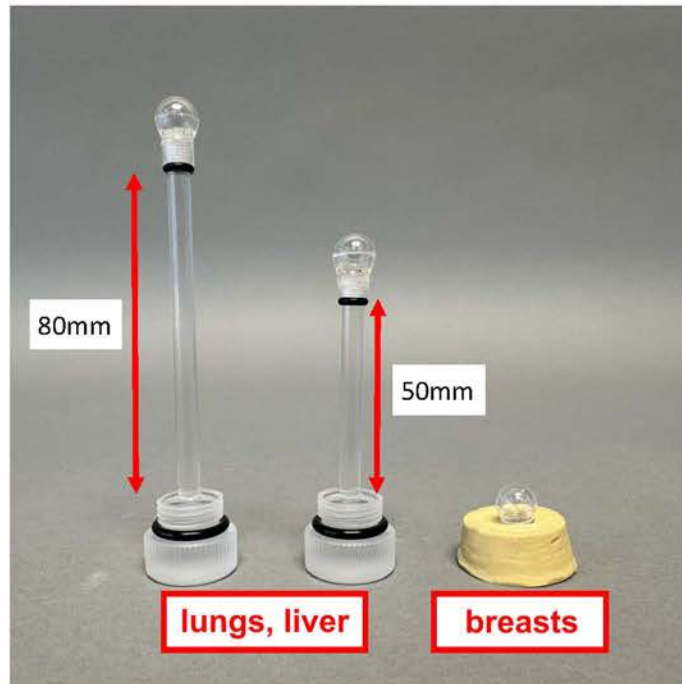


Preparation

Filling the hot spots with RI solution

Filling the hot spots

There are 3 types of hot spots: 2 for the lungs and liver (one long, one short) and one for the breast.



1. Liver

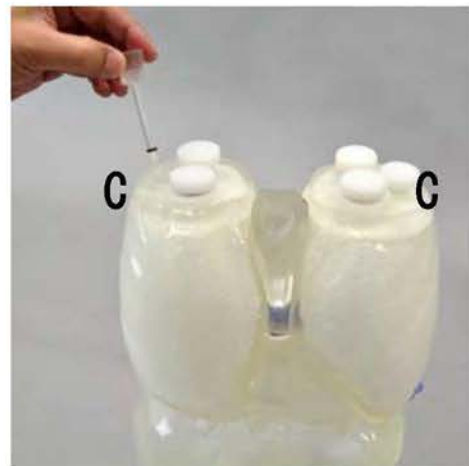
- Remove the capsule at the tip and fill with solution.
- Reattach and install in the liver.



Filling the hot spots

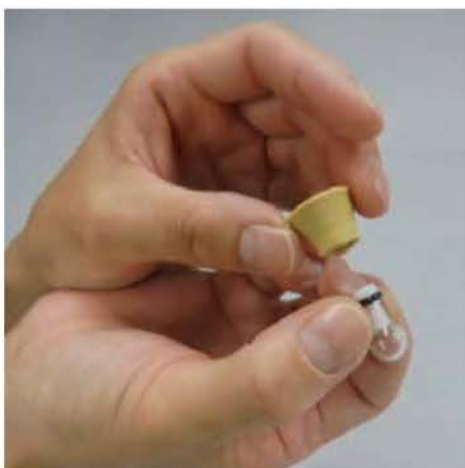
2. Lungs

- Remove the capsule at the tip and fill with solution.
- Reattach and insert in the lung's C port.



3. Breasts

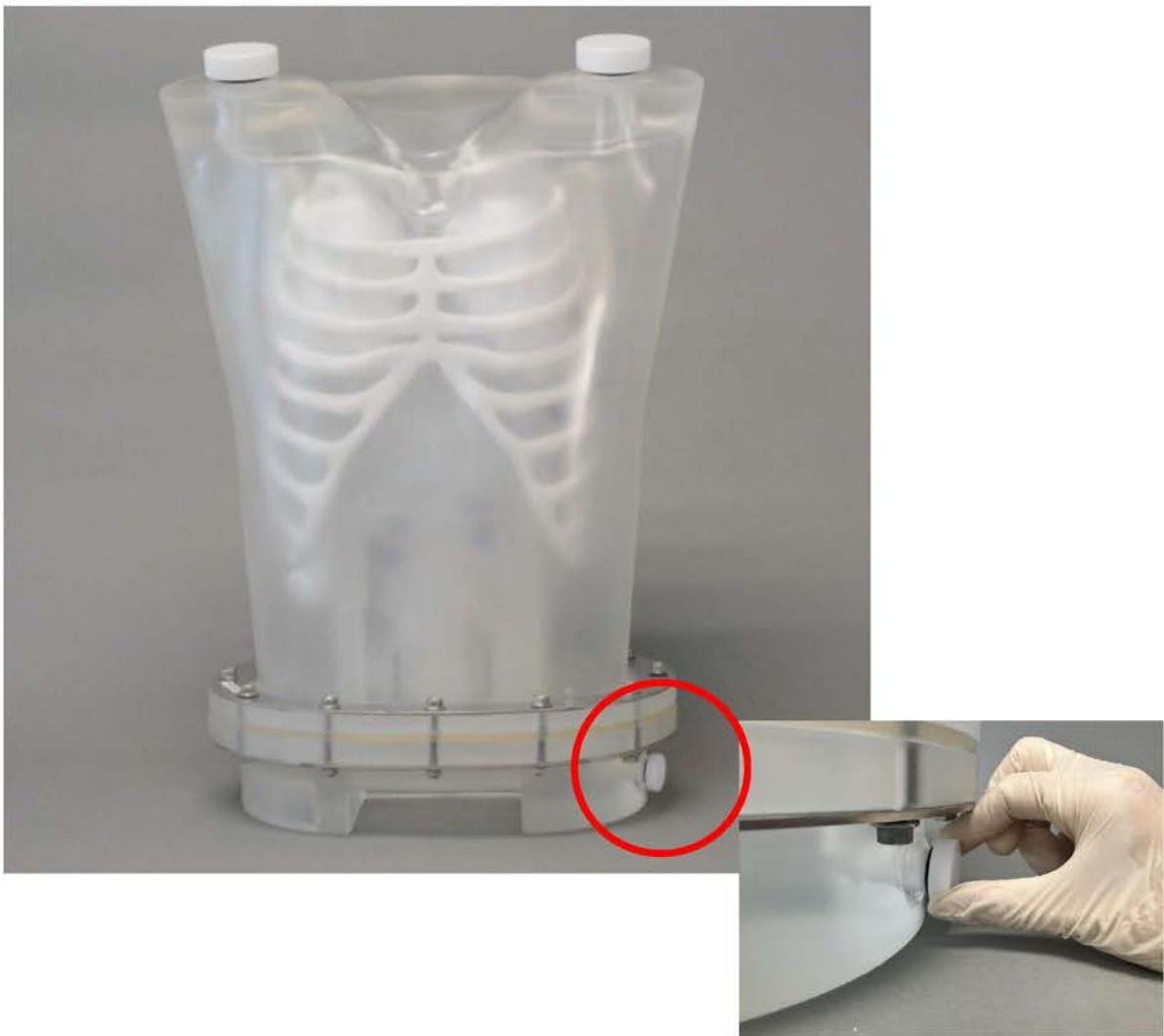
- Remove the capsule from the plug, remove the screw and fill with solution.
- Reattach both and place in the breast attachment.
- Lie the phantom down and place breast attachments on top.



Draining the organs

1. Thorax

- Put the thorax in a sink.
 - Open one of the shoulder ports.
 - Loosen the screw plug on the bottom side of the thorax until liquid flows out.
 - Leave it in the sink until all liquid has left. This takes roughly 30 minutes.
- * Do not remove the screw plug from the draining port.
Removing it would make the liquid gush out and spill all over the place.



Draining the organs

2. Lungs

- Remove the bolt from port A and loosen the one on port B.
 - * Do not touch the C port.
 - * When storing, remove only the screw cap for the A port.



3. Heart

- * The procedure for draining is the same for the anatomical and geometrical type.
- Prepare the tubes (one each for draining and filling) and the syringe.
- Remove the screw plug from the draining port and attach the draining tube.
- Attach the filling tube to the surplug of the filling port and drain the water by injecting air through the syringe.



Draining the organs

4. Liver

- Prepare the draining tube.
- Attach the draining tube to the surplug on the drainage port.
- Remove the bolts on the liver and drain the water.

✘ For storage, move the screw caps to the holder and remove all surplugs



5. Kidneys

- Prepare the tubes (one each for filling and draining) and the syringe
- Attach the draining tube to the surplug on the draining port.
- Attach the filling tube to the surplug on the filling port and drain the water by injecting air using the syringe.

✘ For storage, remove all surplugs





Do not mark on the phantom with pen or leave printed materials on its surface.
Ink marks will be irremovable.

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