

POP! Stirling Engine Assembly Instructions

Engine parts list starts on page 2.

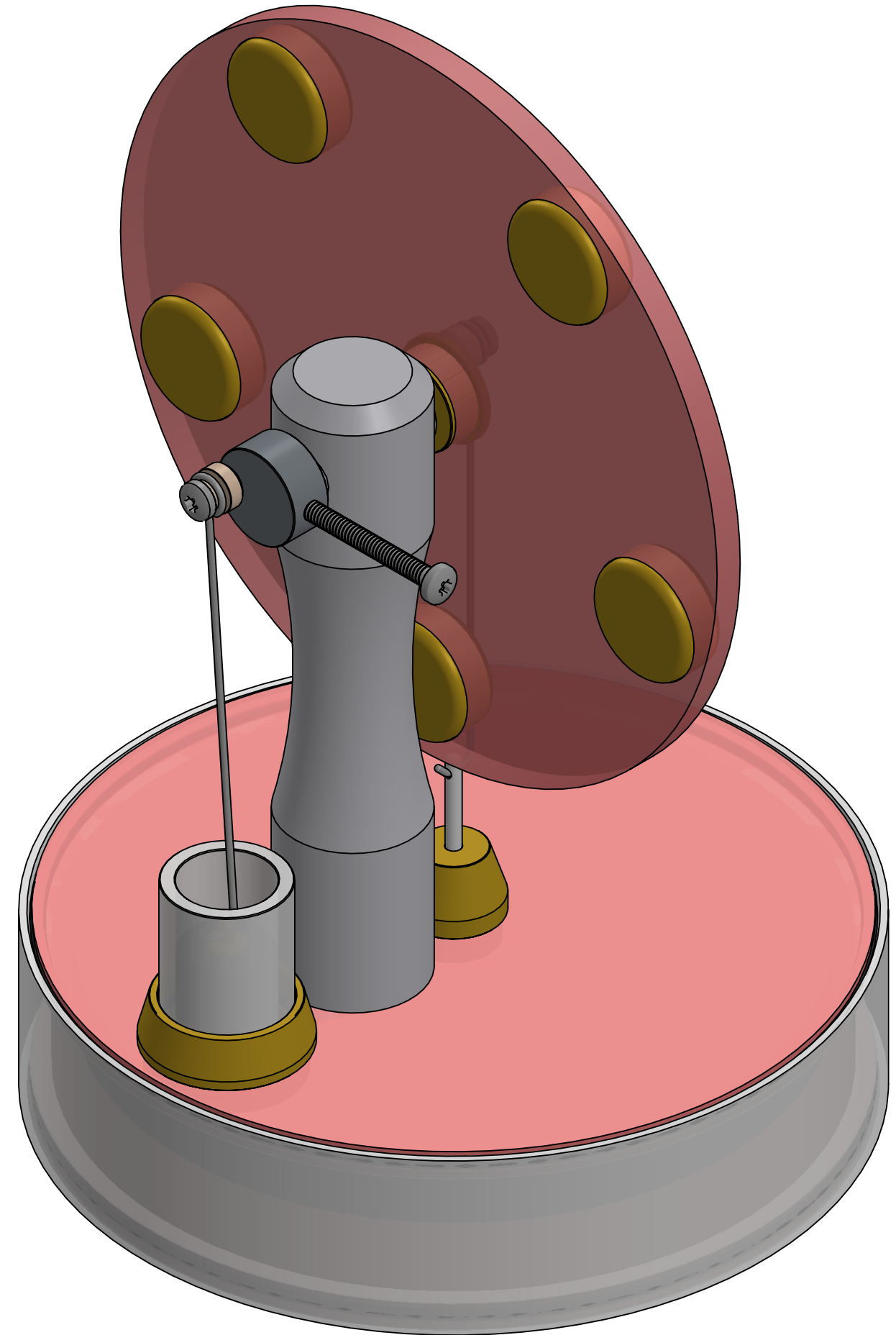
Assembly instructions start on page 5.

Operation instructions are on page 38.

Maintenance instructions are on page 39.

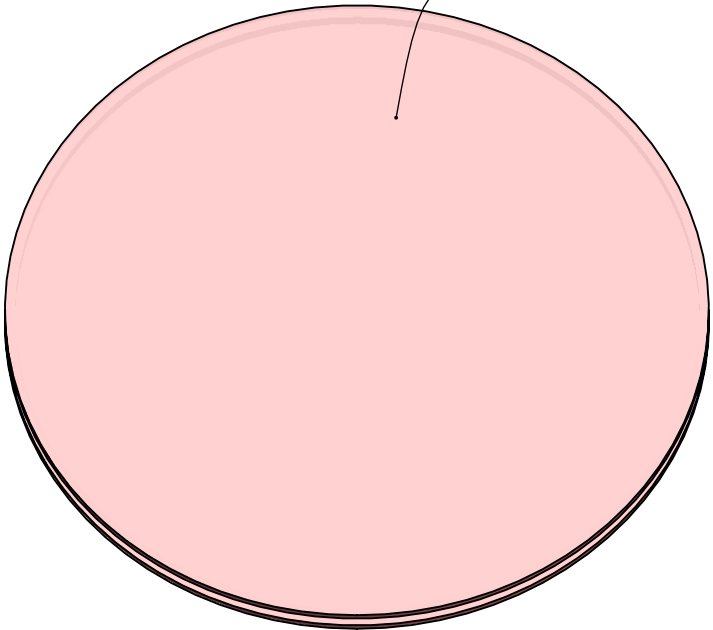
Please read all the way through the assembly instructions to familiarise yourself with the process before you start and pay close attention to the alignment of all the parts in the diagrams.

Assembly time should be approximately 20-25 minutes.

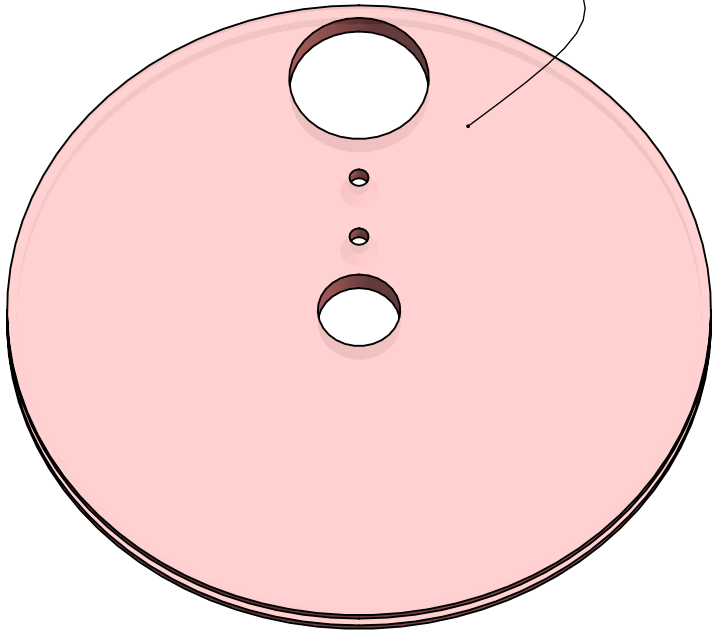


PARTS 1

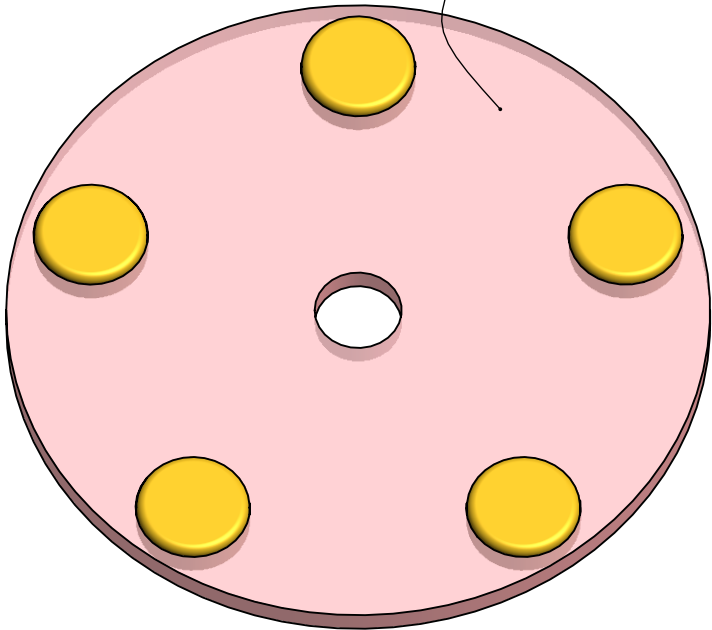
Bottom plate



Top plate



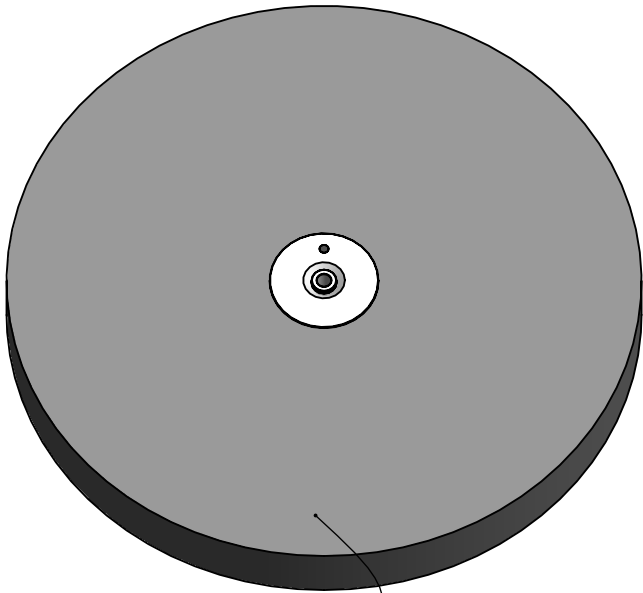
Flywheel



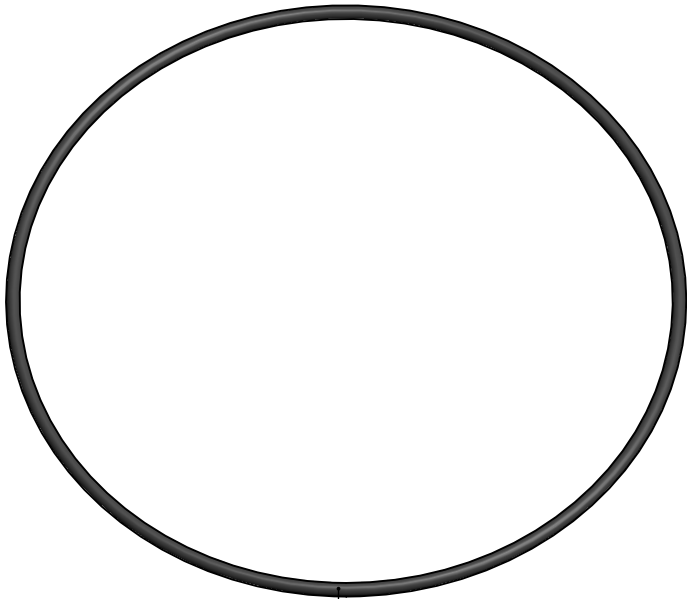
Chamber wall



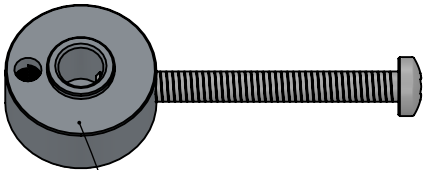
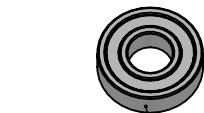
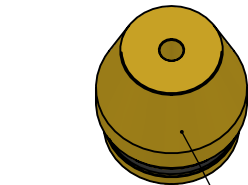
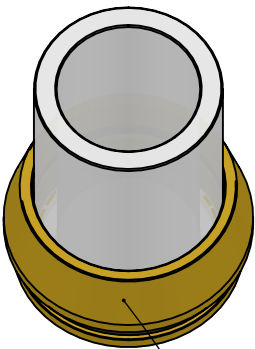
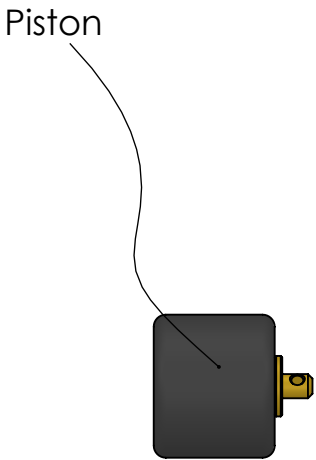
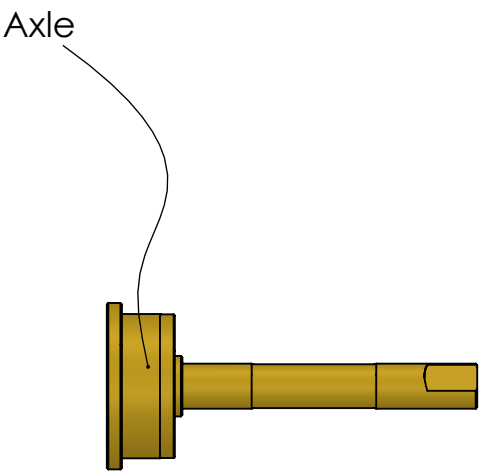
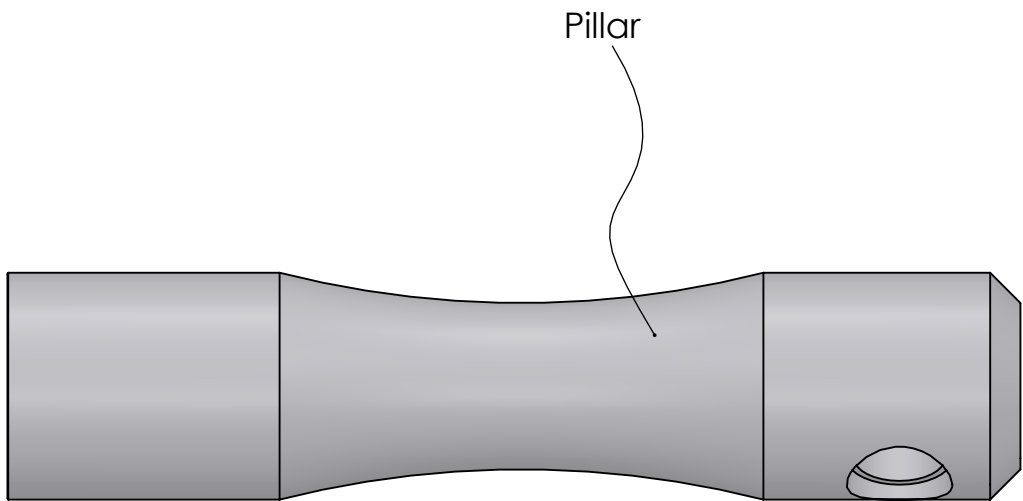
Displacer



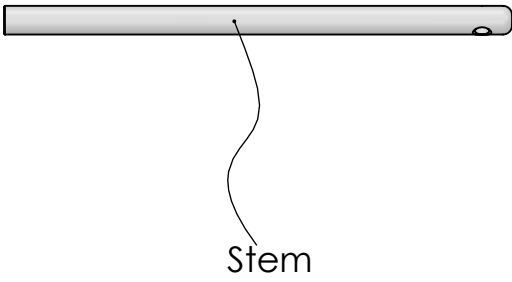
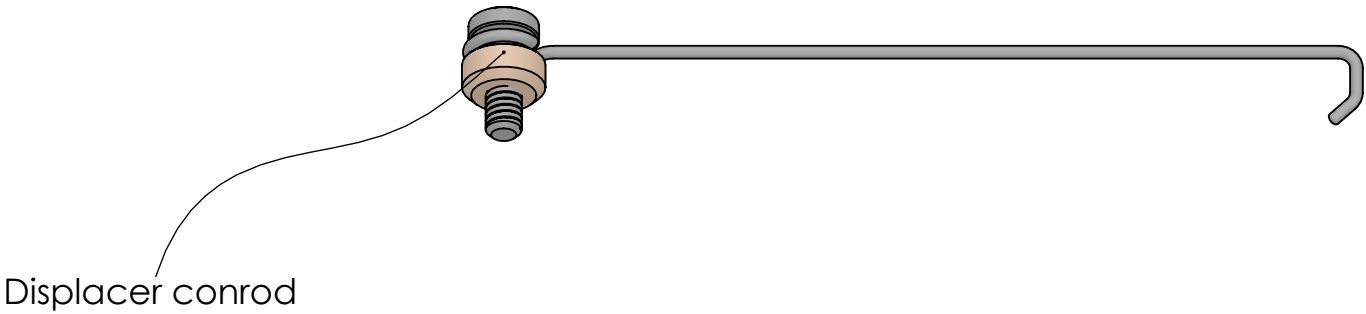
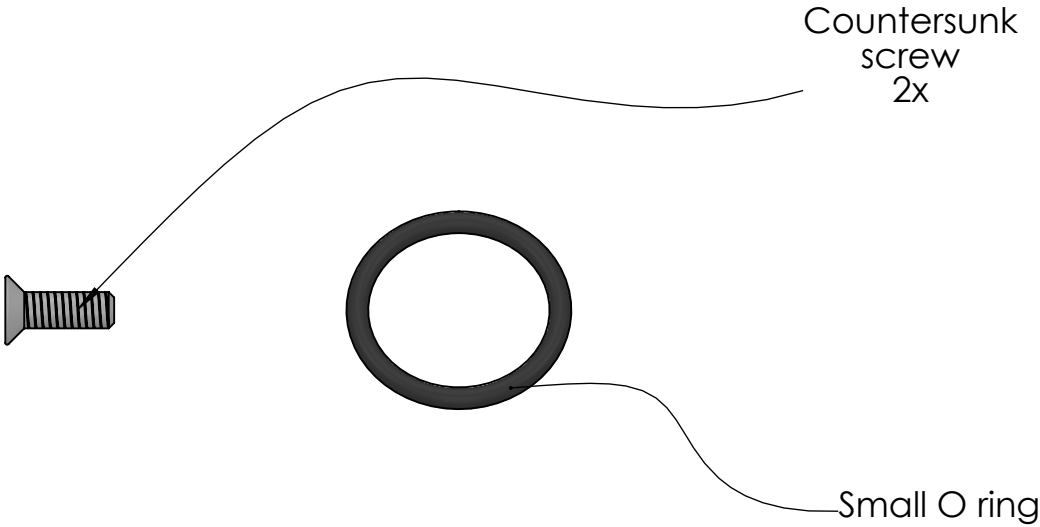
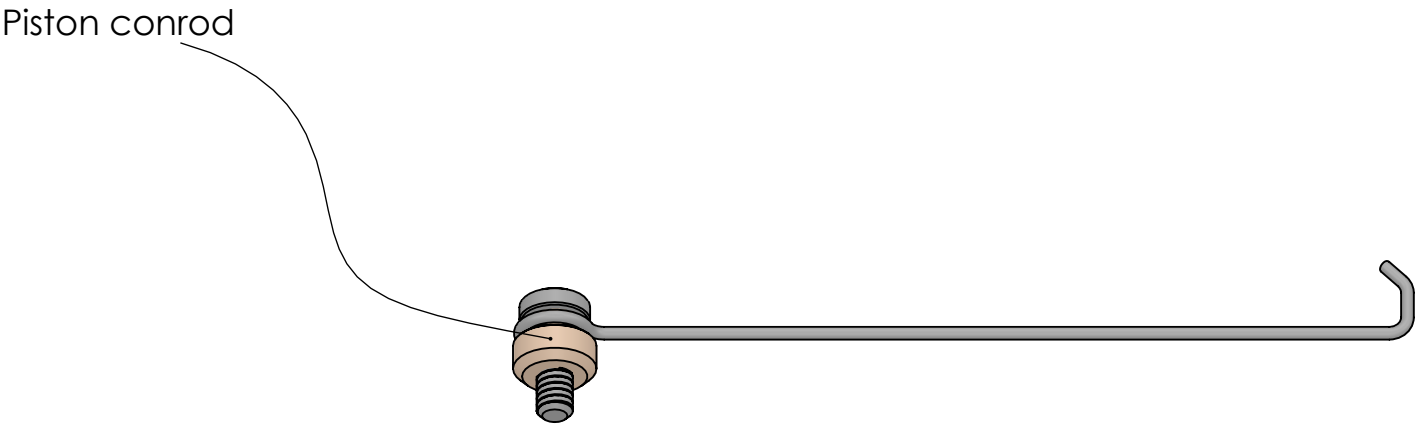
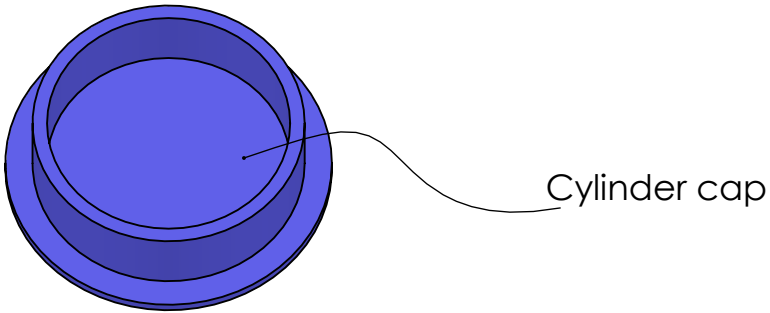
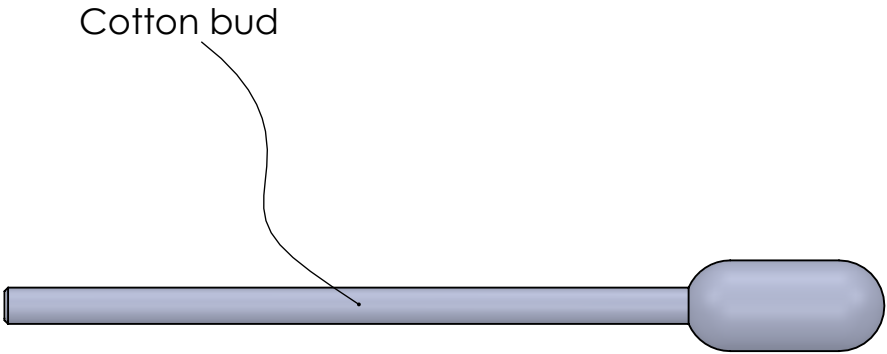
Large O ring
2x



PARTS 2

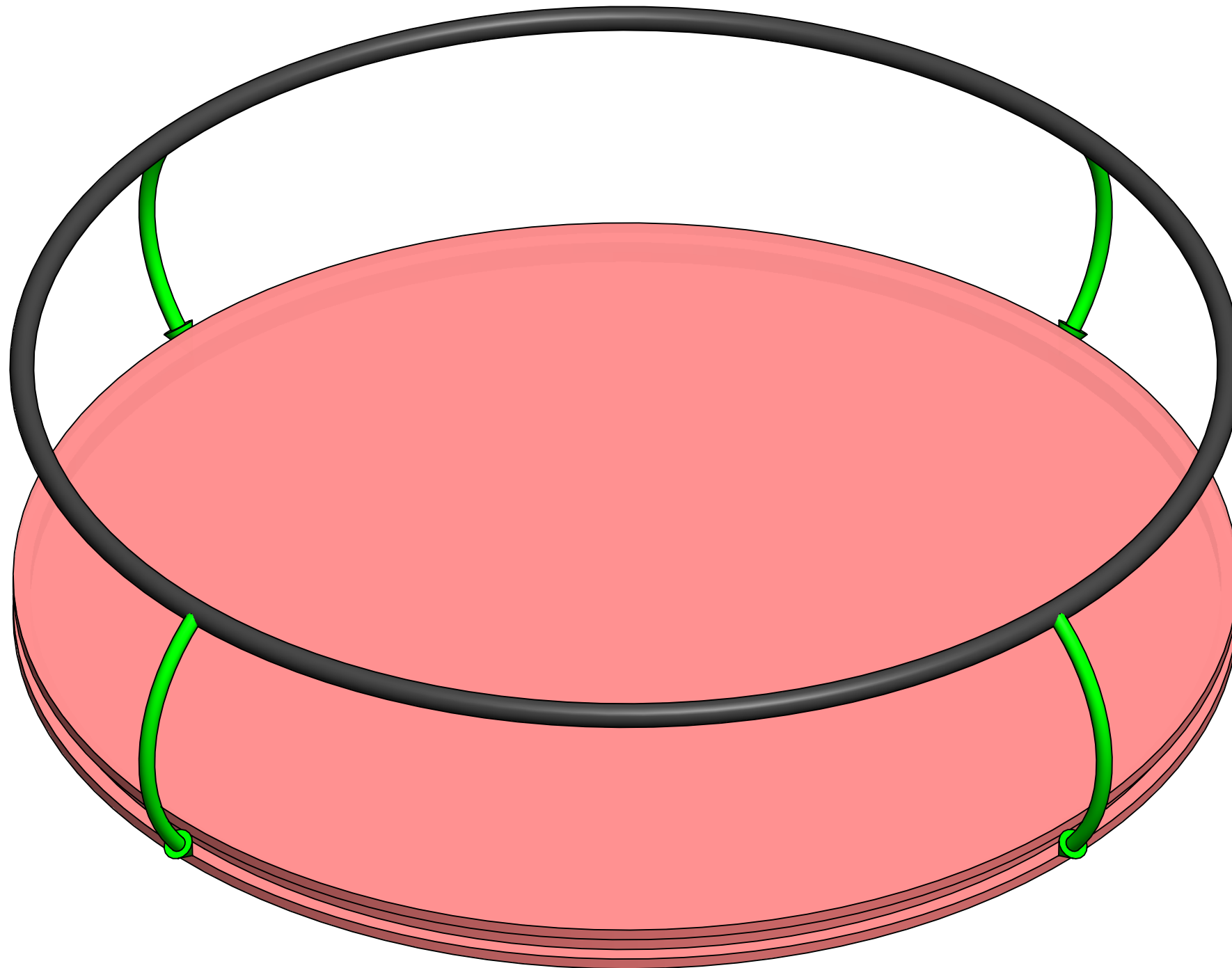


PARTS 3



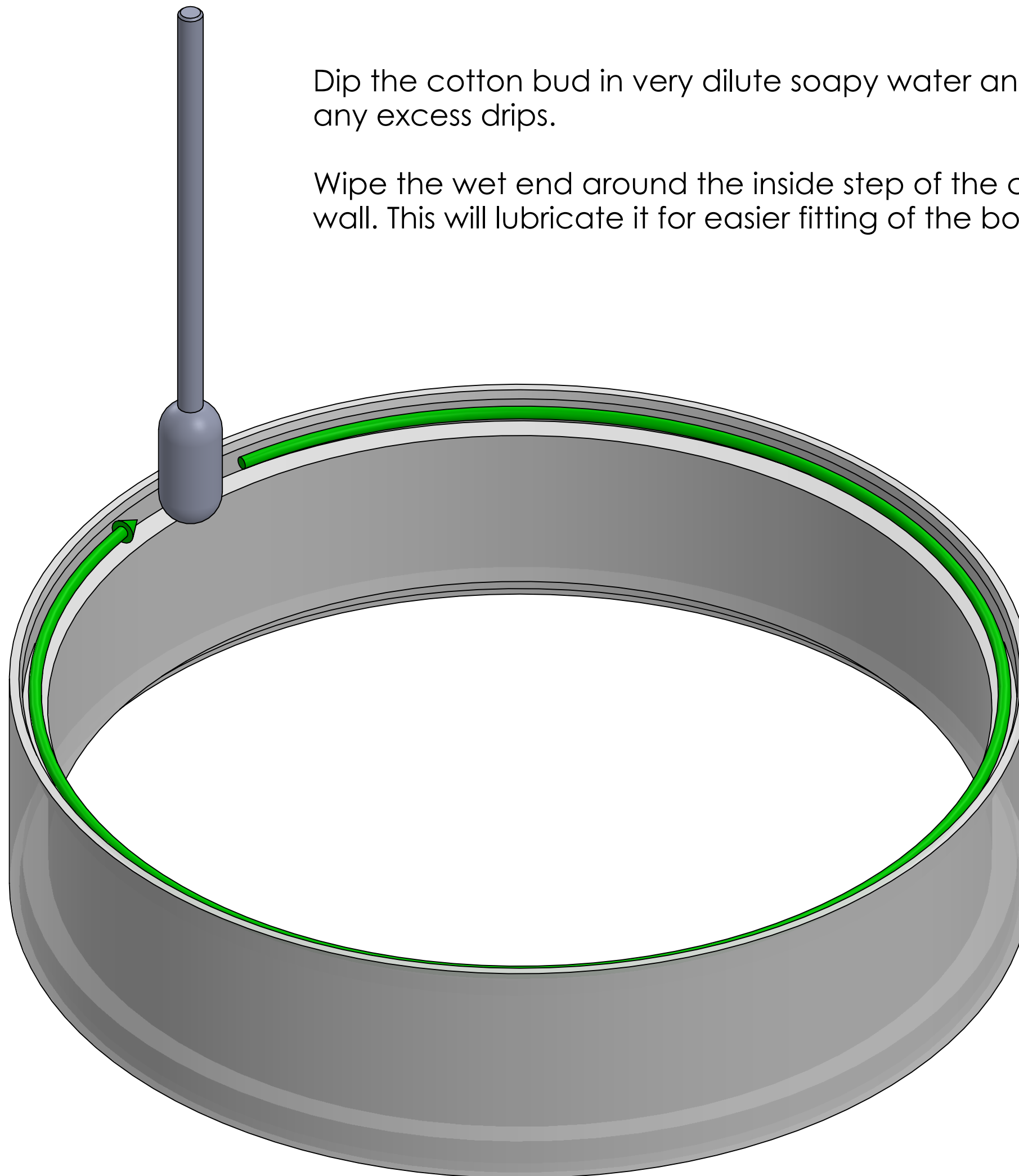
Fit one large O ring into the groove on the edge of the bottom plate, it will need a slight stretch to get it over the edge and into the groove.

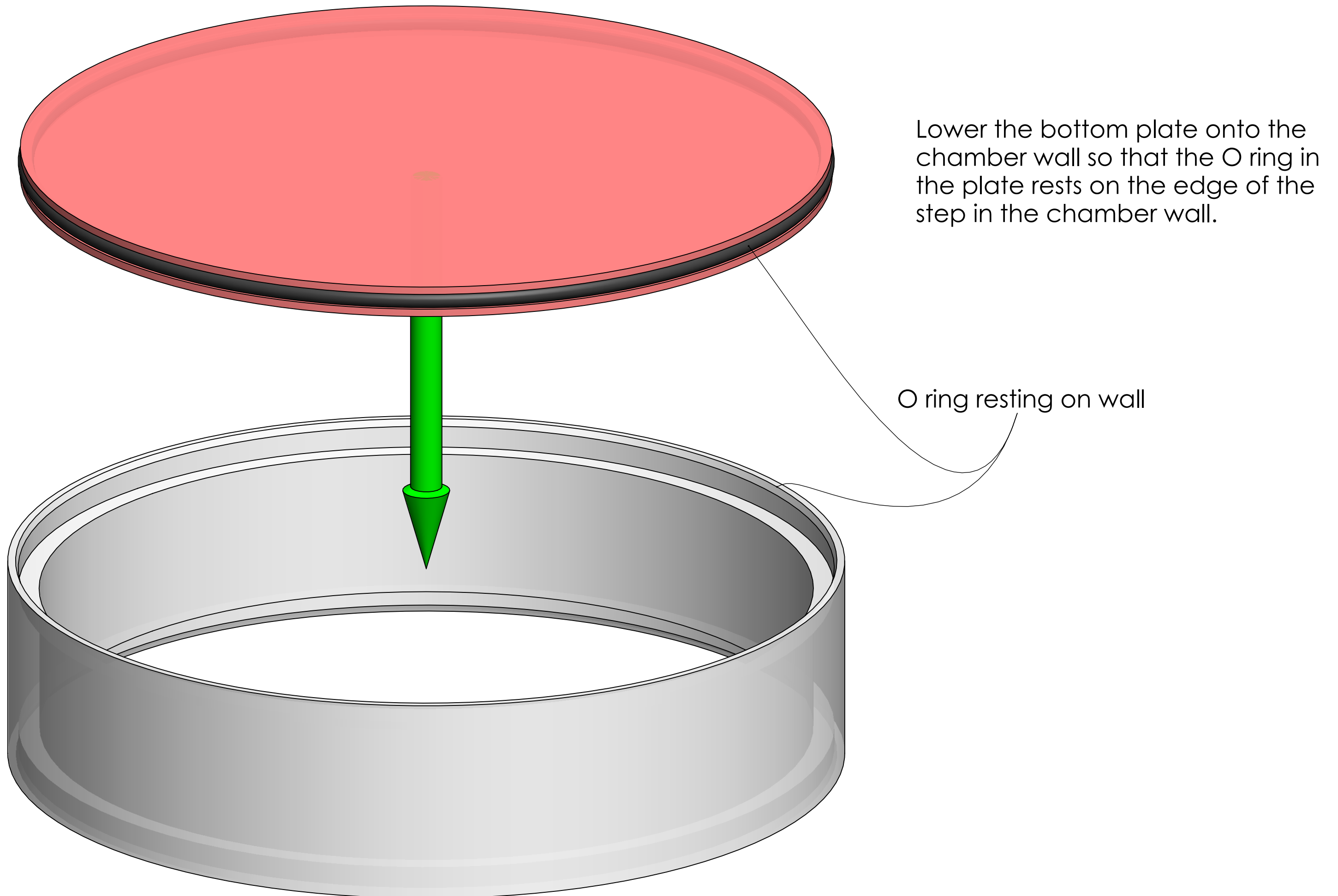
Note: try to handle the plate by its edges to avoid fingerprints on the plate surfaces.



Dip the cotton bud in very dilute soapy water and shake off any excess drips.

Wipe the wet end around the inside step of the chamber wall. This will lubricate it for easier fitting of the bottom plate.

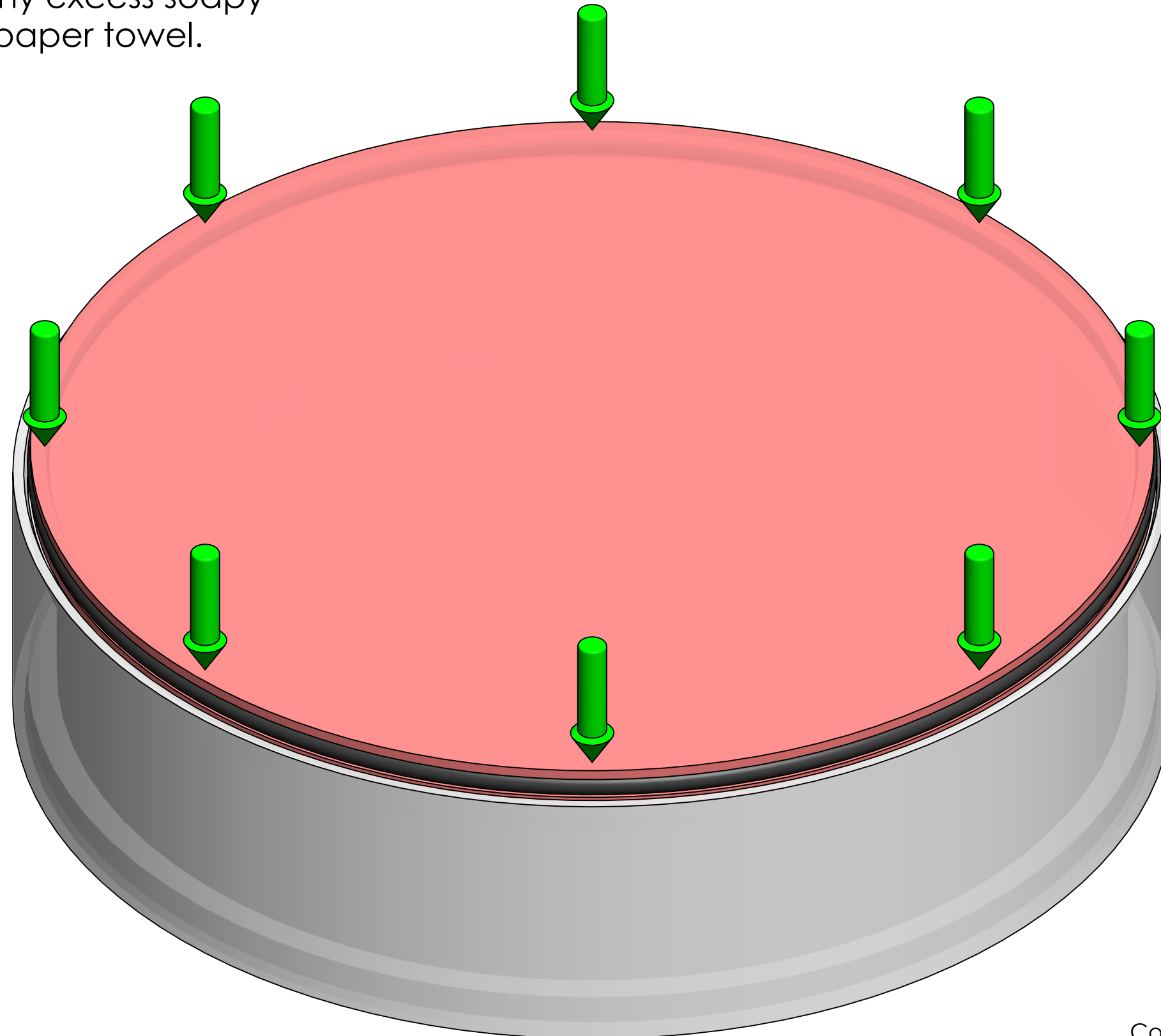




Spread your fingers evenly around the edge of the plate and gently press it into the step on the chamber wall, the O ring in the plate will squeeze into the step on the wall and provide an airtight seal between the plate and wall.

Work your way around the edge of the plate making sure it is pressed in all the way in all the way round. Correct fitting is shown on the next page.

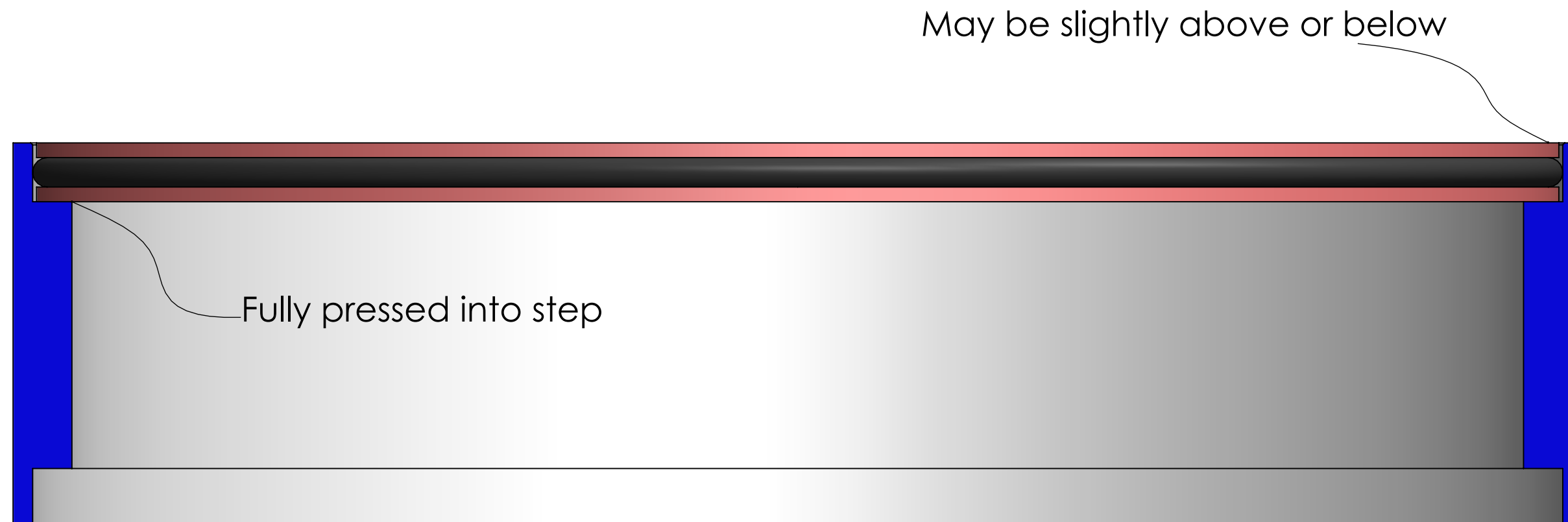
Wipe away any excess soapy water with a paper towel.



Check that the plate is pressed fully into the step on the wall.

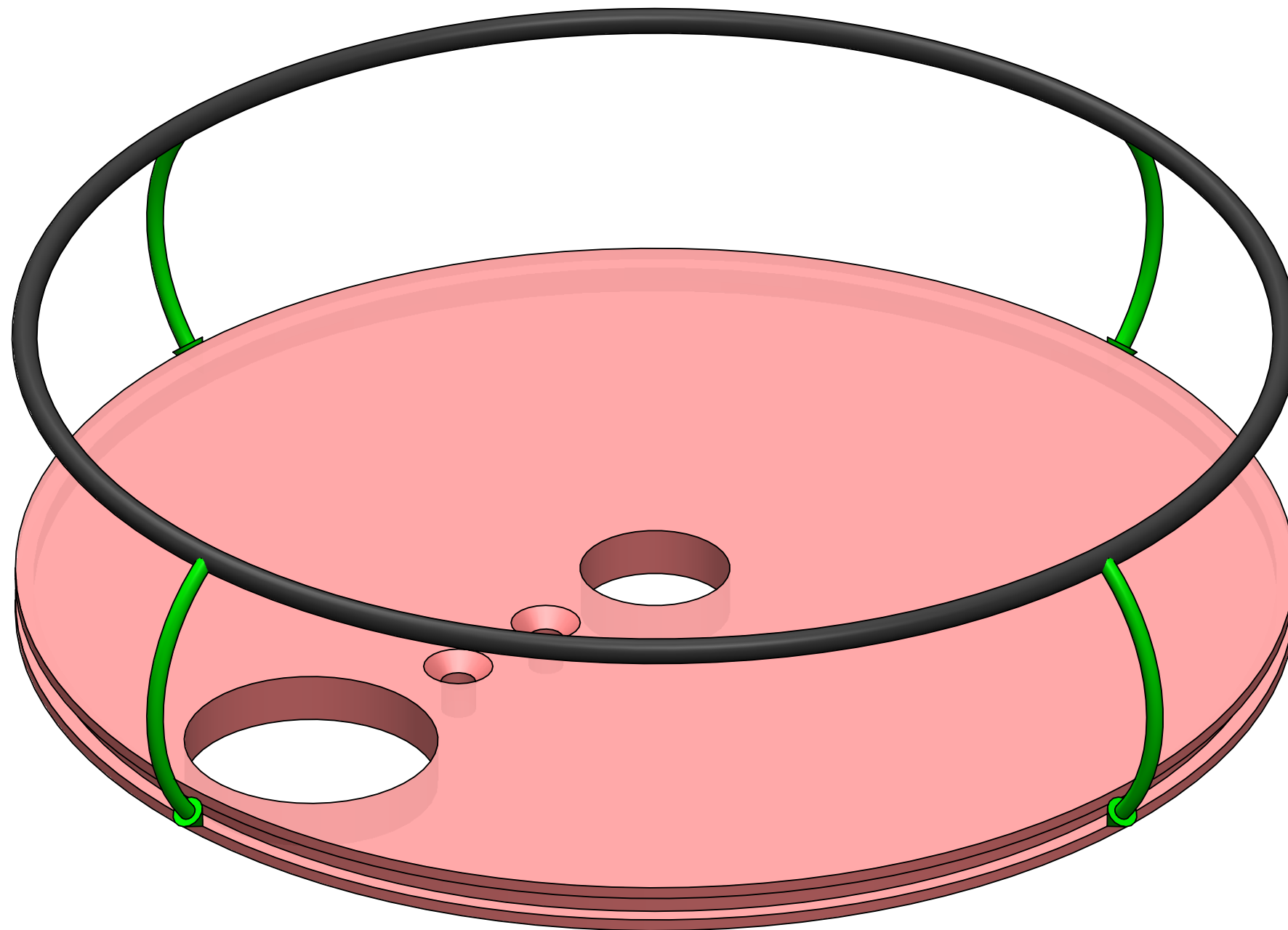
Note 1: Chamber wall is shown cut away for clarity

Note 2: the acrylic sheet used for making the plates can vary slightly in thickness so the top of the plate might sit very slightly above or below the top edge of the chamber wall. This is normal and will not affect performance at all.

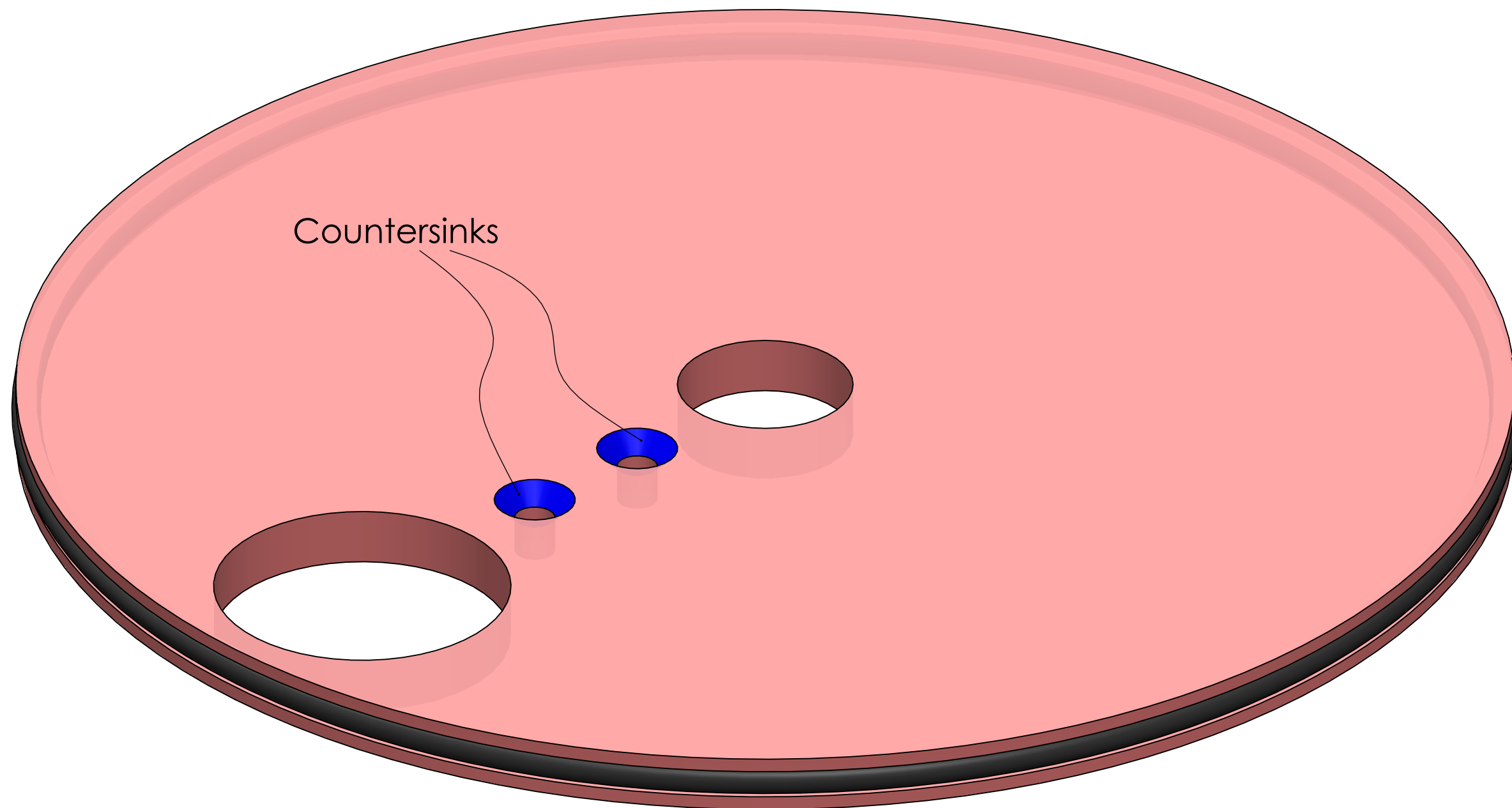


Fit one large O ring into the groove on the edge of the top plate, it will need a slight stretch to get it over the edge and into the groove.

Note: try to handle the plate by its edges to avoid fingerprints on the plate surfaces.

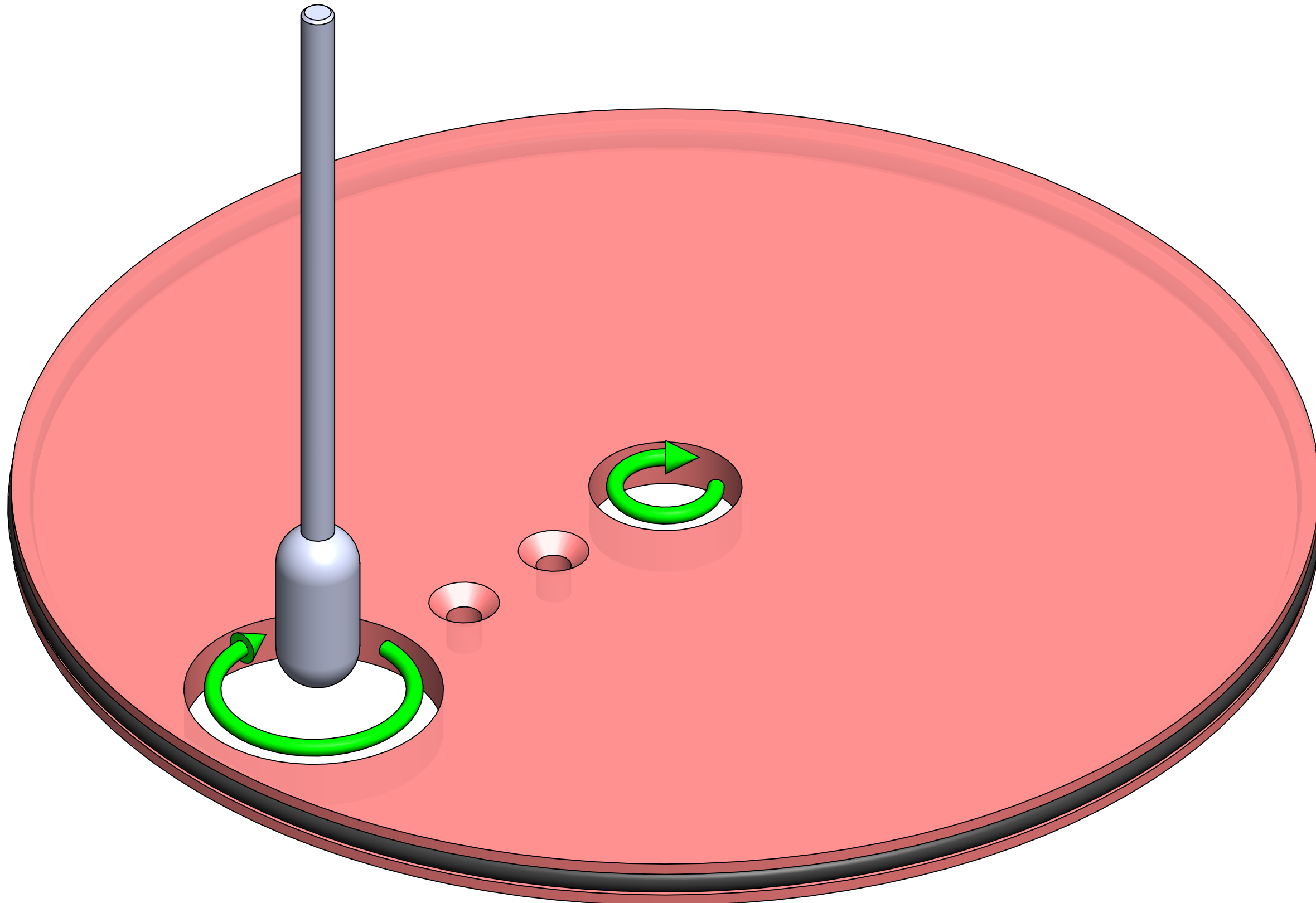


Identify the bottom face of the top plate.
The bottom face is the side with the countersinks on the two holes as shown.



Dip the cotton bud in very dilute soapy water and shake off any excess drips.

Wipe the wet end around the insides of the gland and cylinder holes in the top plate. This will lubricate them for easier fitting of the gland and cylinder.

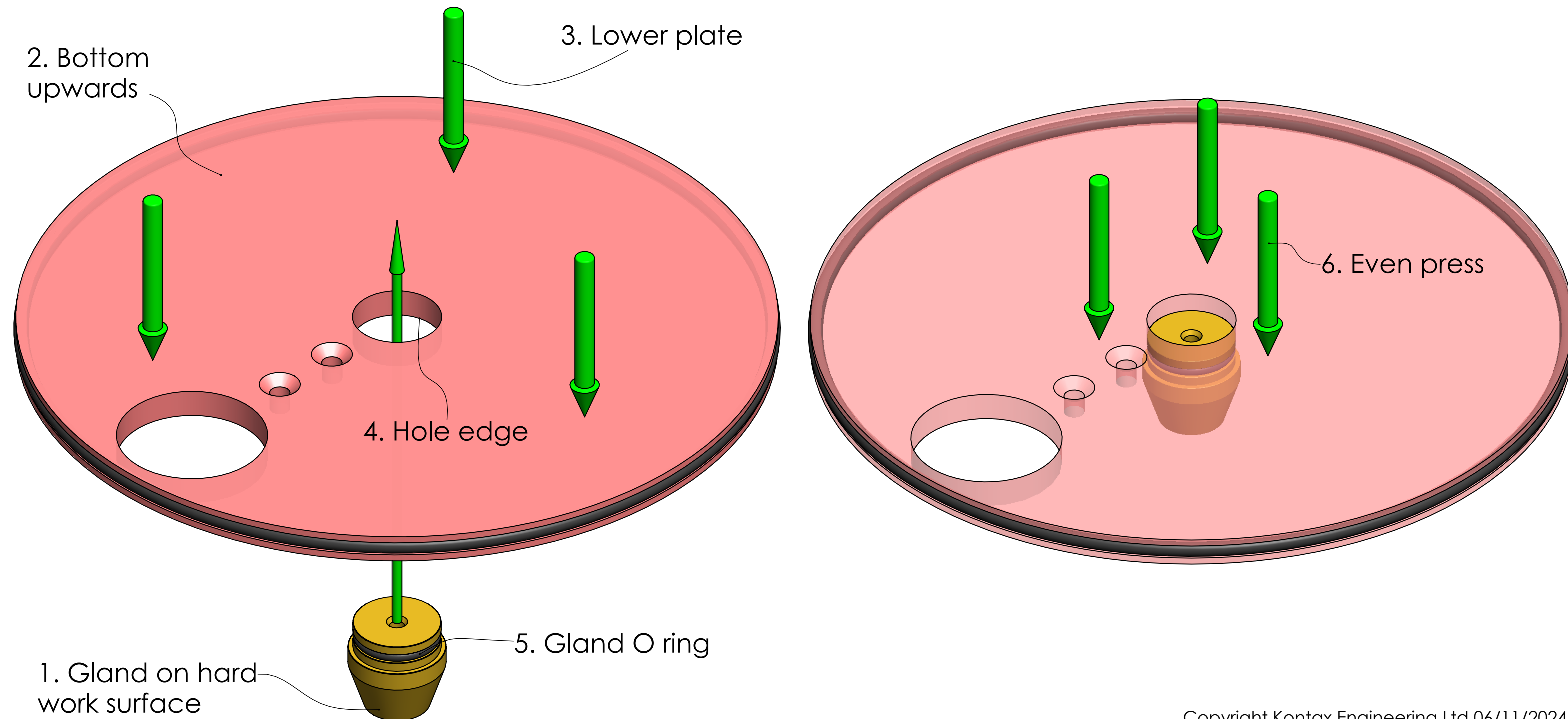


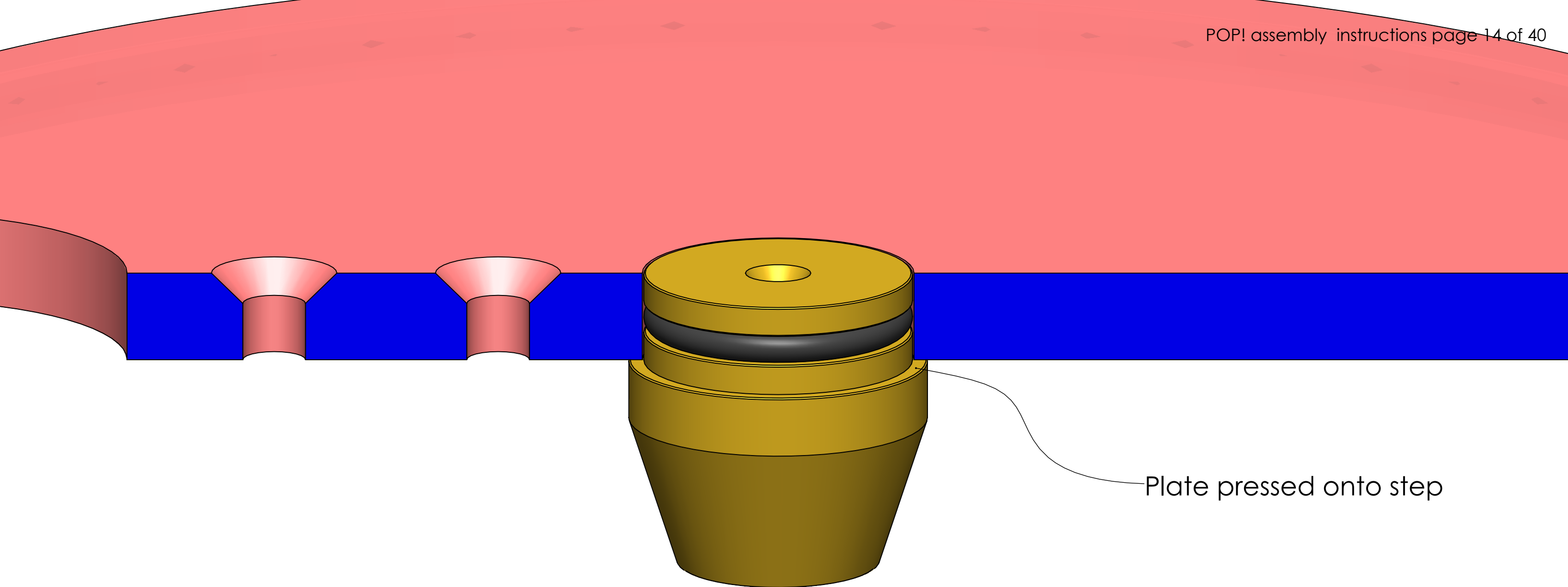
Place the gland as shown on a hard work surface (1).

With the bottom face of the top plate upwards (2) lower the plate down (3) over the gland until the edge of the hole (4) is touching the black rubber O ring in the gland (5).

Place your fingers closely and evenly around the gland hole and carefully press the plate down over the gland (6).

The O ring on the gland will compress as you press the plate down and provide an airtight seal between the gland and the plate. Correct fitting is shown on the next page.





Check that the gland is correctly fitted into the top plate.

The plate should be pressed all the way down so that the face of the plate is against the step on the gland.

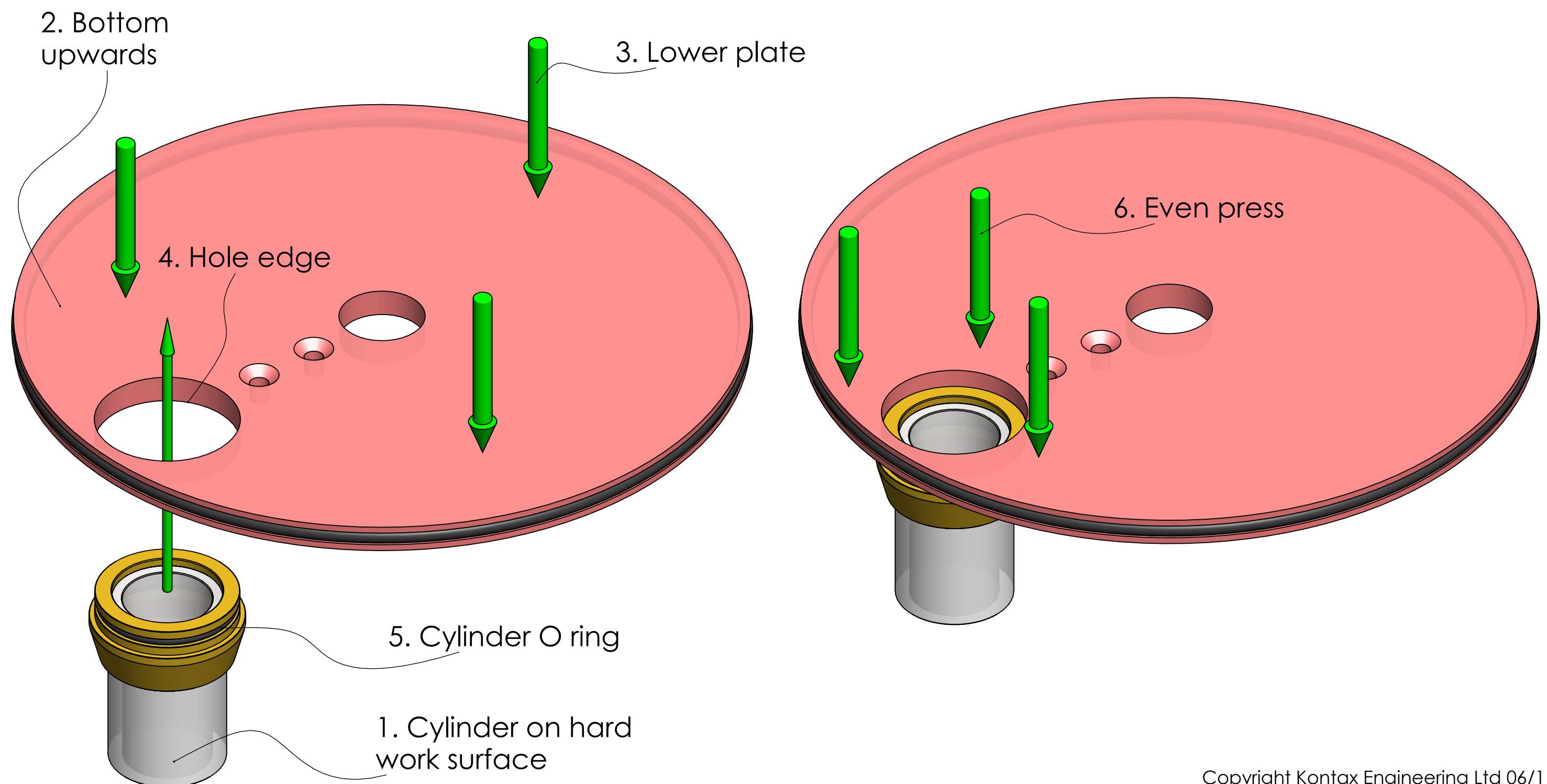
Note: Top plate is shown cut away for clarity.

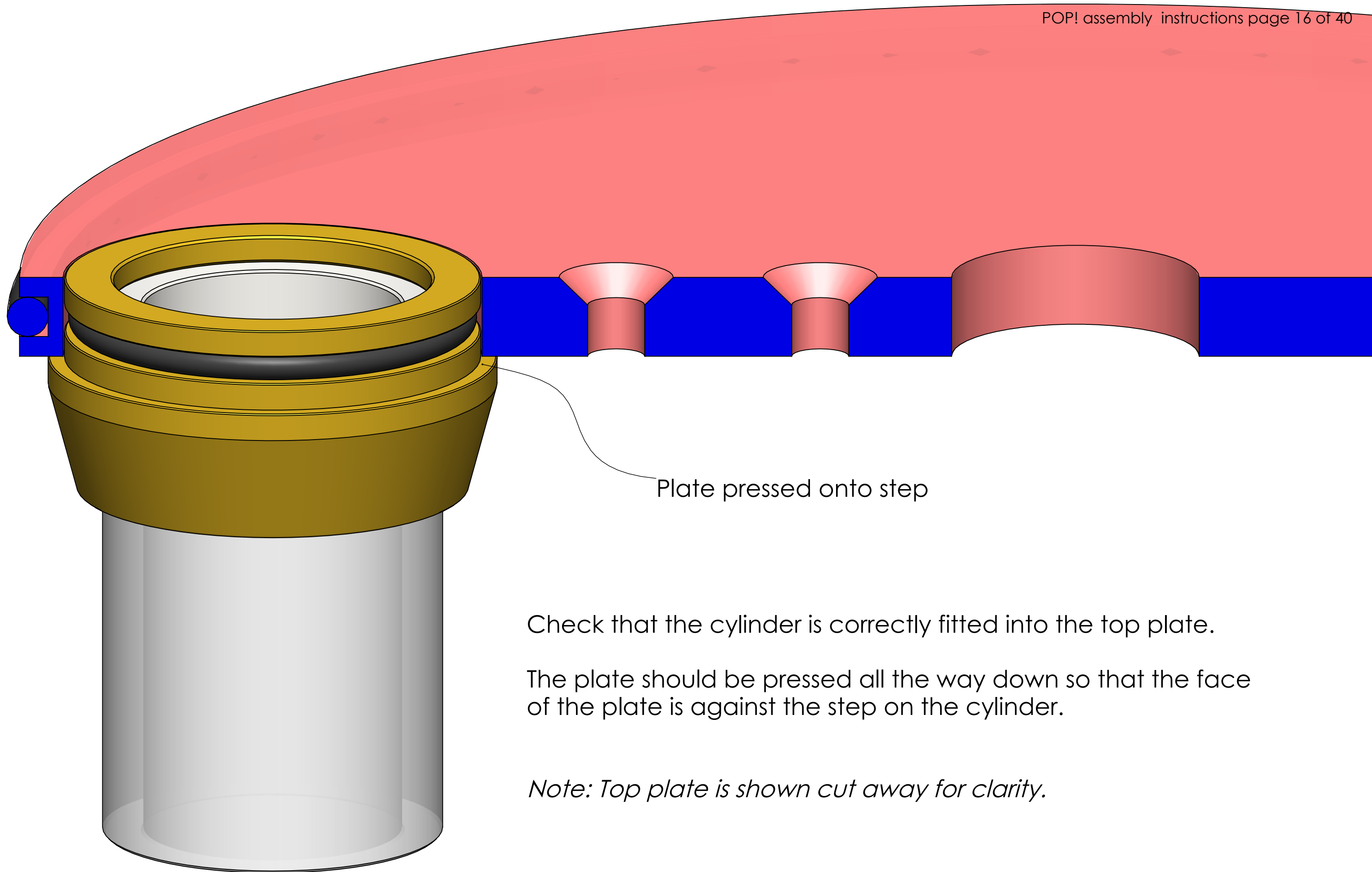
Place the cylinder as shown on a hard work surface (1).

With the bottom face of the top plate upwards (2) lower the plate down (3) over the cylinder until the edge of the hole (4) is touching the black rubber O ring in the cylinder (5).

Place your fingers closely and evenly around the cylinder hole and carefully press the plate down over the cylinder (6).

The O ring on the cylinder will compress as you press the plate down and provide an airtight seal between the cylinder and the plate. Correct fitting is shown on the next page.



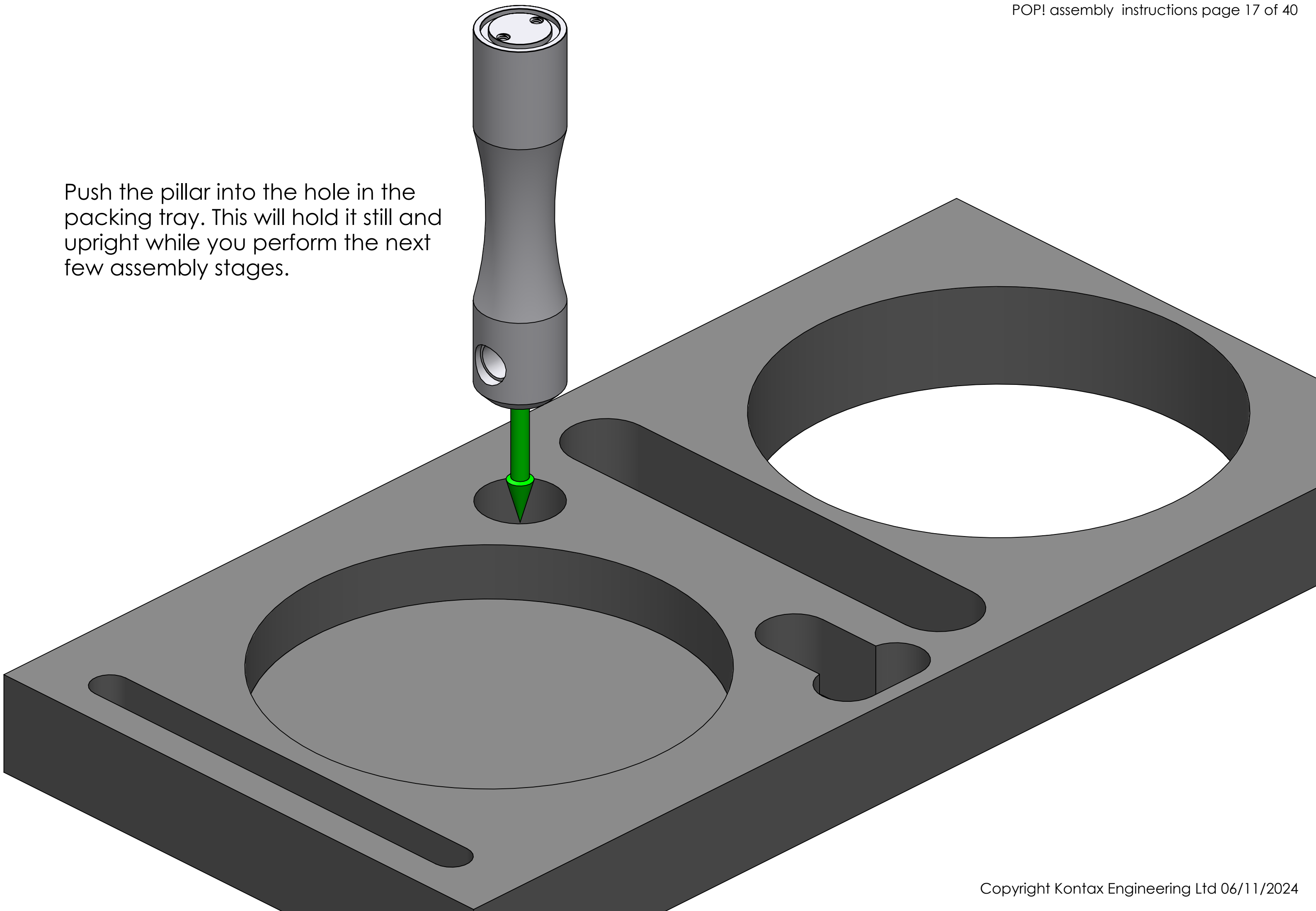


Check that the cylinder is correctly fitted into the top plate.

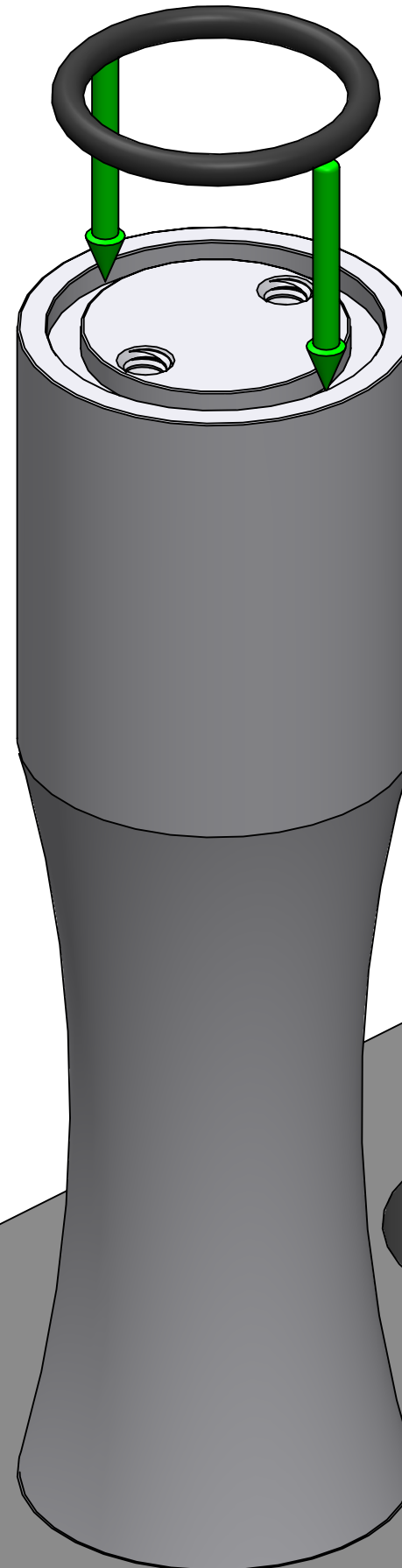
The plate should be pressed all the way down so that the face of the plate is against the step on the cylinder.

Note: Top plate is shown cut away for clarity.

Push the pillar into the hole in the packing tray. This will hold it still and upright while you perform the next few assembly stages.



Fit the small O ring into the groove in the pillar.

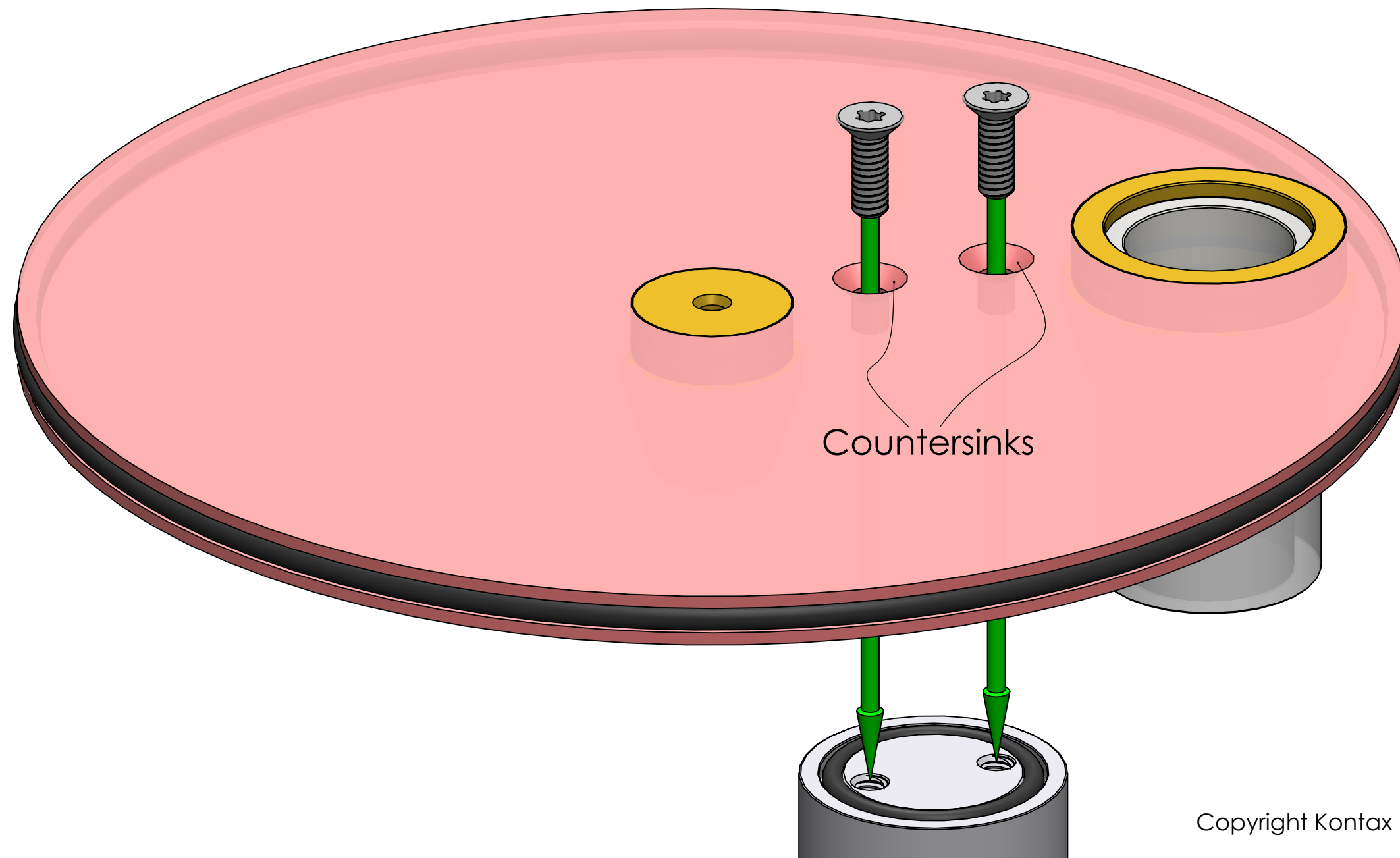


With the cylinder and gland downwards, lower the top plate onto the pillar.

Screw the two countersunk screws through the plate into the pillar so that they just touch the countersinks in the plate. Make sure the O ring in the pillar does not become dislodged.

When the screws are both touching the countersinks they can be tightened.

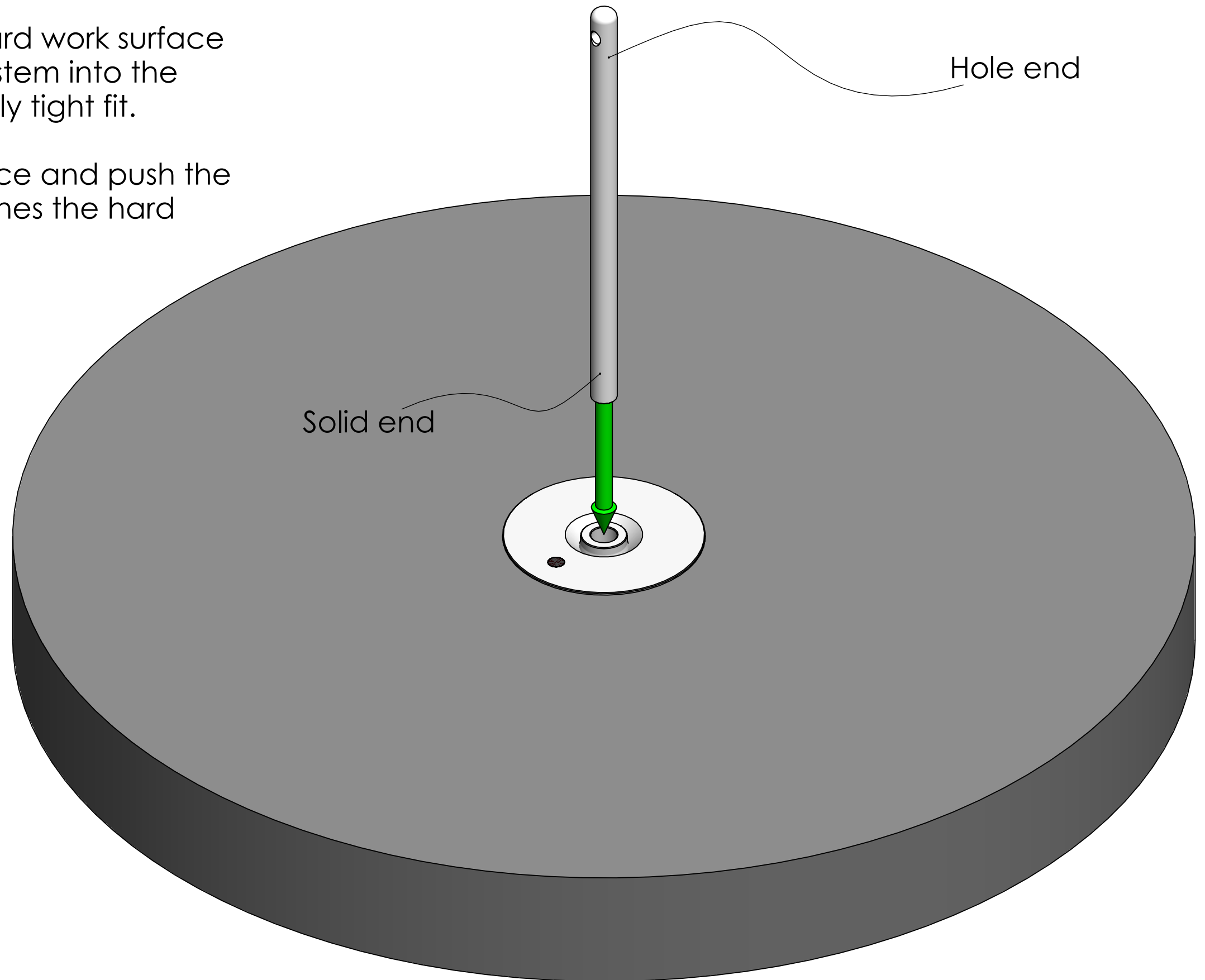
Note: If you tighten the first screw all the way in before the second one is touching the countersink you may find the second hole isn't aligned and you cannot fit the second screw.



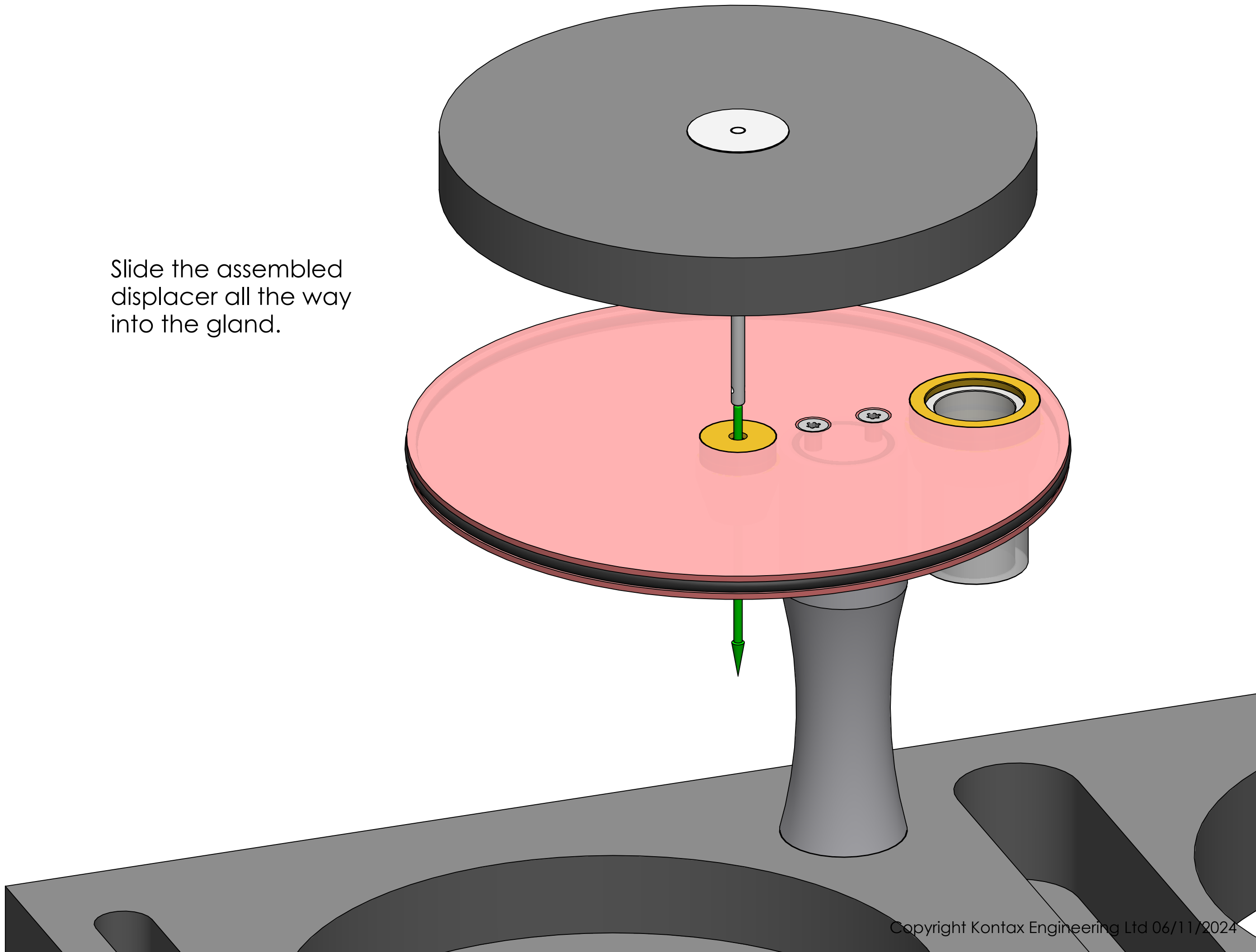
One end of the stem is solid and the other has a small hole through it.

Place the displacer on your hard work surface and push the solid end of the stem into the displacer, it will be a reasonably tight fit.

Hold the displacer firmly in place and push the stem all the way in until it touches the hard surface.



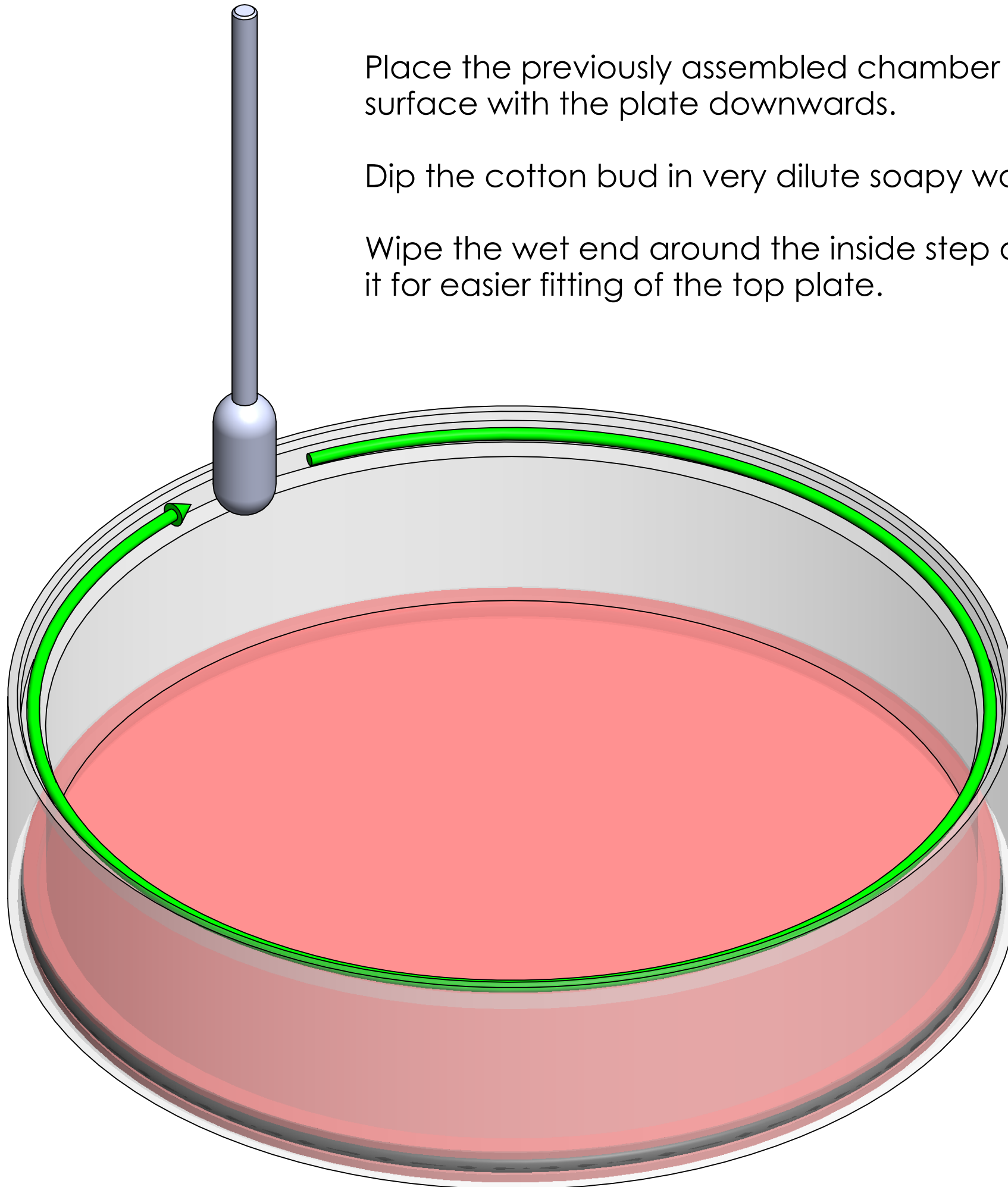
Slide the assembled
displacer all the way
into the gland.

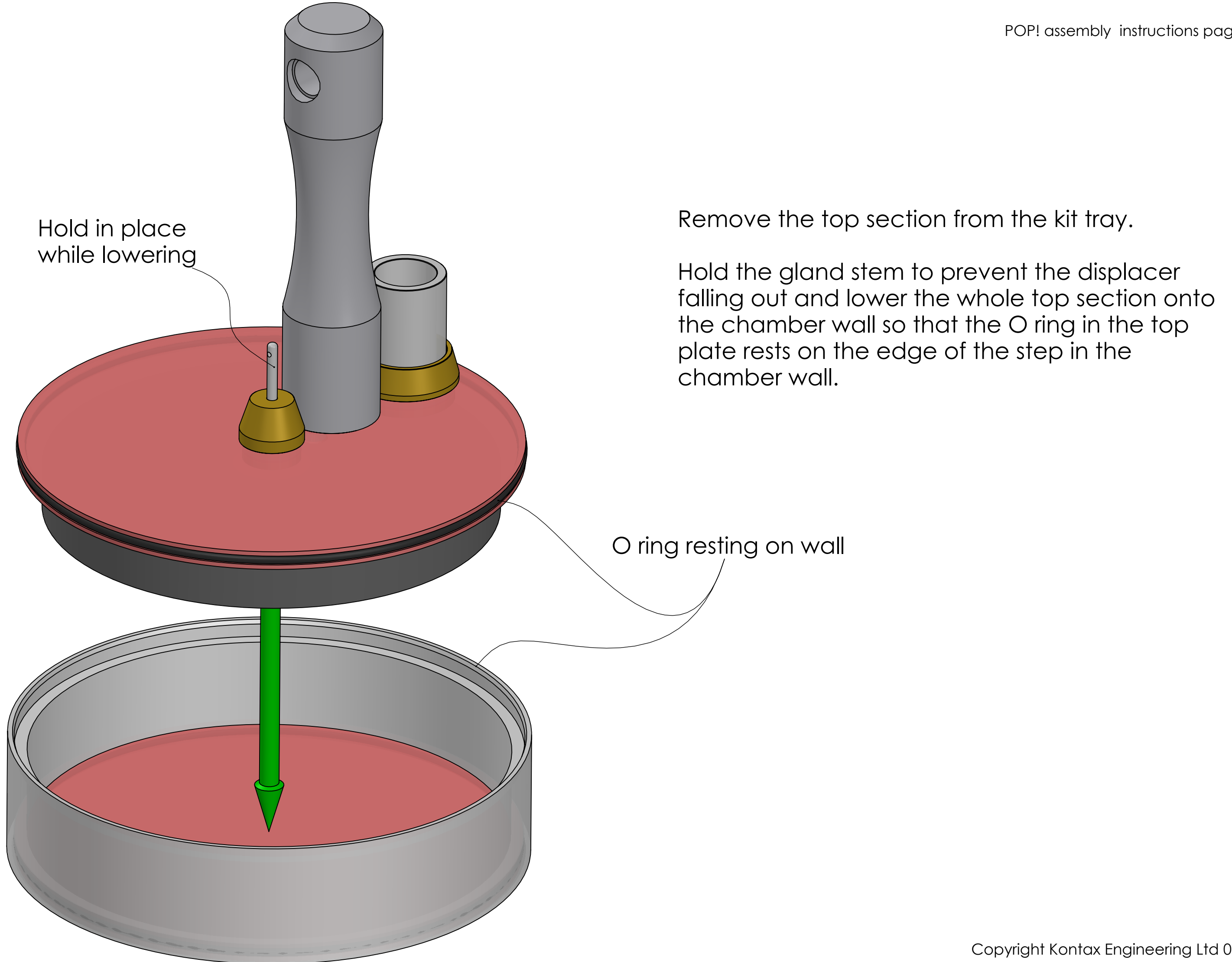


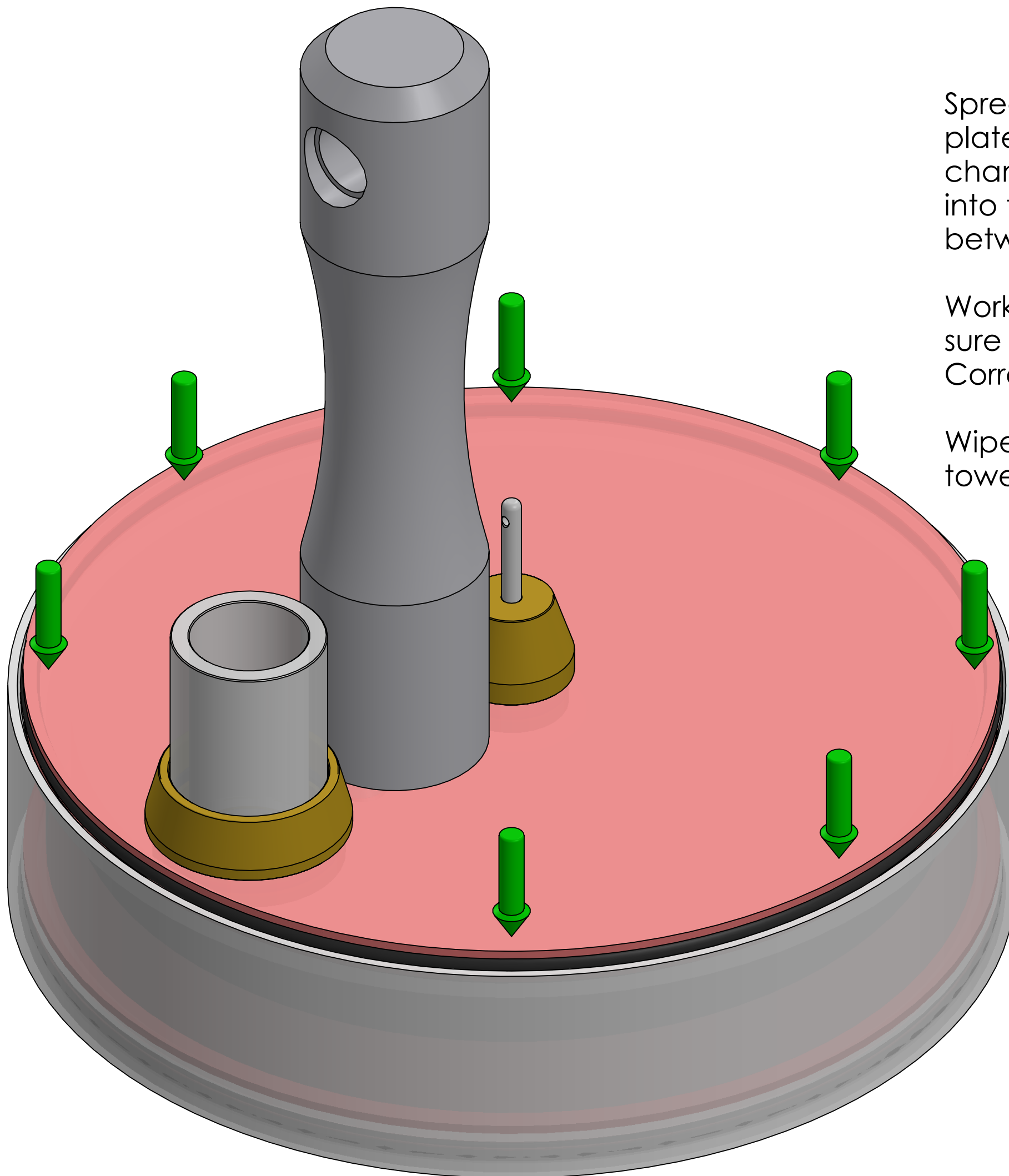
Place the previously assembled chamber wall and bottom plate on your work surface with the plate downwards.

Dip the cotton bud in very dilute soapy water and shake off any excess drips.

Wipe the wet end around the inside step of the chamber wall. This will lubricate it for easier fitting of the top plate.







Spread your fingers evenly around the edge of the plate and gently press it into the step on the chamber wall, the O ring in the plate will squeeze into the step on the wall and provide an airtight seal between the plate and wall.

Work your way around the edge of the plate making sure it is pressed in all the way in all the way round. Correct fitting is shown on the next page.

Wipe away any excess soapy water with a paper towel.

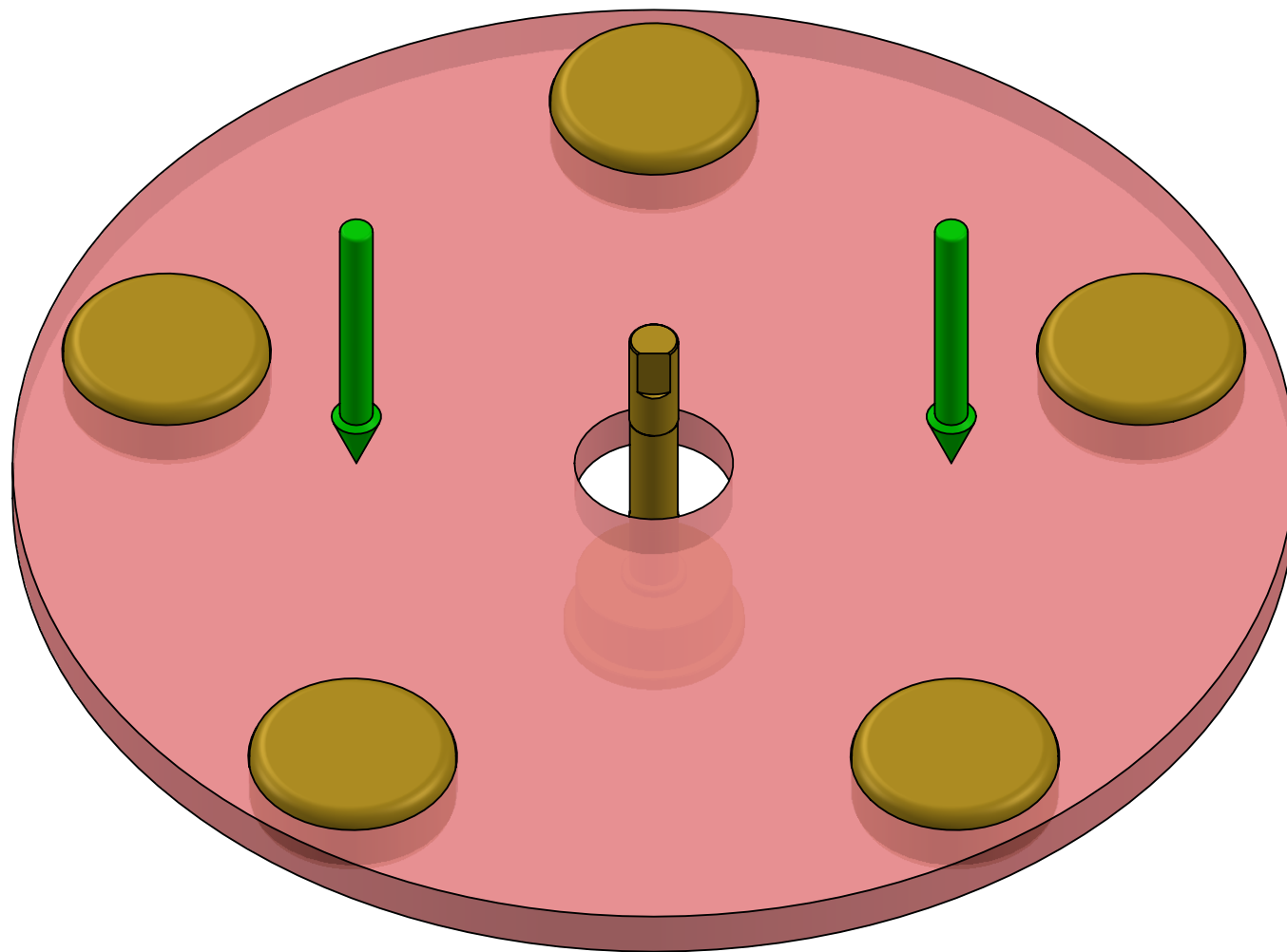


Check that the plate is pressed fully into the step on the wall.

Note 1: Chamber wall is shown cut away for clarity

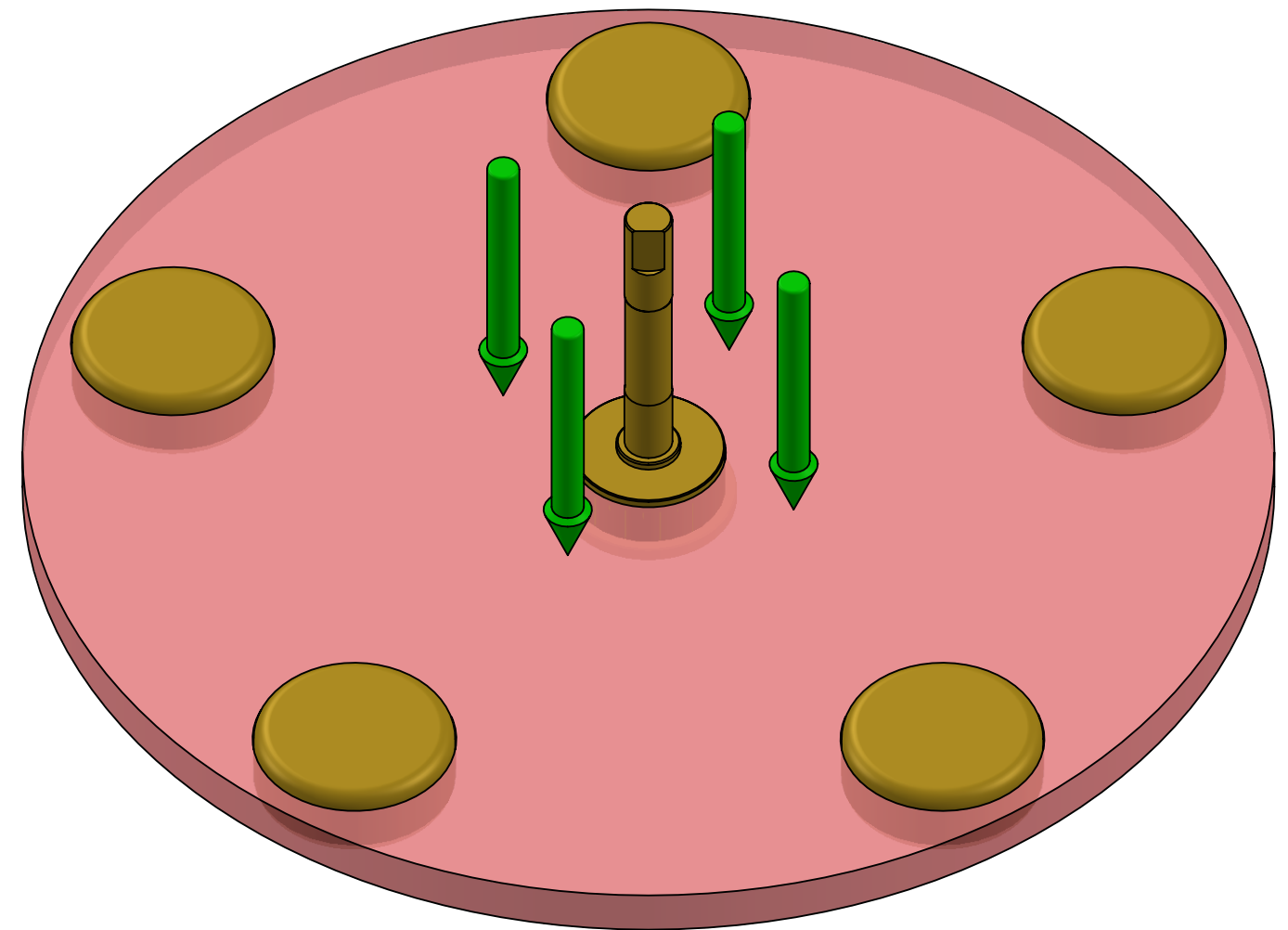
Note 2: the acrylic sheet used for making the plates can vary slightly in thickness so the top of the plate might sit very slightly above or below the top edge of the chamber wall. This is normal and will not affect performance at all.

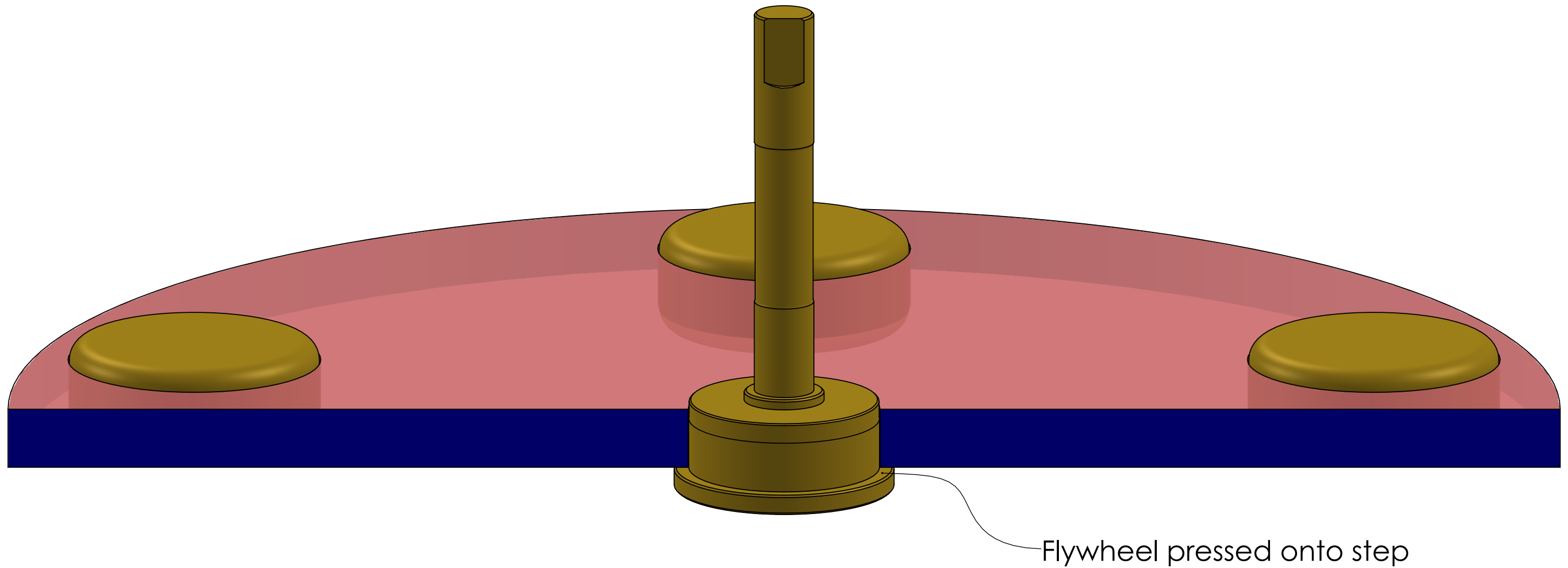
Place the axle upright on your hard work surface and lower the flywheel onto it.



Spread your fingers evenly around the middle and VERY carefully press the flywheel all the way down onto the axle. Make sure when pressing down that you press vertically.

Correct fitting is shown on the next page.

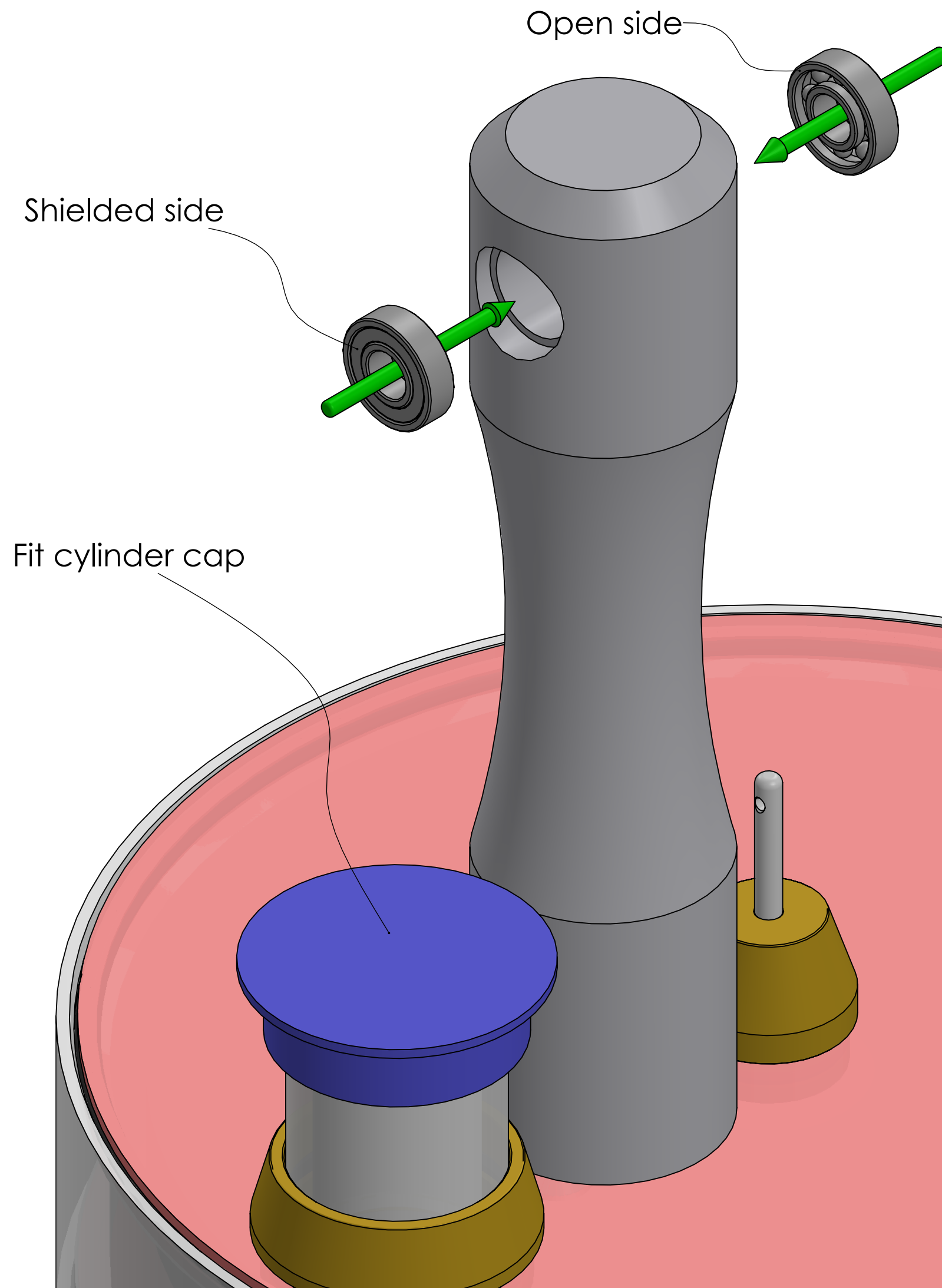




Check that the flywheel is correctly fitted onto the axle.

The flywheel should be pressed all the way down so that the face of the flywheel is against the step on the axle.

Note: Flywheel is shown cut away for clarity.



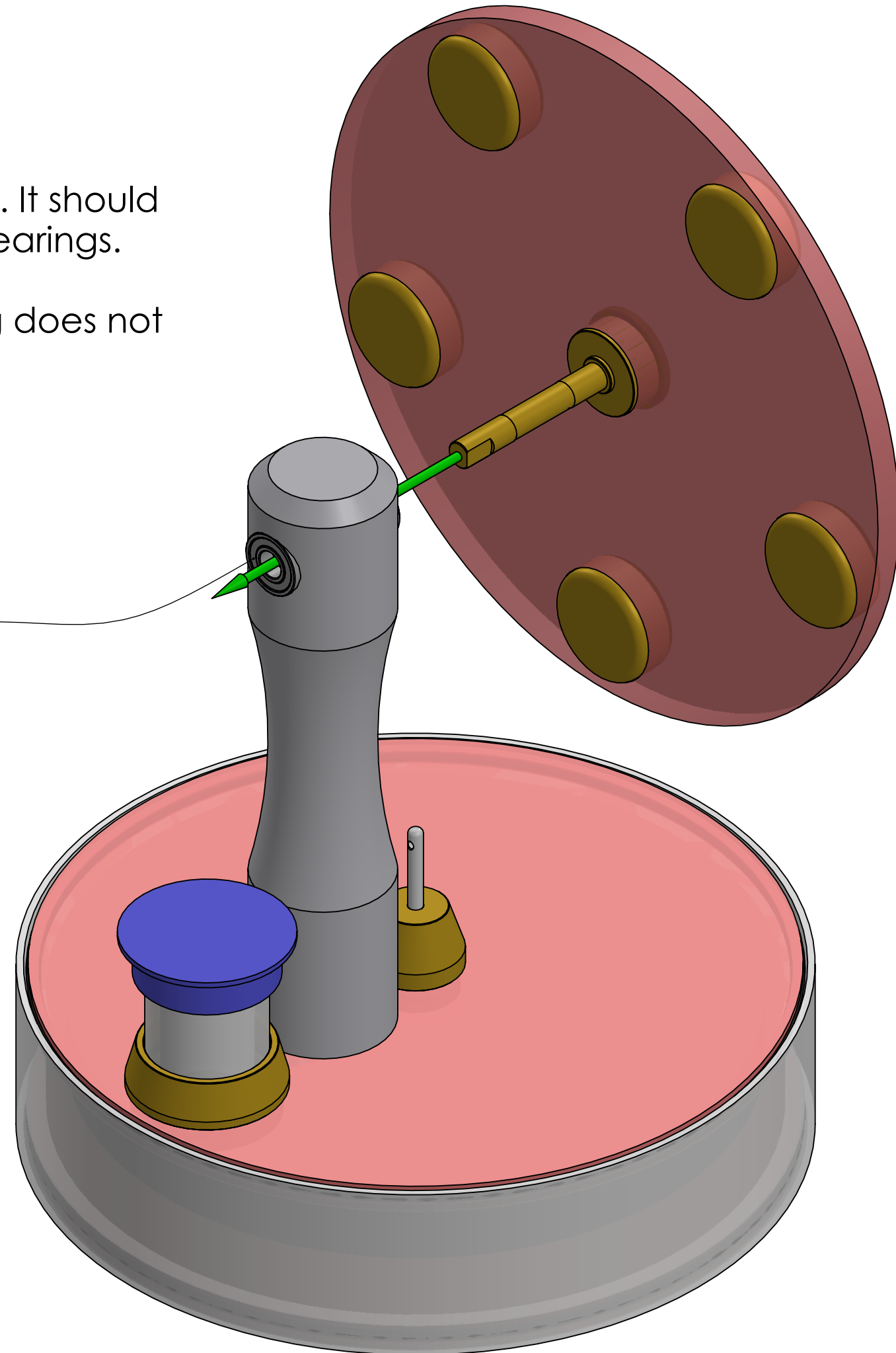
Fit the cylinder cap over the glass cylinder, this will prevent small parts falling into the main chamber.

Fit the two bearings into the recesses in the top of the pillar. The bearings have a shield on one side and are open on the other. The shielded sides should face outwards after fitting.

Slide the axle through the bearings. It should be a good fit but not tight in the bearings.

Take care that the second bearing does not get pushed out by the axle.

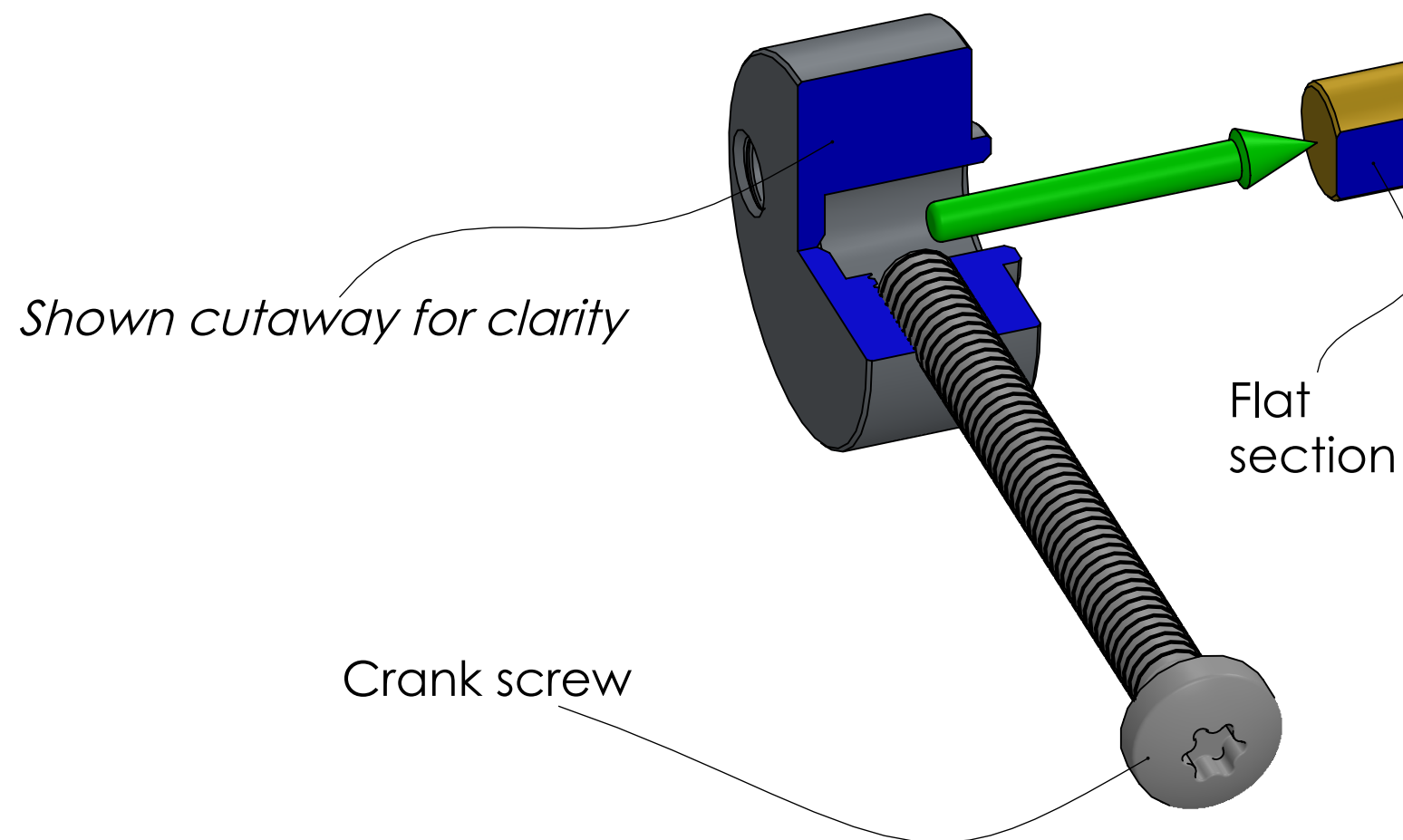
Second bearing



Identify the flat section on the axle.

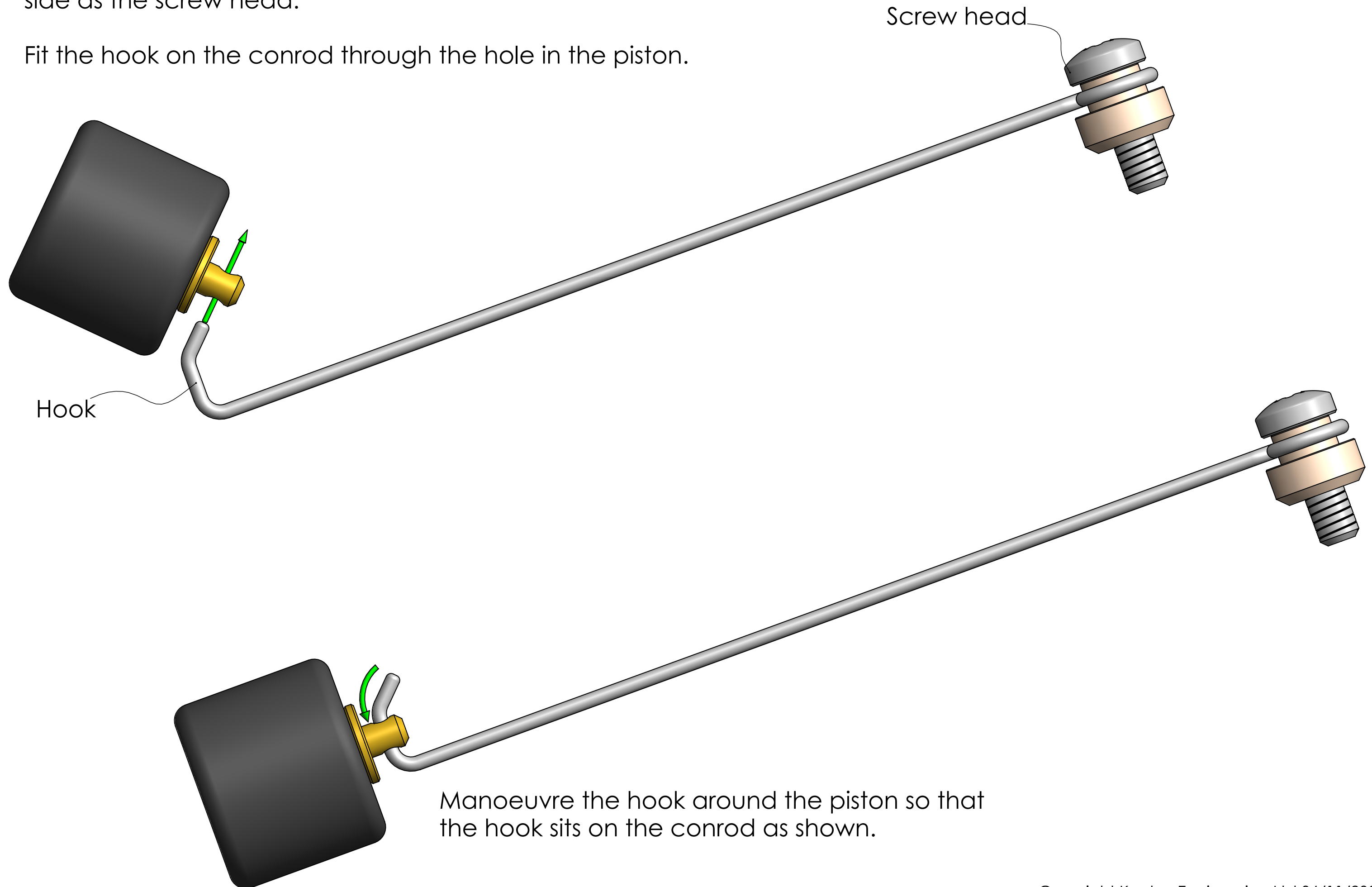
Slide the crank onto the end of the axle, the crank screw should be aligned perpendicular to the flat section on the end of the axle. Screw the screw gently onto the flat section and carefully tighten.

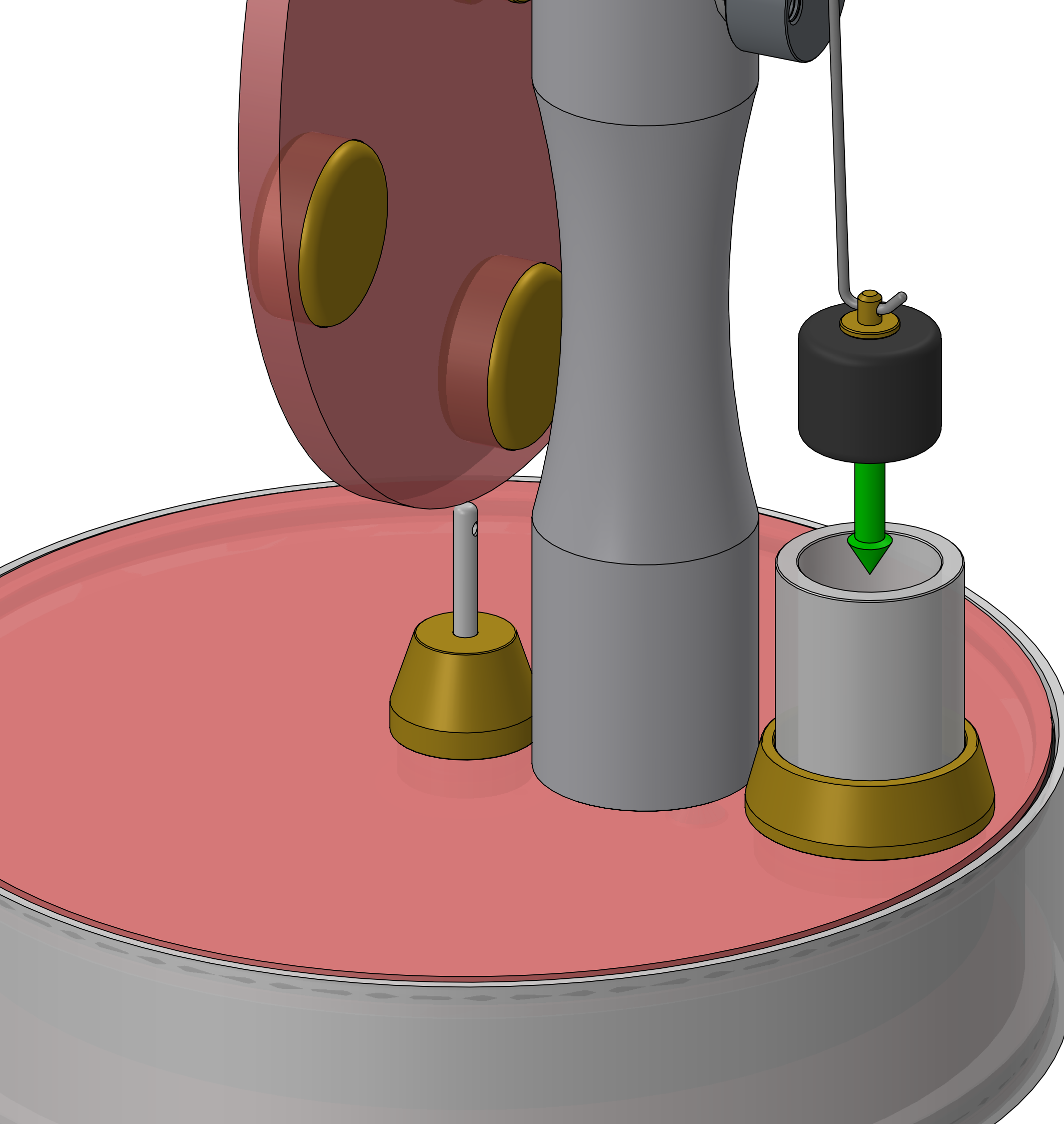
Note: Crank shown cutaway for clarity.



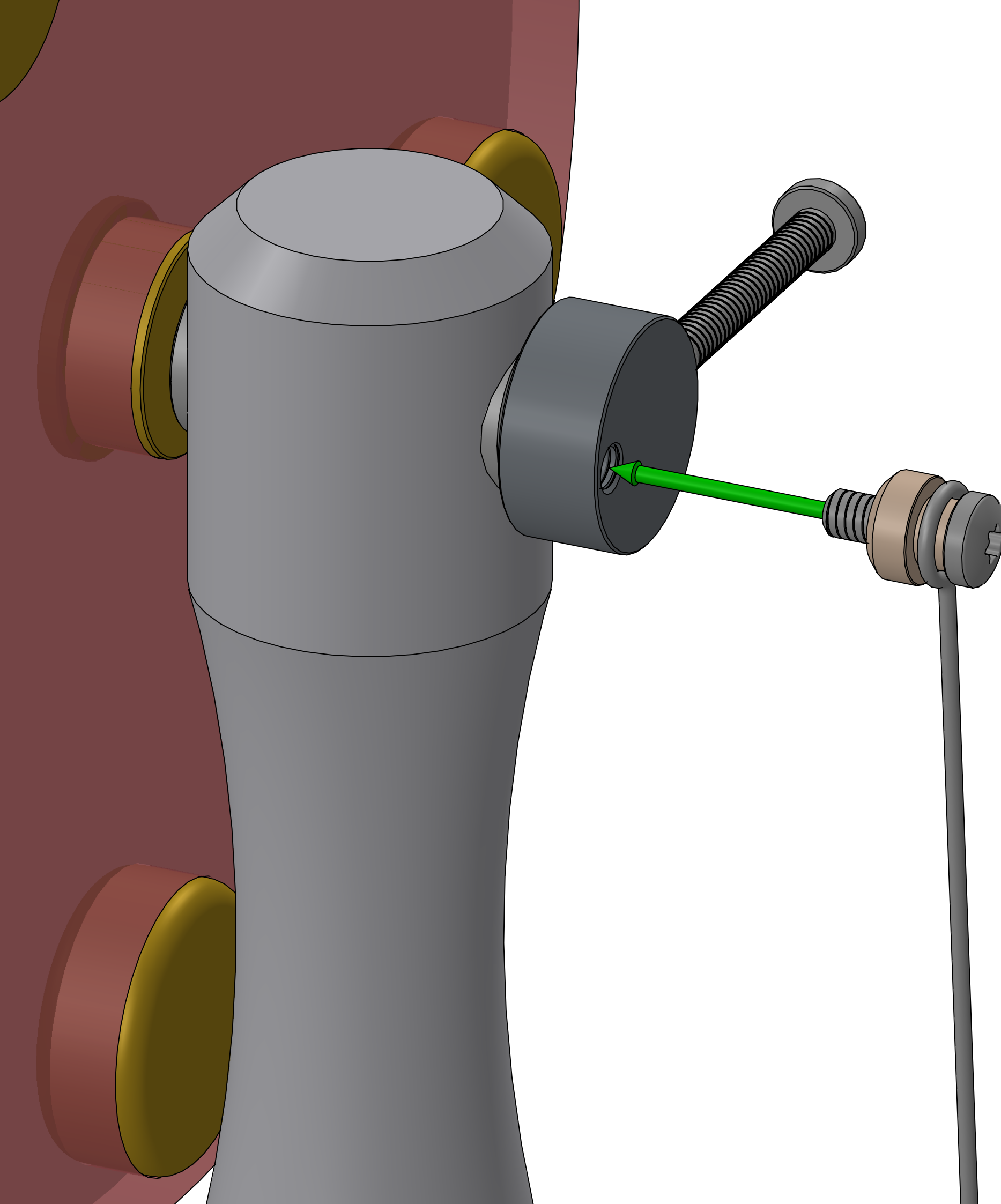
Identify the piston conrod, it is the conrod with the hook on the same side as the screw head.

Fit the hook on the conrod through the hole in the piston.





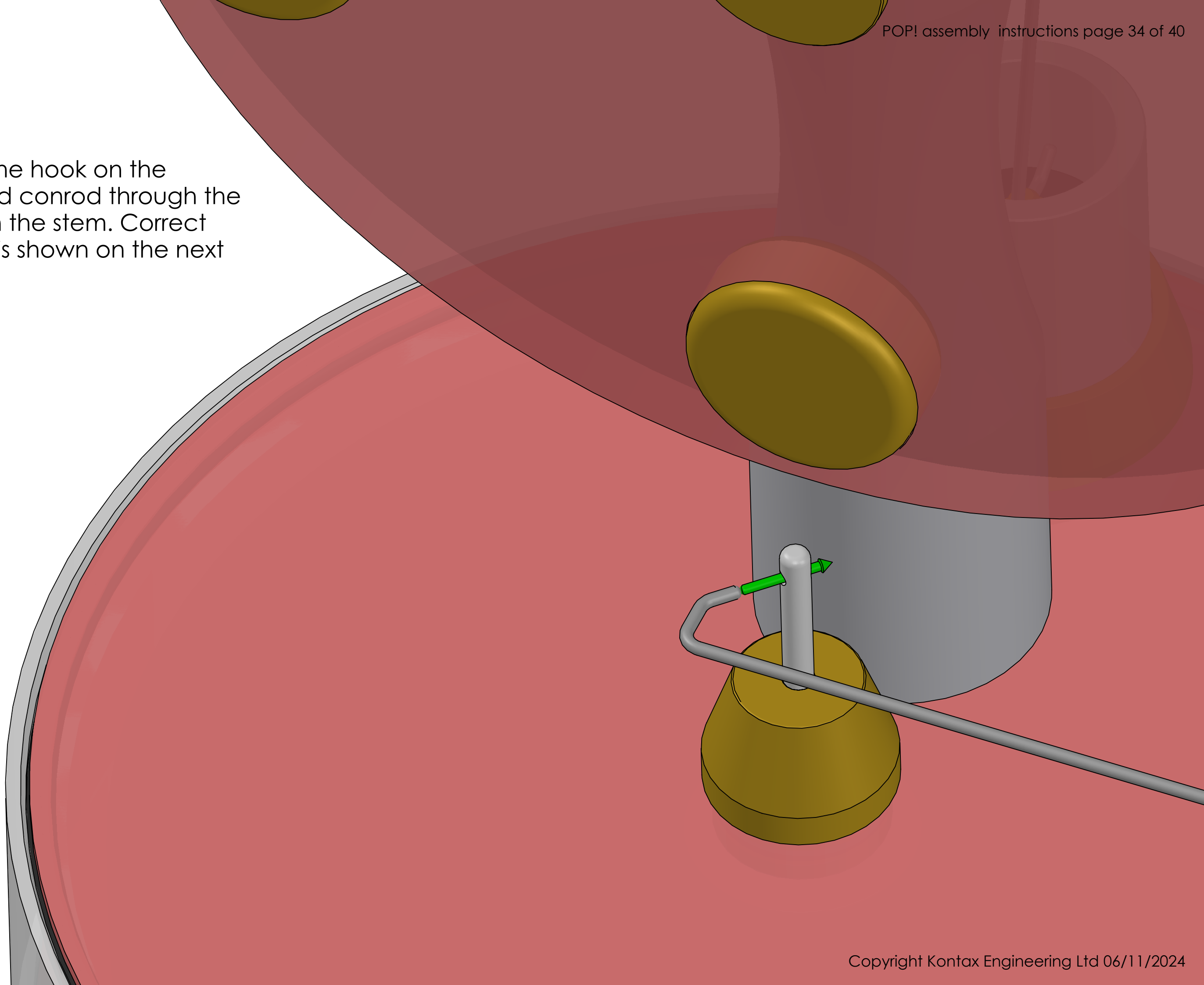
Slide the piston & conrod
into the glass cylinder.



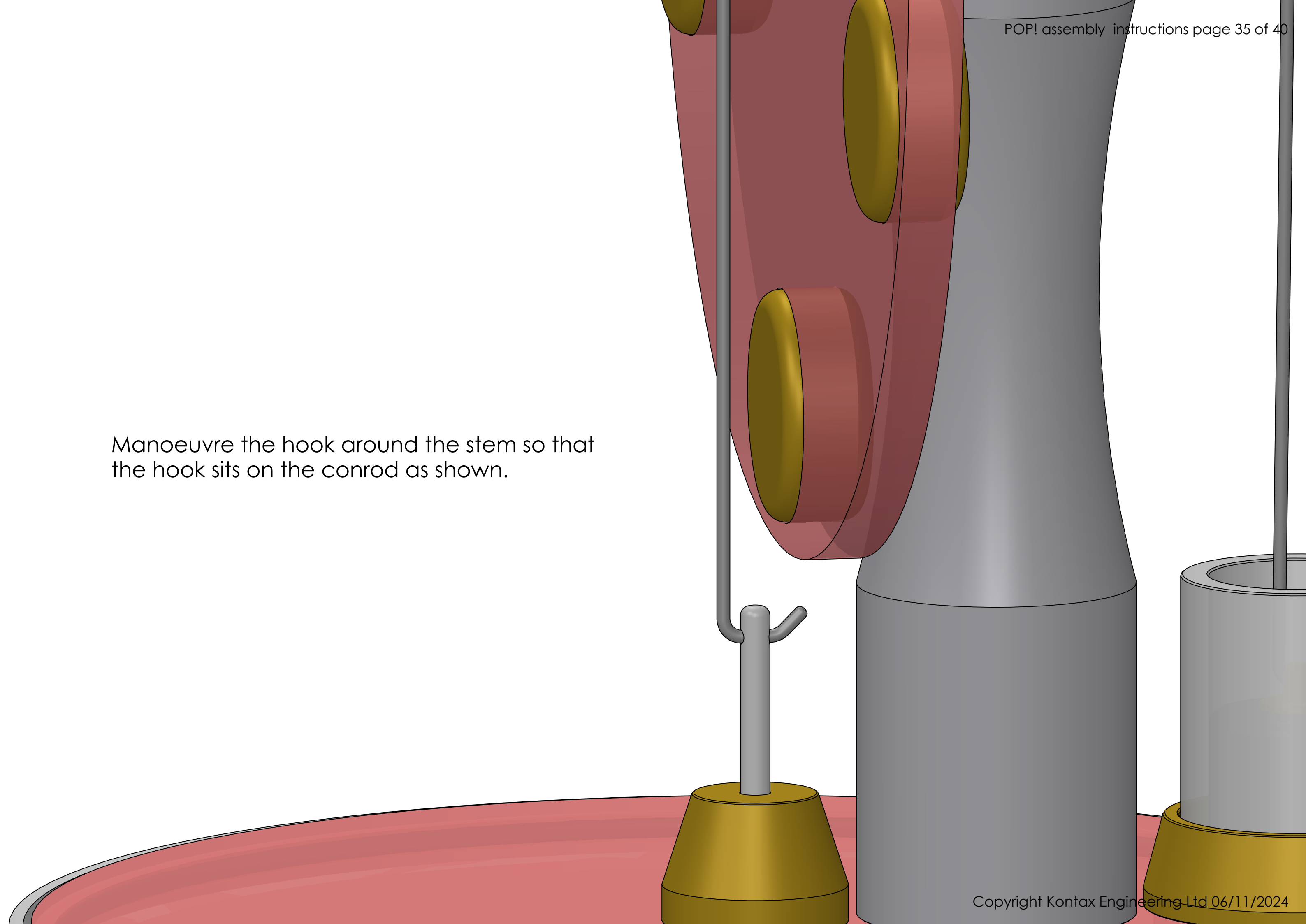
Screw the conrod screw into the crank.

Tighten only sufficient to hold in place, over-tightening could cause the conrod bush to expand and pinch the conrod eye, which could prevent your engine from running.

Slide the hook on the second conrod through the hole in the stem. Correct fitting is shown on the next page.

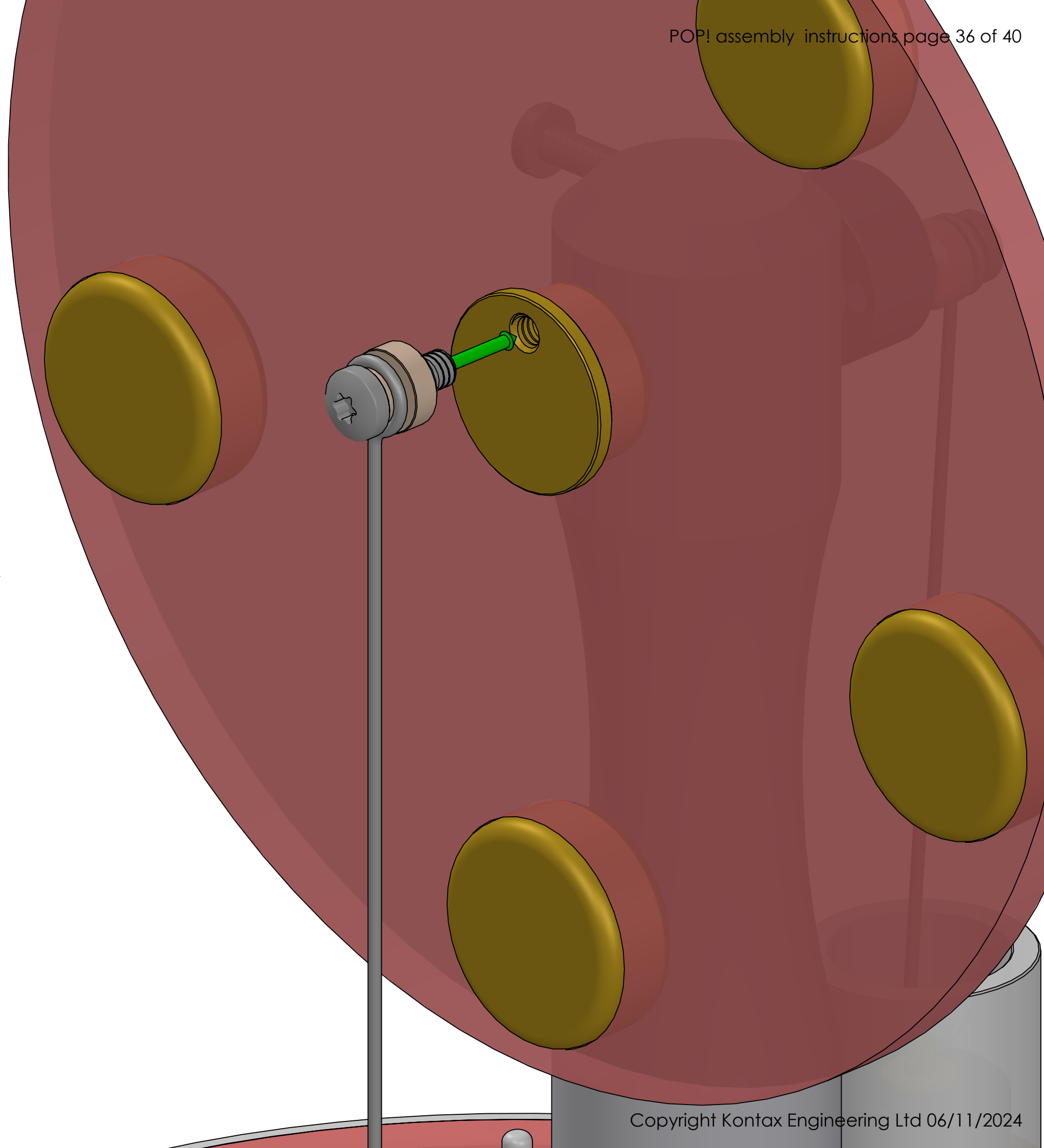


Manoeuvre the hook around the stem so that the hook sits on the conrod as shown.



Screw the conrod screw into the axle.

Tighten only sufficient to hold in place, over-tightening could cause the conrod bush to expand and pinch the conrod eye, which could prevent your engine from running.



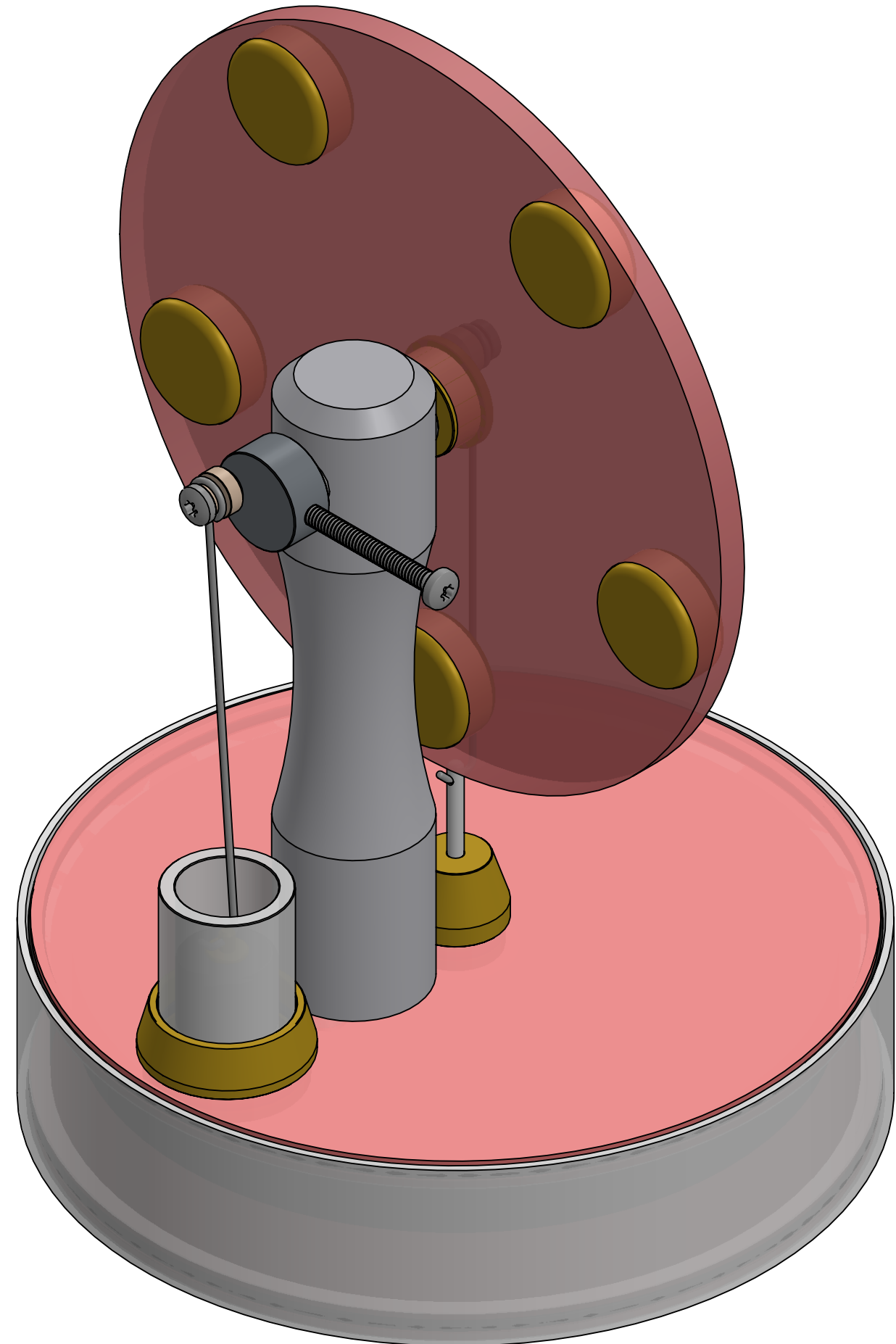
Your POP Stirling engine is now fully assembled.

Check that the flywheel rotates easily, a small amount of resistance will be felt on rotation due to the air pressure inside the main chamber.

Check that the displacer does not bump into either plate. Once you have made these final checks you are ready to operate your engine.

Operation and maintenance information can be found in the next few pages.

If you need help with your engine you can email us at: support@stirlingengine.co.uk



POP! operation

The POP! Stirling engine has been designed to run on a low temperature difference, between 15°C and 20°C. It will run from a wide variety of heat sources, including Digital TV box, 3D printer bed, table lamp, hot water, tea or coffee, warm sunlight.

The engine is not self-starting, you will need to give the flywheel a little spin to get it going. After the engine has been on your heat source for minute or two gently spin the flywheel clockwise to start it. You may need to spin the engine a couple of times for it to pick up and start running.

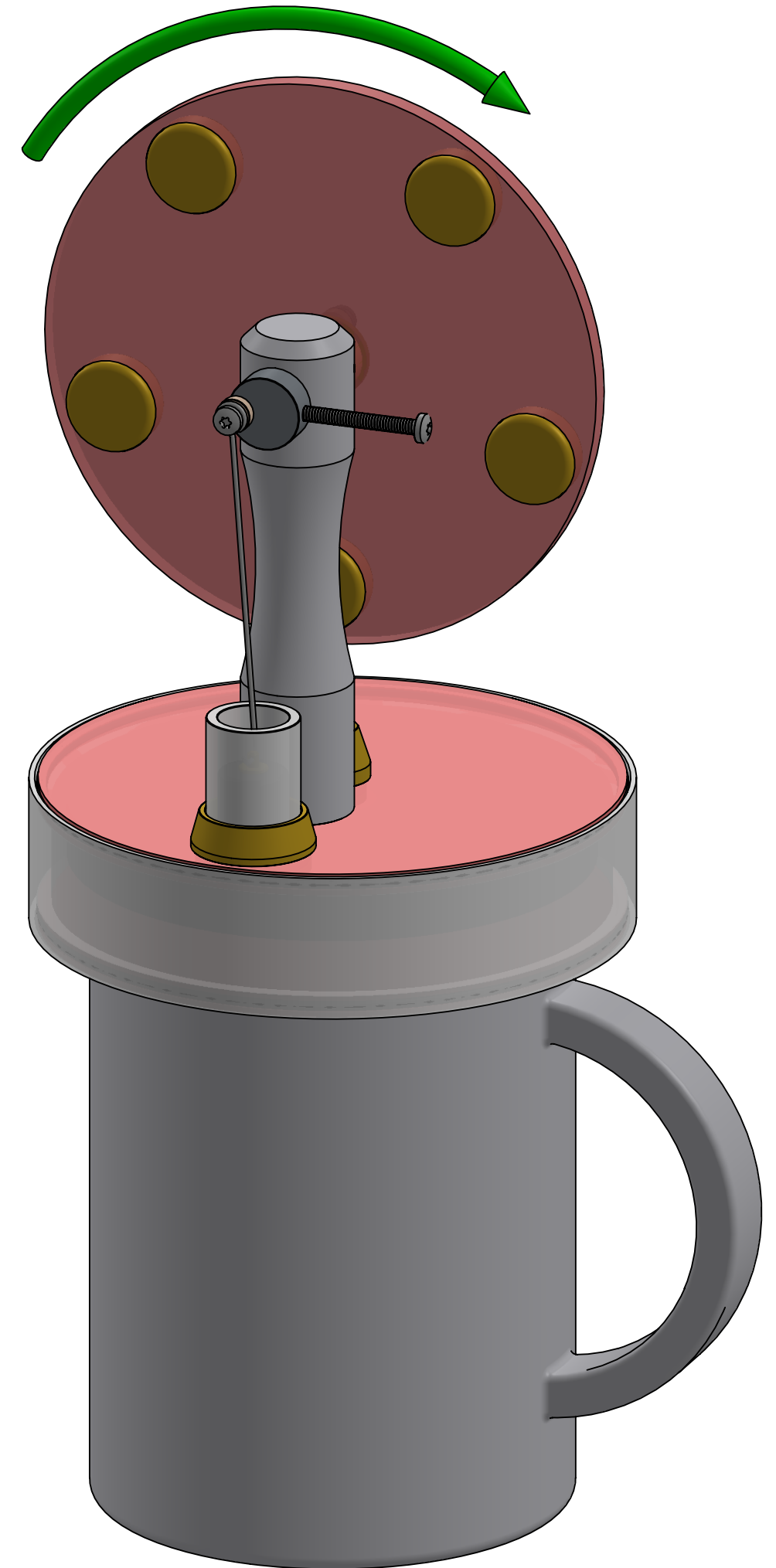
The engine will operate in reverse if you place it on ice. This is because Stirling engines operate on a temperature difference, and it doesn't matter if the bottom plate is warm and the top plate cool, or if the bottom is cool and the top warm.

IMPORTANT:

Anything hotter than hot water WILL damage the engine. DO NOT place it on any high temperature heat sources (cooker, wood burning stove, candle etc.). This will melt a number of parts on the engine.

If you wish to operate your engine on a cup of hot liquid (water, tea, coffee) you must allow the liquid to cool for a few minutes first and it must be at least 2cm down from the top of the container. Hot liquid must never come into contact with the engine.

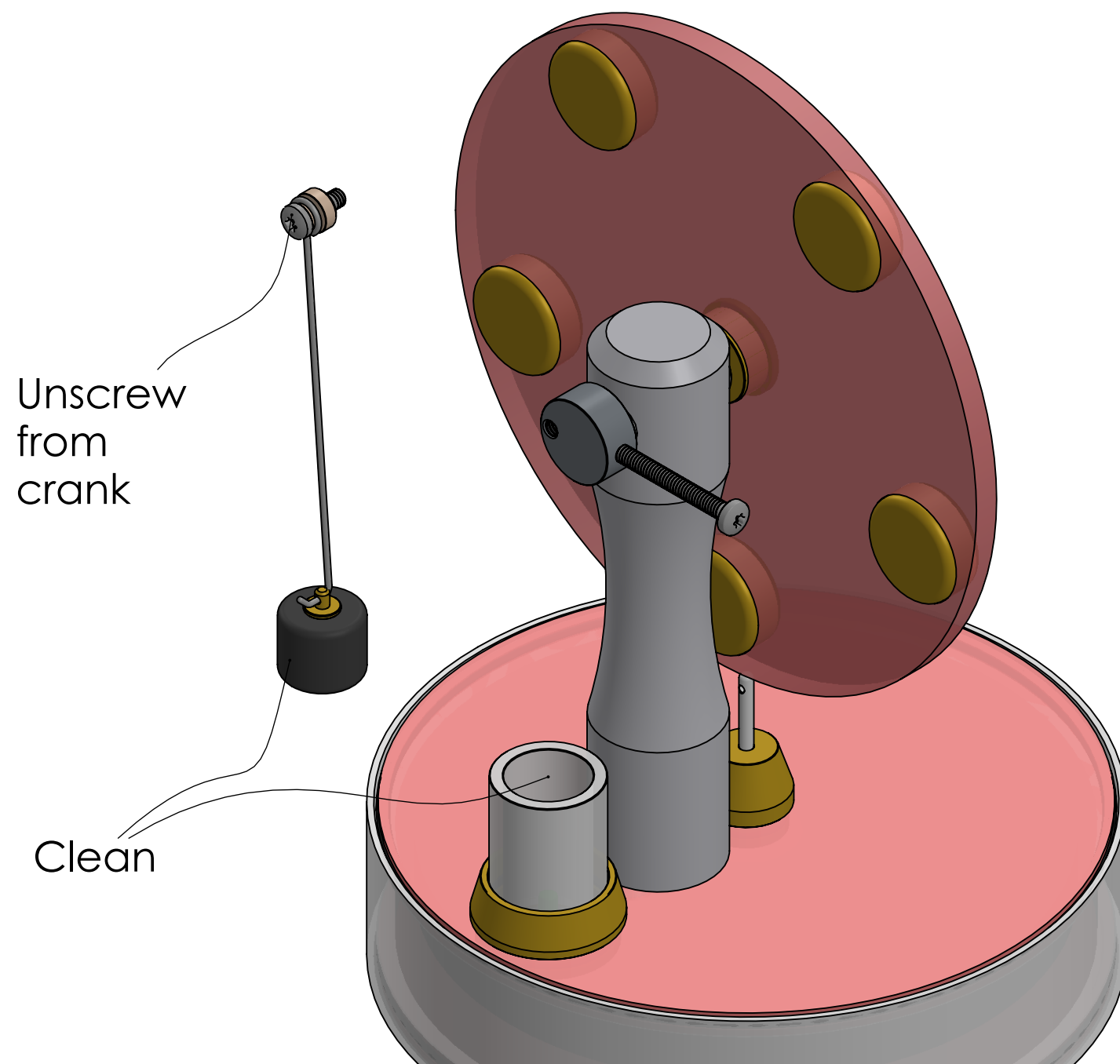
The hottest heat source that you should use for your engine should not be hotter than 70°C (158°F).



Your POP! engine should run for many hours maintenance free.
Eventually, however, household dust might get into some parts and they might need cleaning.

PISTON/CYLINDER CLEANING

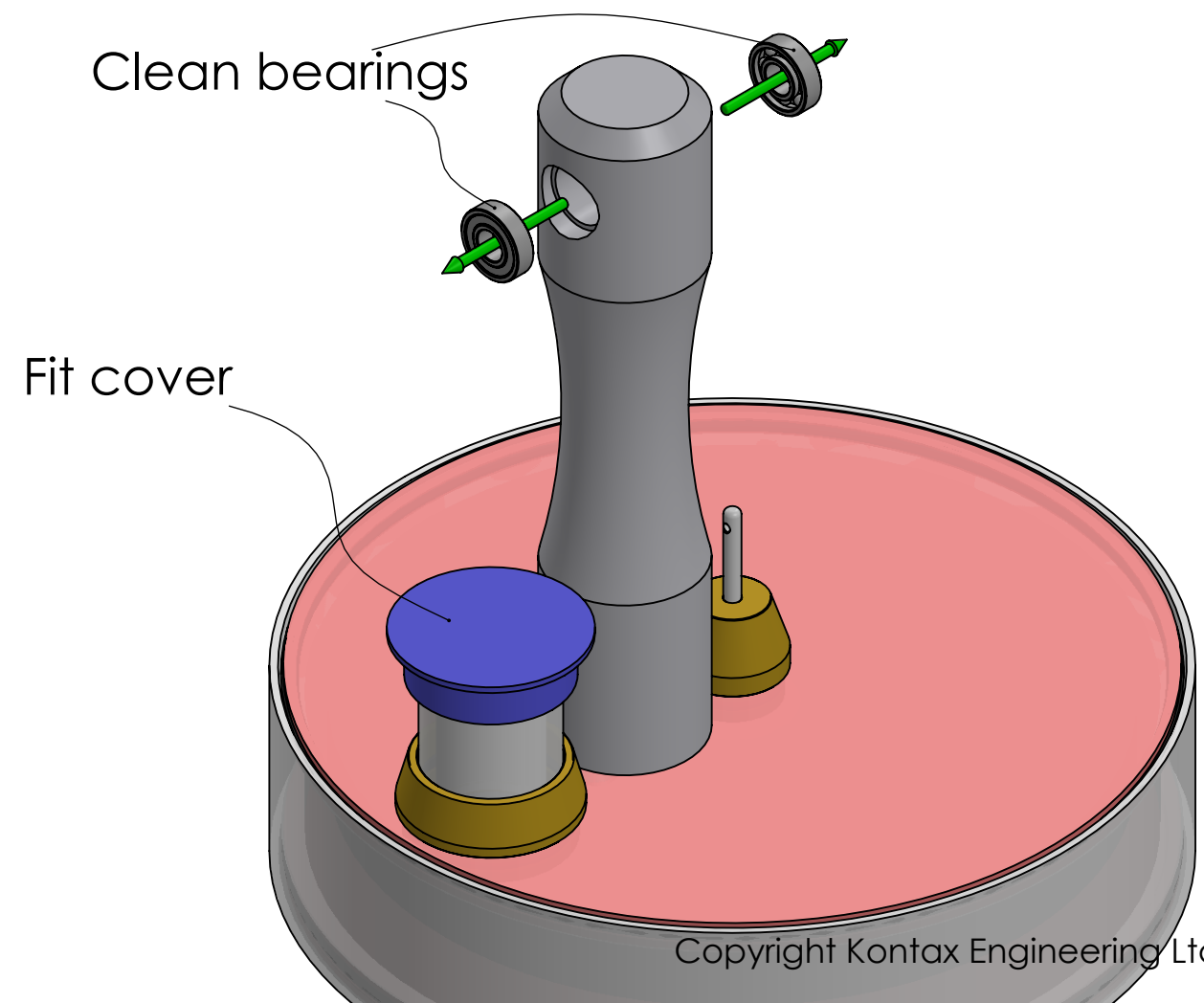
Unscrew the piston conrod, remove the piston and wipe it and the inside of the glass cylinder with a DRY paper towel.
Refit and test.



BEARINGS CLEANING

Unscrew and remove both conrods from the engine. Fit the cylinder cover over the cylinder to prevent the bearings falling in. Unscrew and remove the crank and flywheel.

Remove and rinse the bearings in Methylated spirits or Denatured alcohol and allow to dry on a paper towel. Refit and test.





Our workshop is located in the Thames Valley, United Kingdom and is staffed by a skilled team of 9 designers, machinists and assemblers. We have 3 CNC mills, 3 CNC lathes and 3 CNC mill-turn centres.