

Prop V Engine Assembly & Operation Instructions

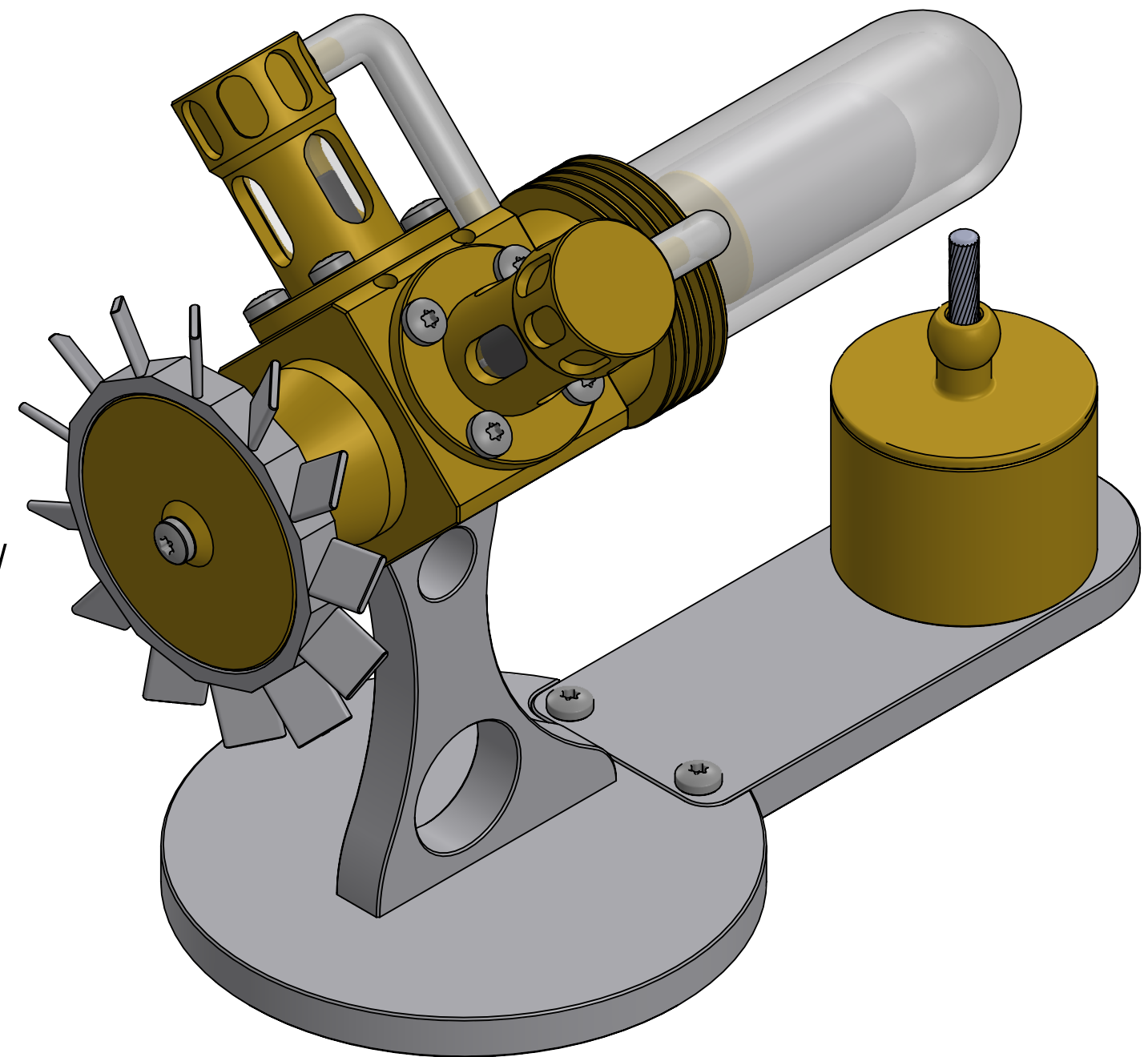
Please read all the way through the assembly instructions to familiarise yourself with the process before you start and pay close attention to the alignment of all the parts in the diagrams.

Assembly time should be approximately 35-40 minutes.

Please take great care when opening the bag of small parts! It is recommended to remove the packing tray from the box and open the bag over the box to catch dropped parts.

The engine parts list starts on the next page.

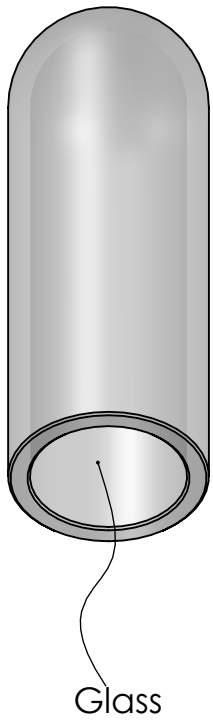
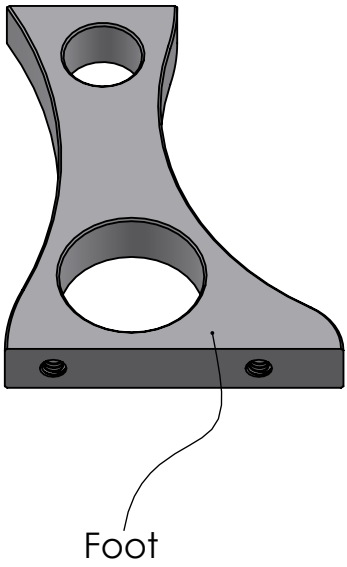
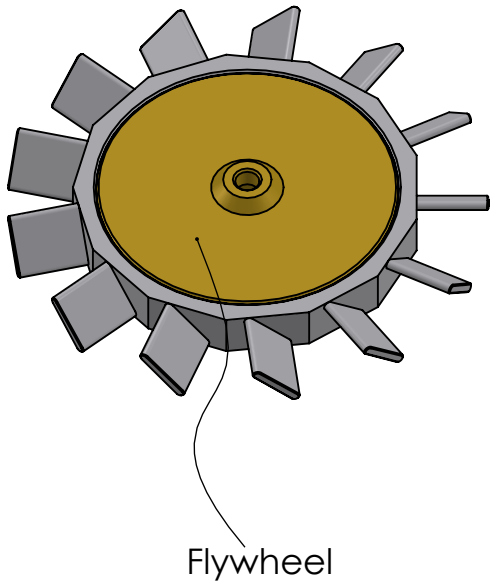
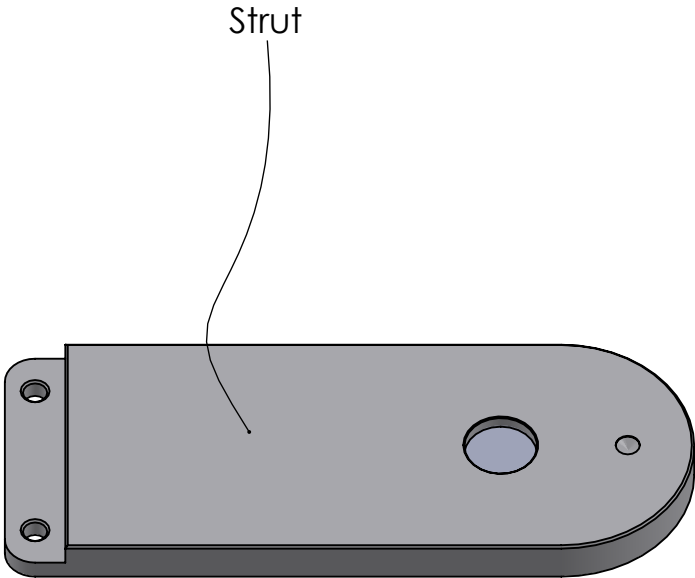
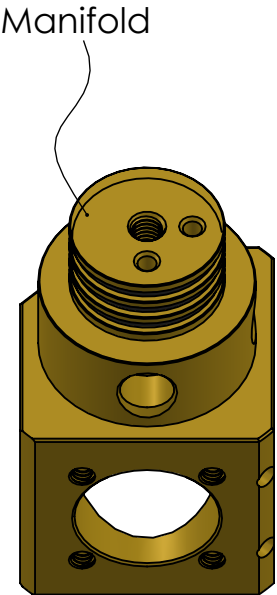
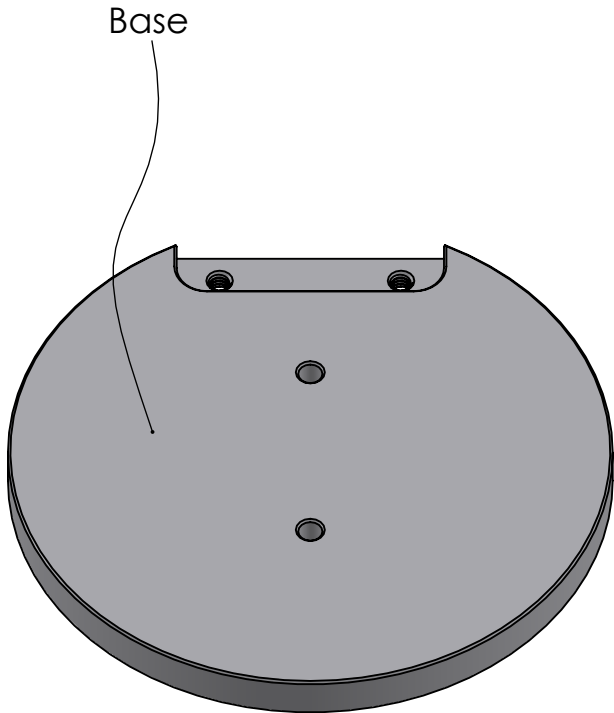
Maintenance and operation instructions can be found at the end of this document.



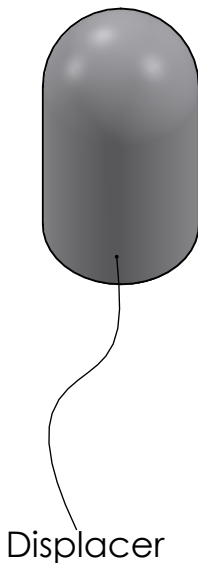
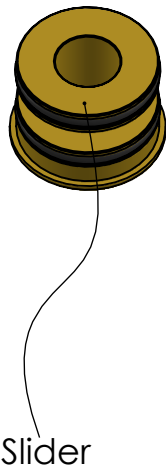
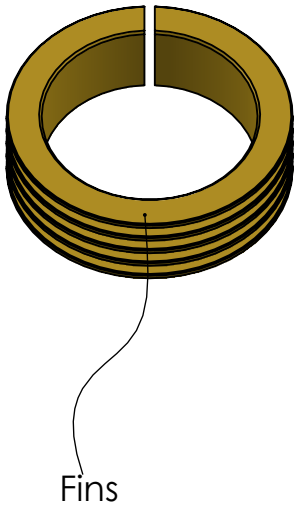
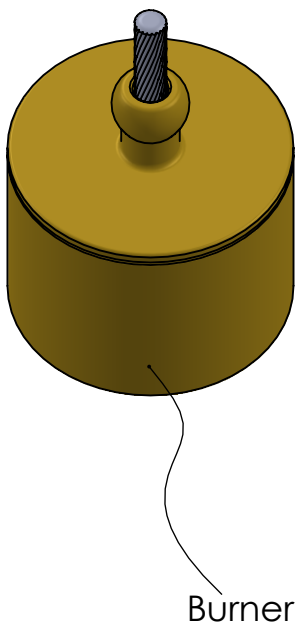
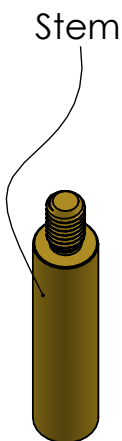
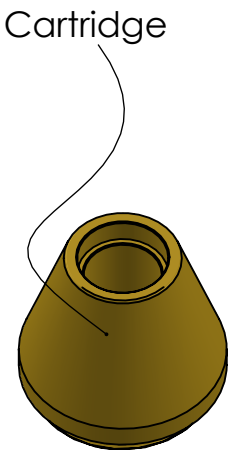
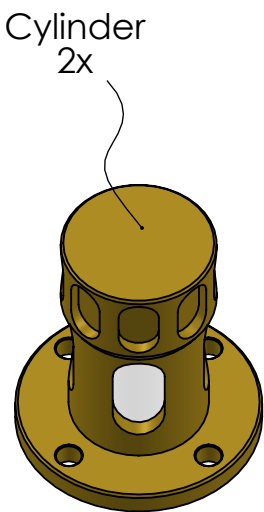
SAFETY NOTICE:

- **All parts of the engine will be very hot while in operation and will take time to cool down after running.**
- **The flame produced by a steel wick can be almost invisible, ensure burner is extinguished after use.**
- **Make sure you have a suitable fire extinguisher to hand in case of emergencies.**
- **Never leave a running engine or naked flame unattended.**
- **Make sure children are fully supervised.**

Prop V Engine Parts 1 / 3

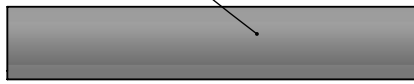


Prop V Engine Parts 2 / 3

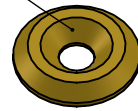


Prop V Engine Parts 3 / 3

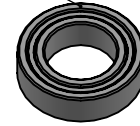
Connecting tube (silicone)
2x



Retainer



Bearing
2x



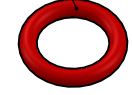
M2x6 roundhead screw
4x (1 spare)



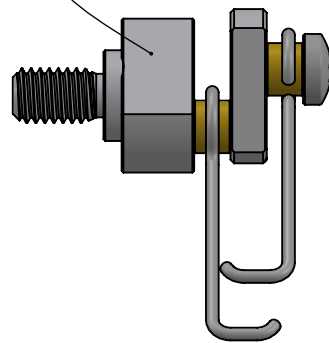
M2x4 roundhead screw
11x (1 spare)



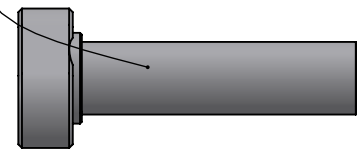
O ring
2x



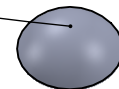
Crankset



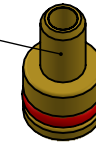
Axle
1x



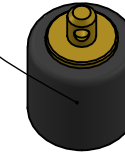
Rubber foot
5x



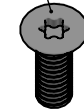
Port
4x



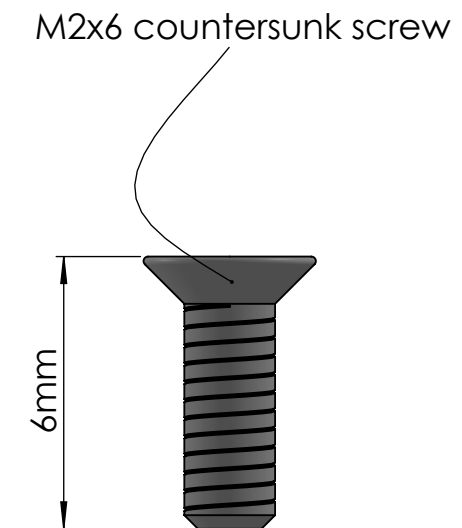
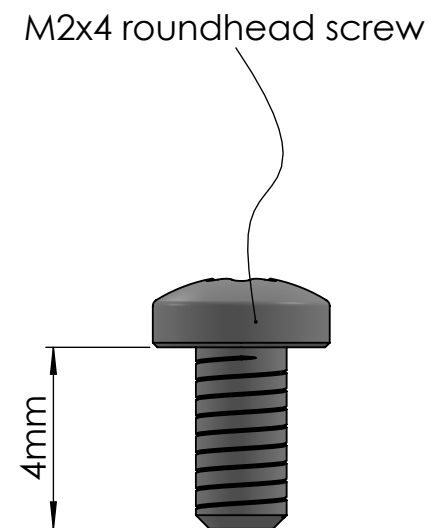
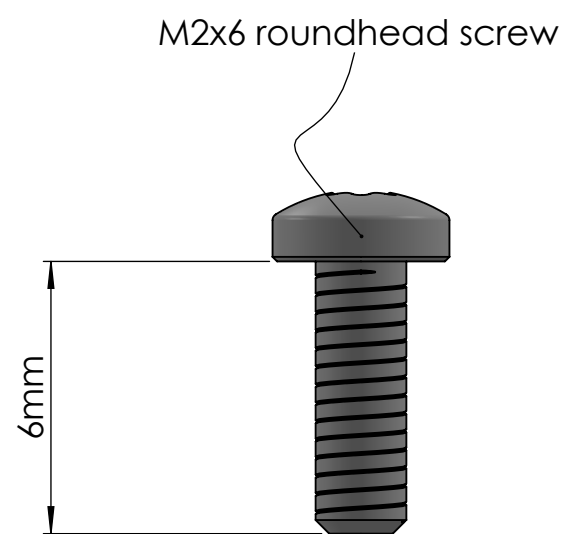
Piston
2x



M2x6 countersunk screw
4x (1 spare)



Prop V Engine screw identification

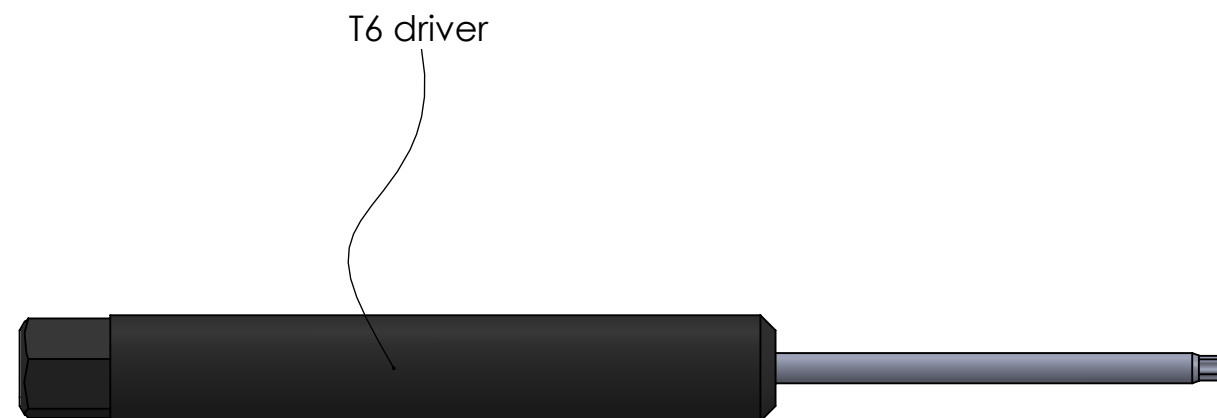
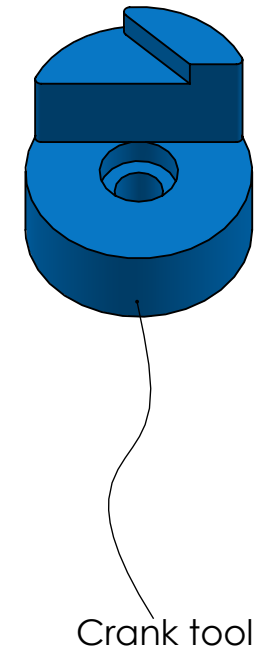
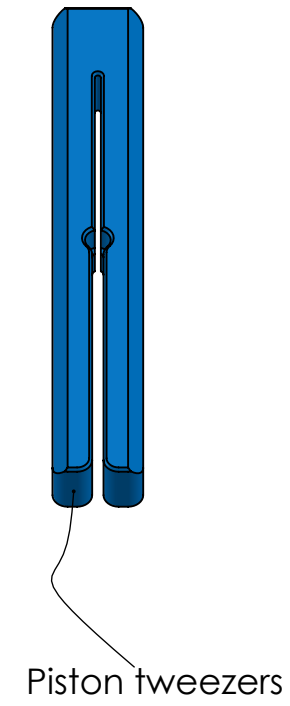
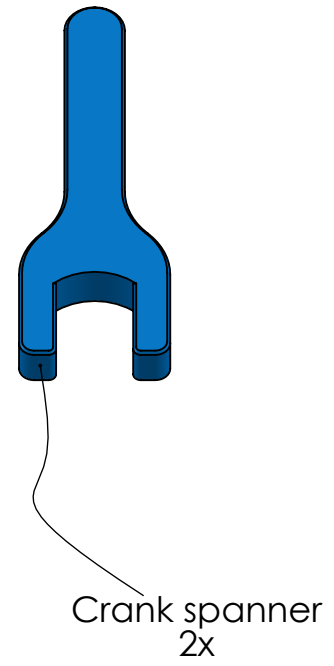
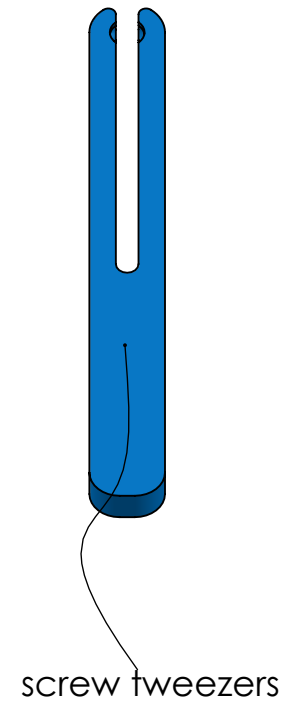


Note: the three types of screws in this kit are similar in length, you can use the above diagram to distinguish them.

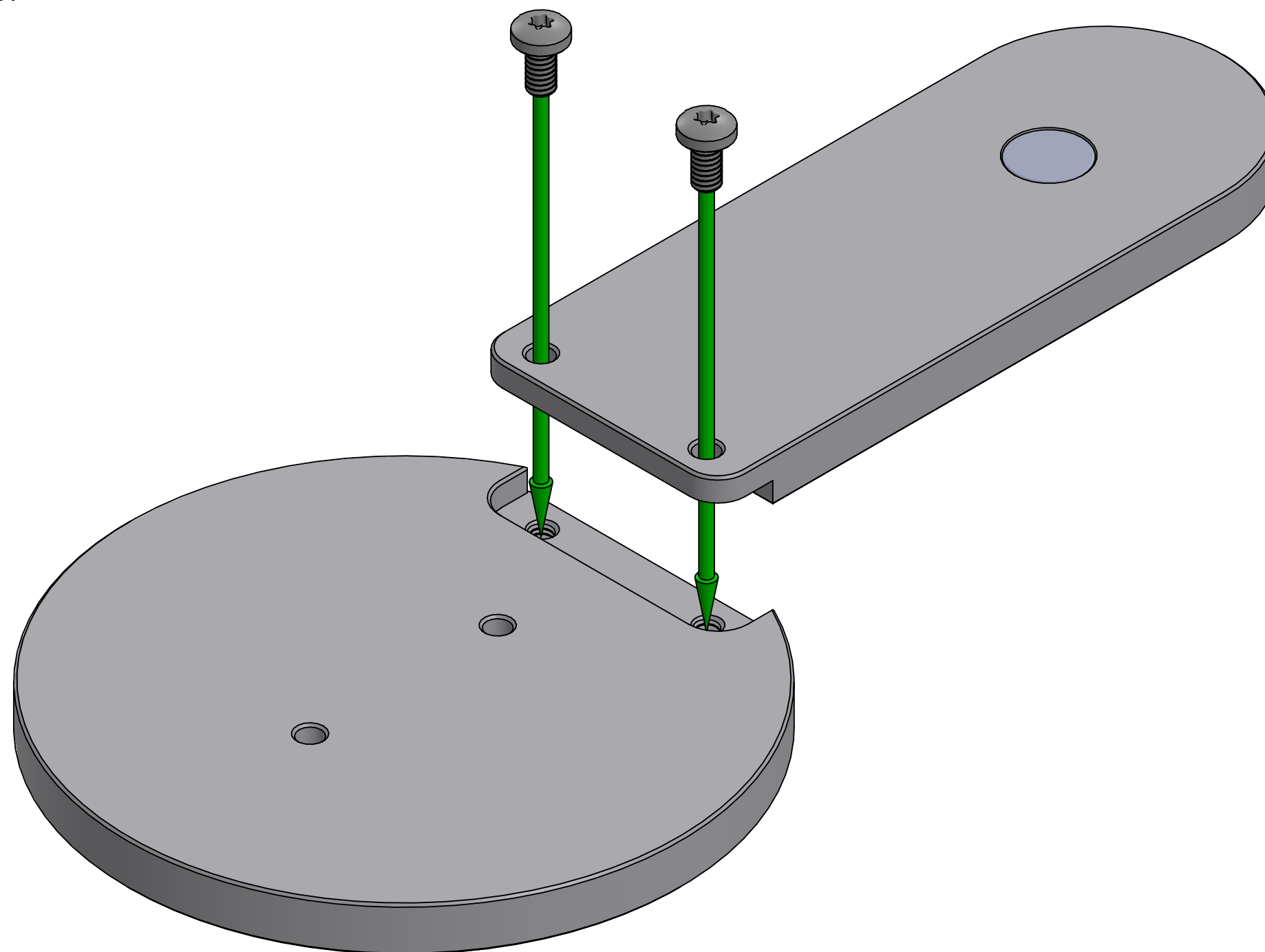
Roundhead screw length is measure UNDER the head.

Countersunk screw length is measured by the OVERALL length.

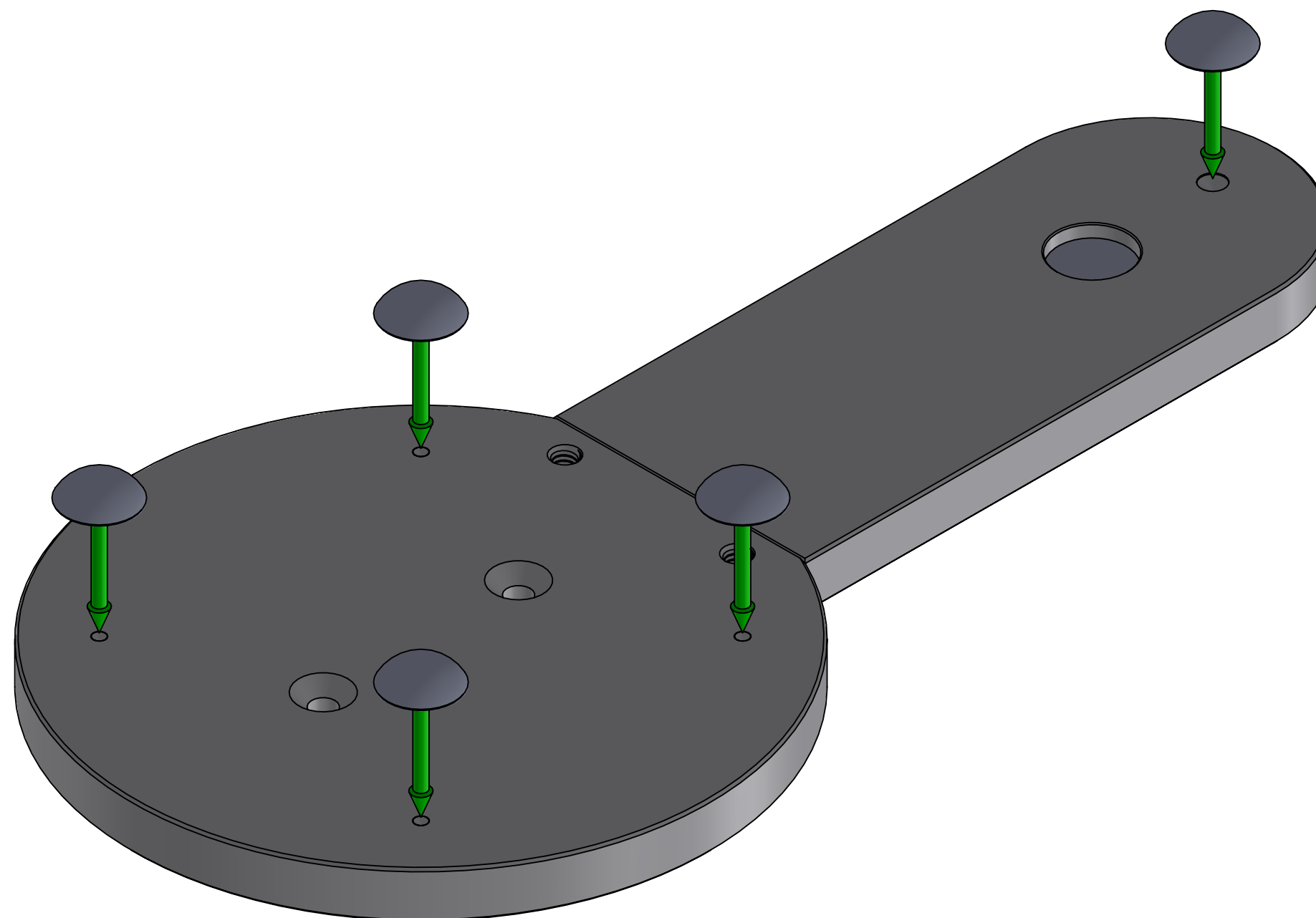
Prop V Engine tools



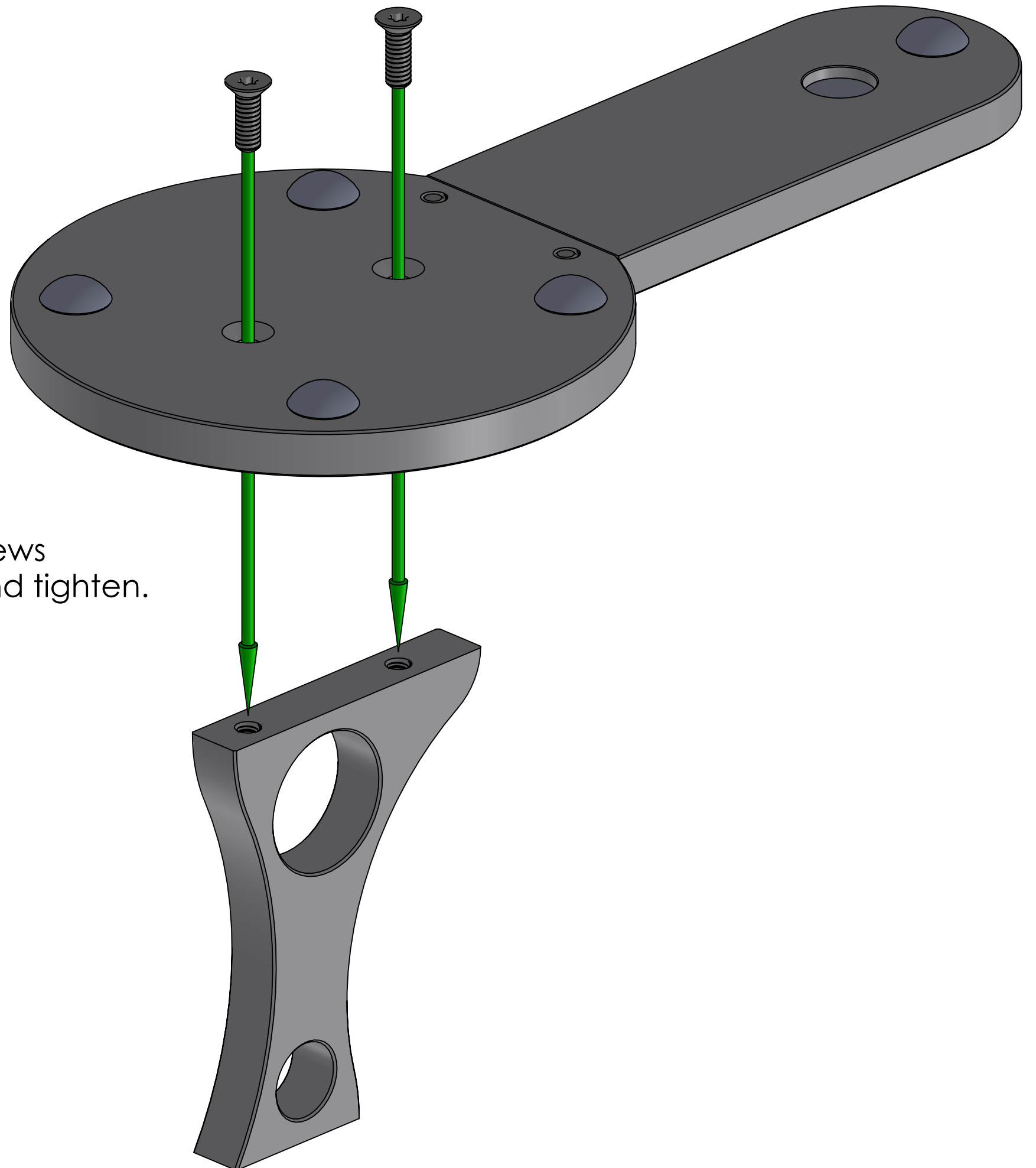
Fit the strut into the pocket in the base and screw two M2x4 roundhead screws through the strut into the base. Tighten the screws.



Remove the backing from the 5 rubber feet and stick them over the dimples/dots in the bottom faces of the strut and base.

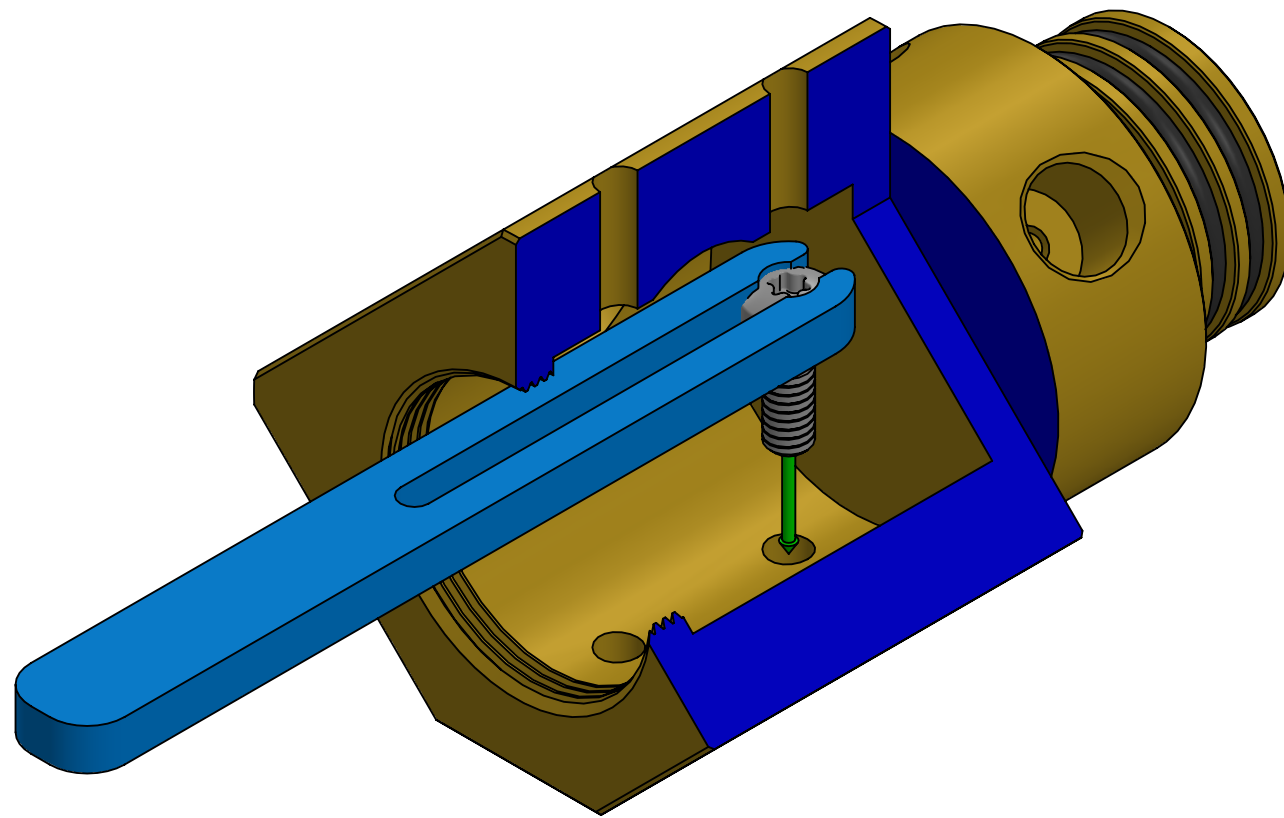


Screw two M2x6 countersunk screws through the base into the foot and tighten.

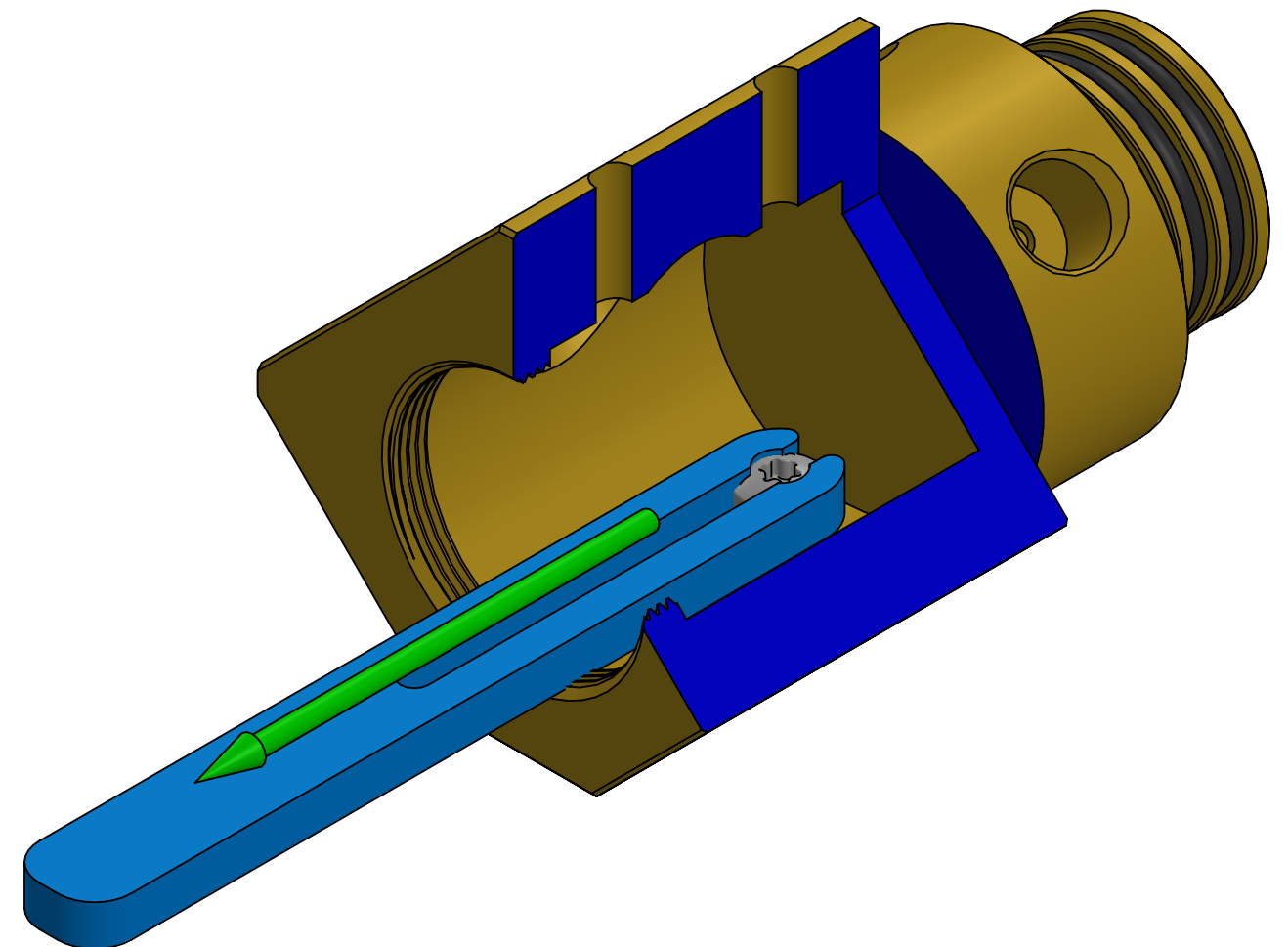


Clip one M2x6 roundhead screw into the tweezers and fit the screw into the hole furthest away from the front.

Note: Manifold is shown cutaway for clarity



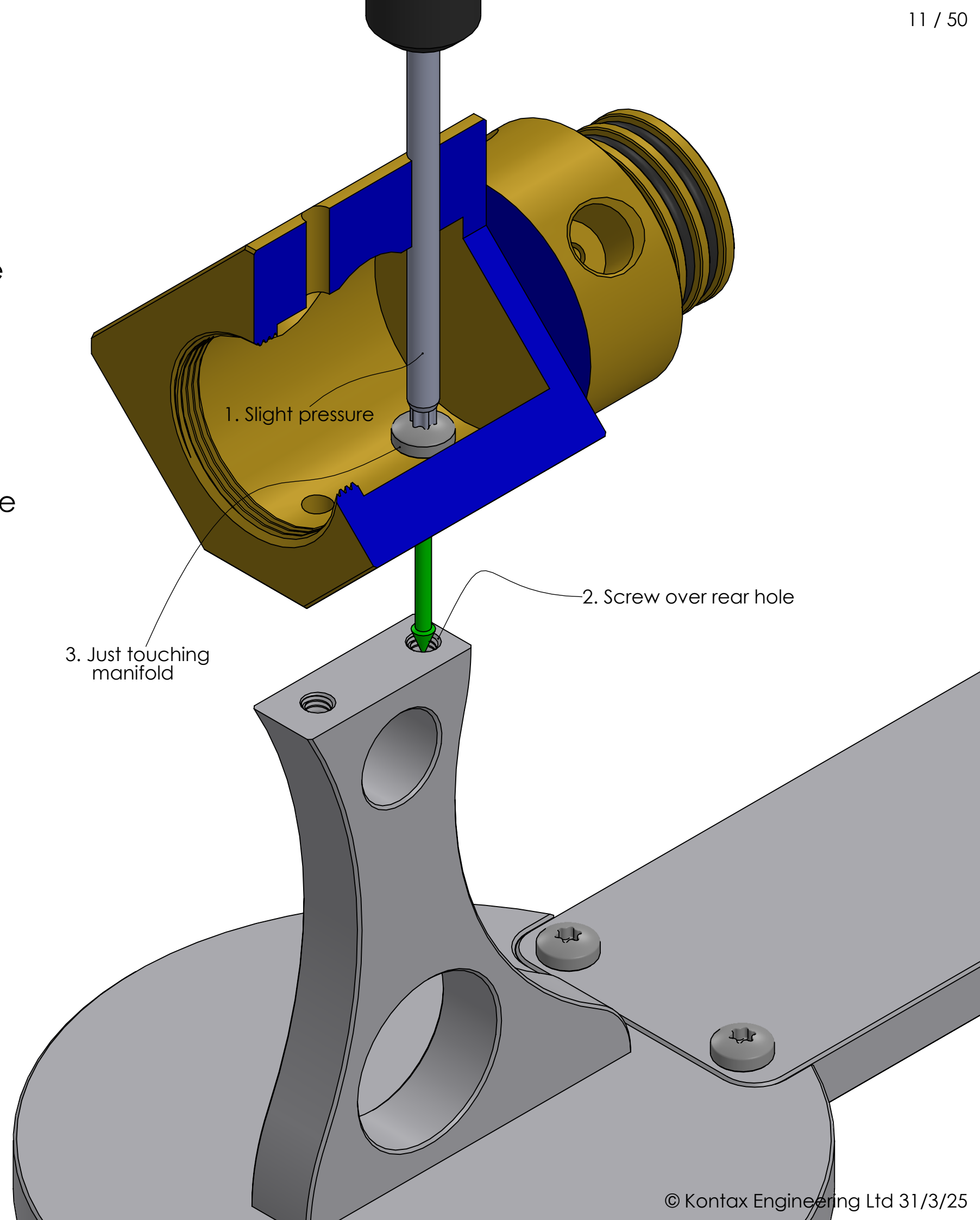
With the screw fitted into the hole slide the tweezers off the screw.



1. Fit the T6 driver through the top hole in the manifold into the screw and apply slight pressure to keep the screw in place, then position the manifold as shown above the foot.

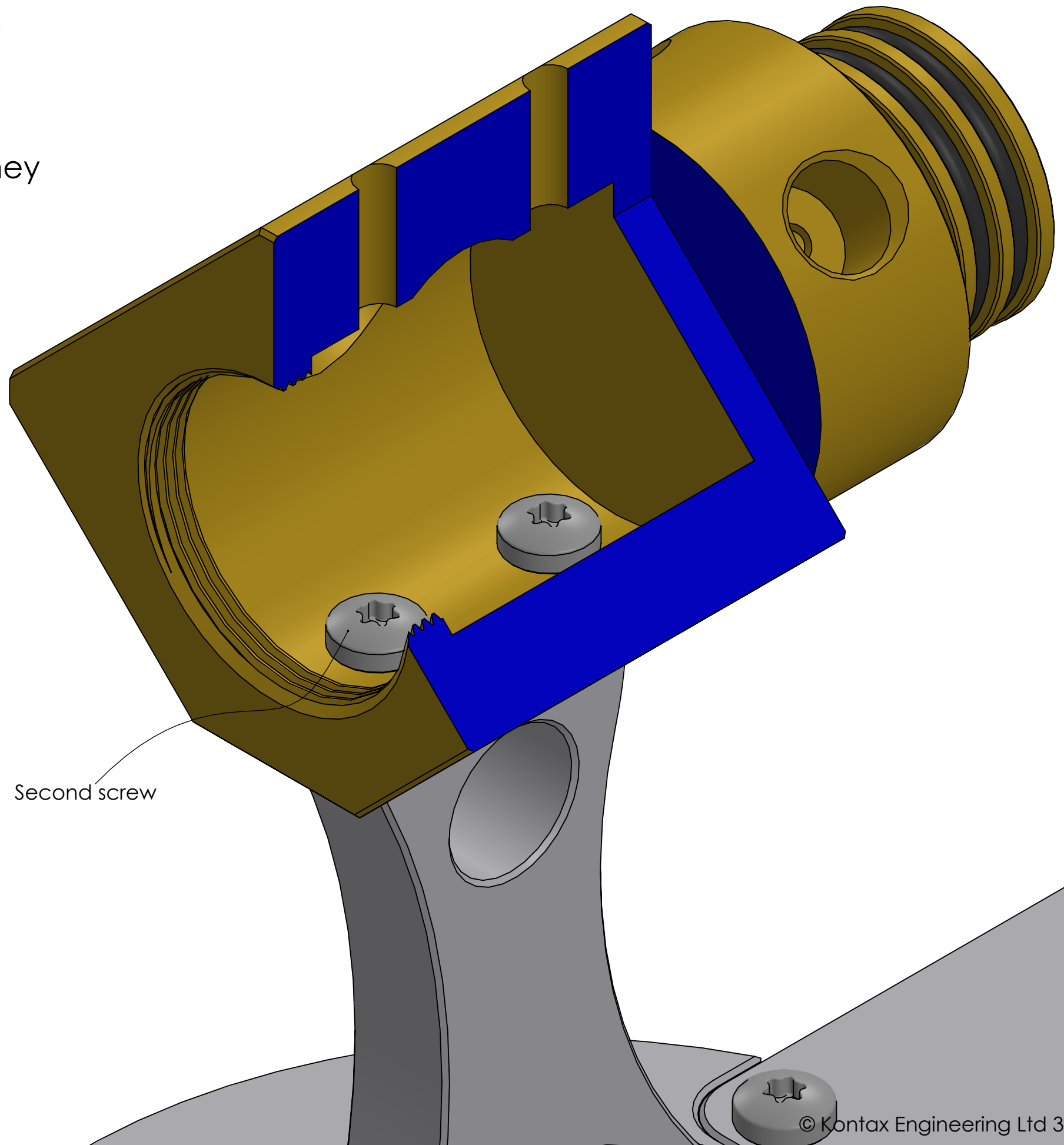
2. Lower onto the foot with the screw fitting into rear hole.

3. Screw the screw in until it just touches the inside of the manifold, do not tighten fully yet.



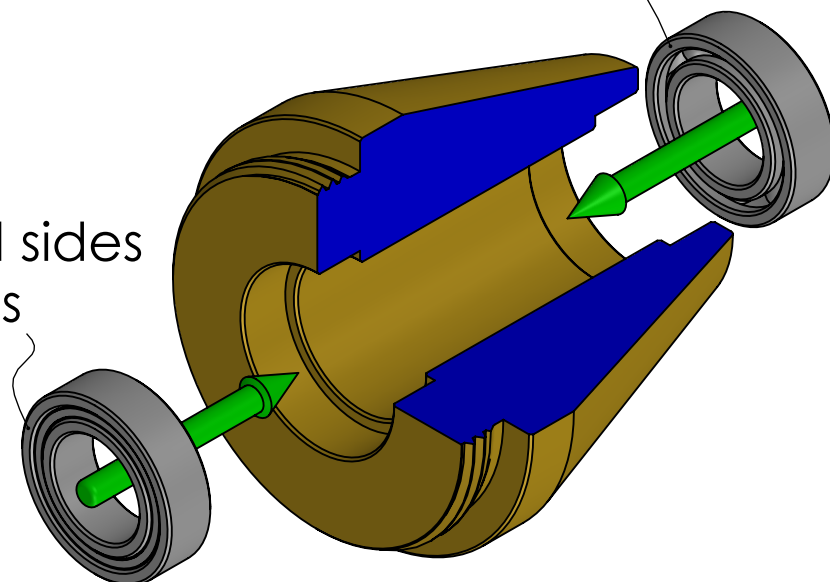
Use the tweezers to fit the front screw into the manifold and screw it in until it just touches the inside of the manifold, as with the first screw.

When both screws are fitted and just touching the inside of the manifold they can both be tightened.



Open sides inwards

Shielded sides
outwards



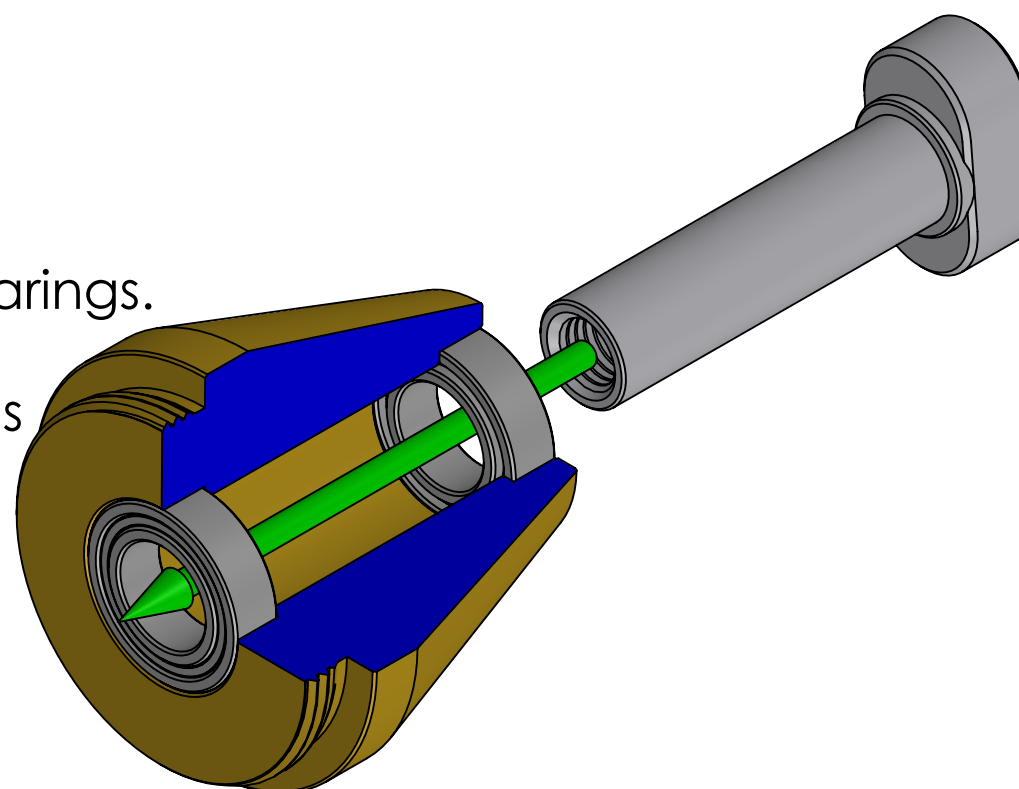
The bearings have a shielded side and an open side.

Fit the bearings into the recesses in the cartridge with the open sides inwards.

(Note: cartridge is shown cutaway for clarity)

Fit the axle through the bearings.

Take care that the bearings
do not get dislodged.

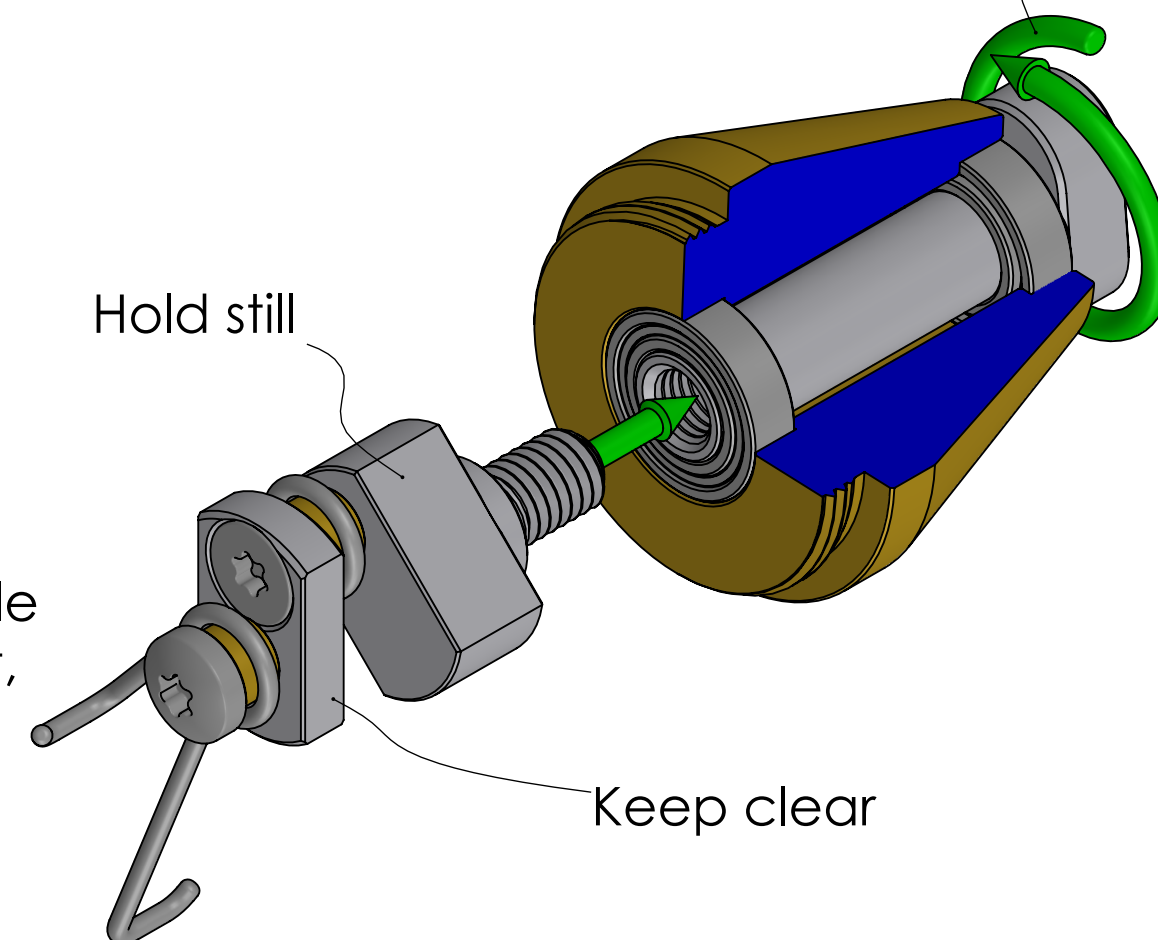


Screw axle over crankset

Hold still

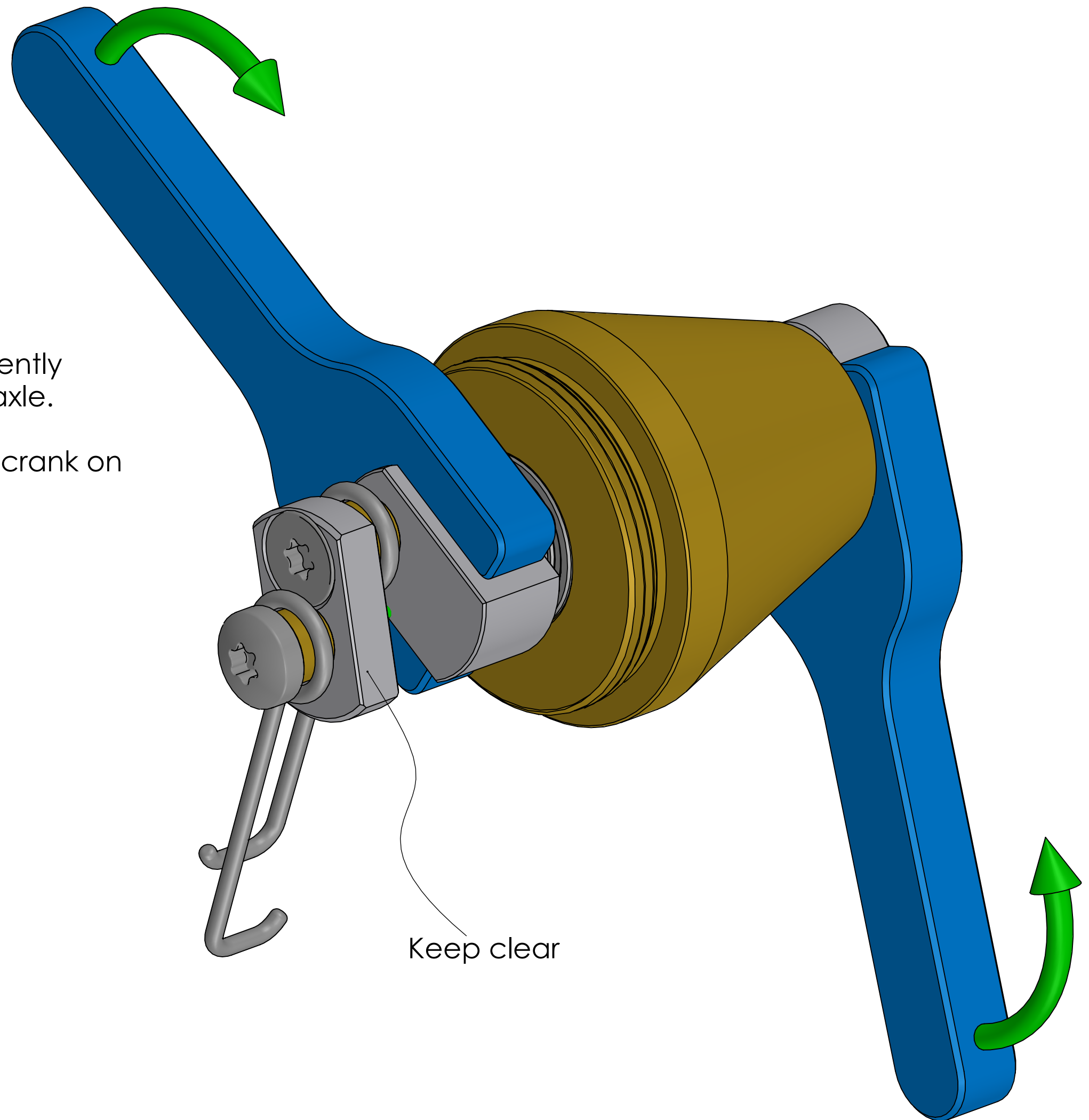
Hold the crankset still and screw the axle
over the threaded end on the crankset,
finger tight is sufficient at this stage.

Keep clear of the second crank on the
crankset.



Use the two spanners to gently
tighten the crankset and axle.

Keep clear of the second crank on
the crankset.

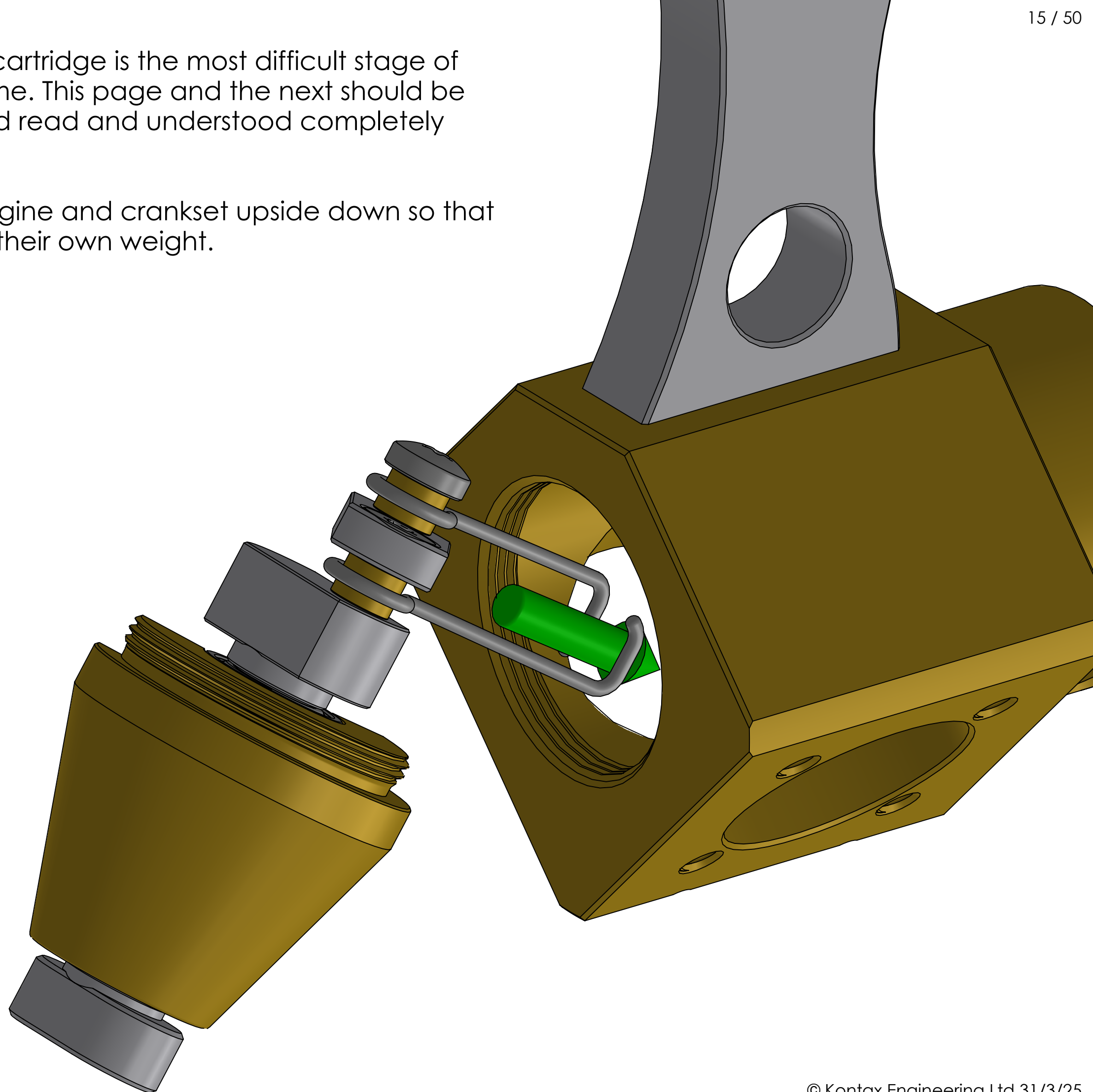


Note 1: fitting the crankset and cartridge is the most difficult stage of assembly and can take some time. This page and the next should be taken together as one stage and read and understood completely before proceeding.

Note 2: It will help to hold the engine and crankset upside down so that the conrods are hanging under their own weight.

Gather the two conrods together as shown and fit them through the hole in the front of the manifold. Manoeuvre the crankset and conrods so that one conrod fits through one side hole and the other conrod fits through the other side hole.

It is important which conrod fits through which hole, refer to the next page for details.



Hook pointing *away* from cartridge

Hook pointing *towards* cartridge

Manifold and cartridge shown cutaway for clarity

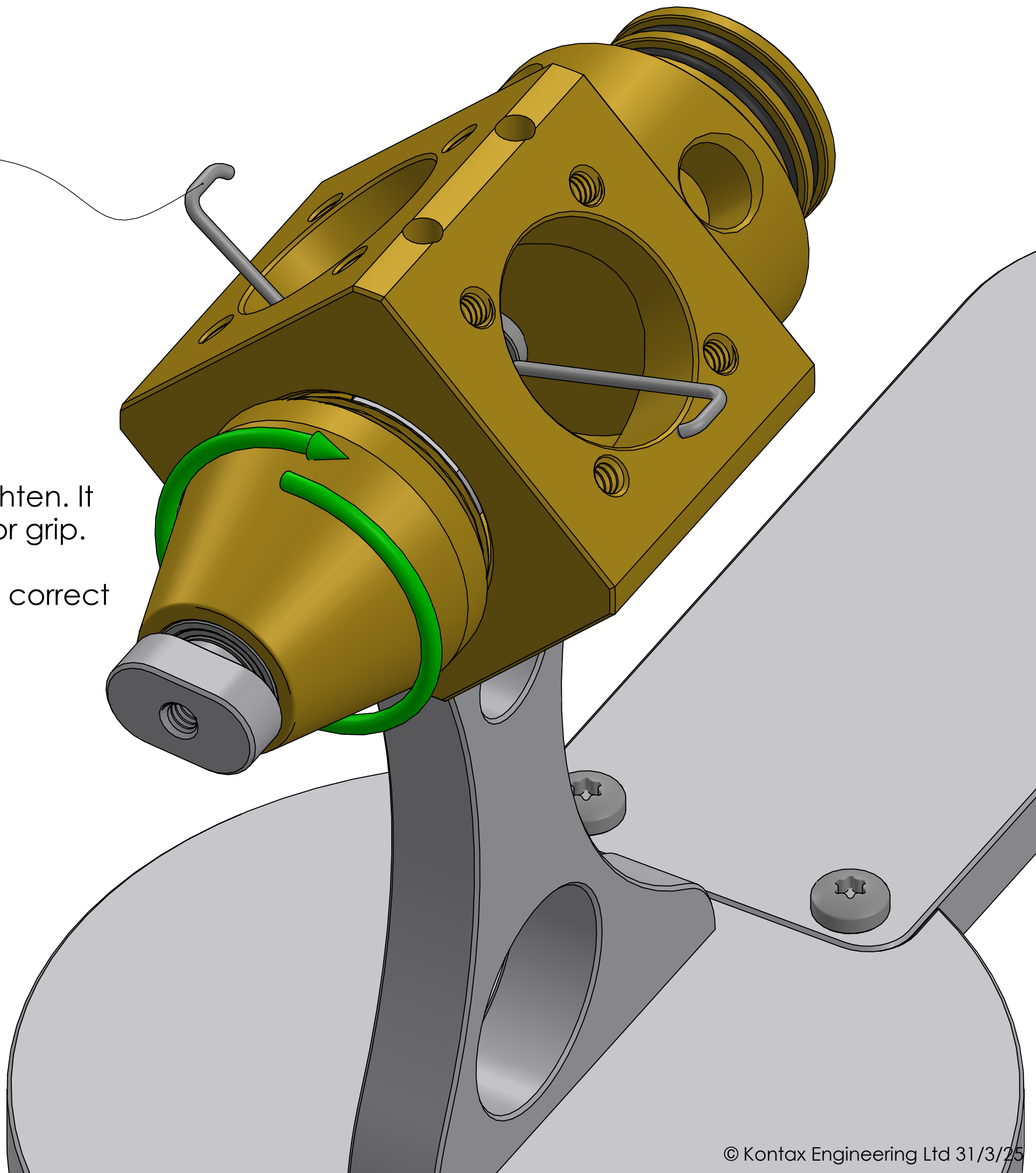
The conrod with the end hook pointing *away* from the cartridge must fit through the left hole as shown.

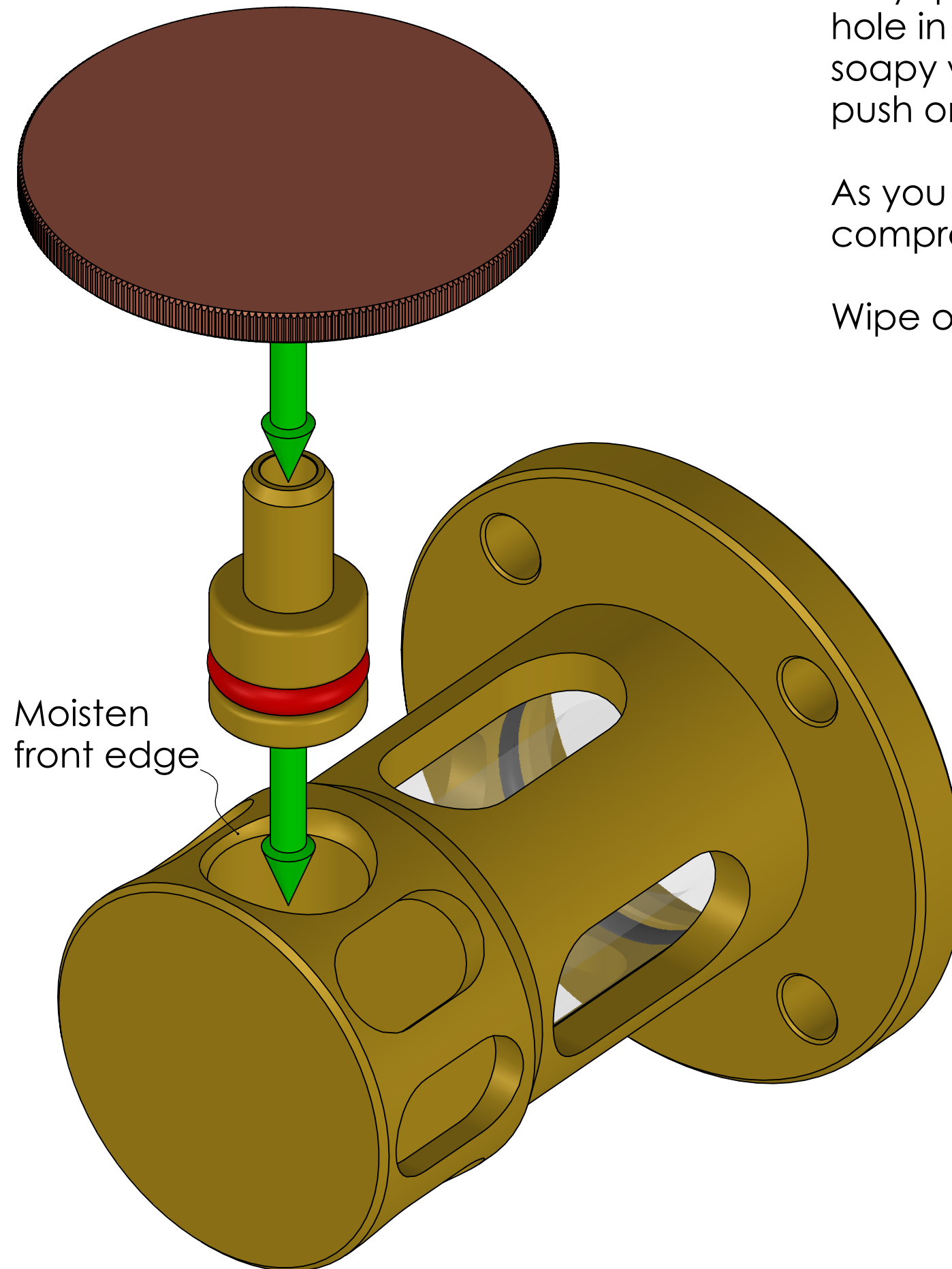
The conrod with the end hook pointing *towards* the cartridge must fit through the right hole as shown.

Hook pointing *away*
from cartridge

Screw the cartridge into the manifold and tighten. It can help to wrap an elastic band around it for grip.

Make sure the conrods stay poking out of the correct manifold holes.





Very sparingly moisten the front edge of the port hole in one of the cylinders with very dilute soapy water for lubrication and use a coin to push one of the ports all the way into the hole.

As you push it in the red rubber O ring will compress slightly to provide an airtight seal.

Wipe off any excess water afterwards.

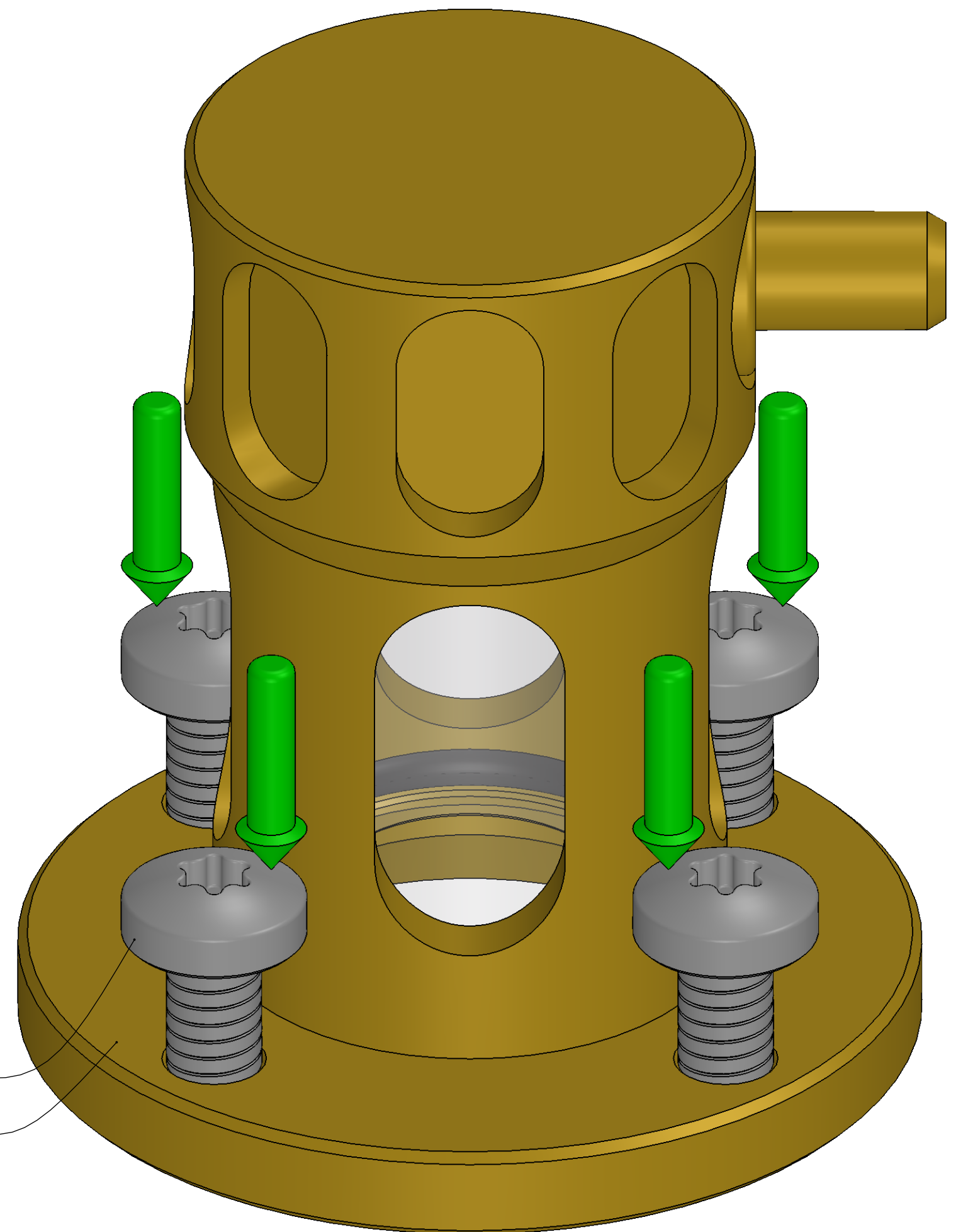
Place the cylinder flat on your work surface and fit four M2x4 panhead screws into the screw holes in the cylinder.

Allow the bottoms of the screws to sit down on your work surface, they will sit slightly above the flange surface on the cylinder.

After fitting the screws keep the cylinder face down on your work surface ready for the next assembly stage.

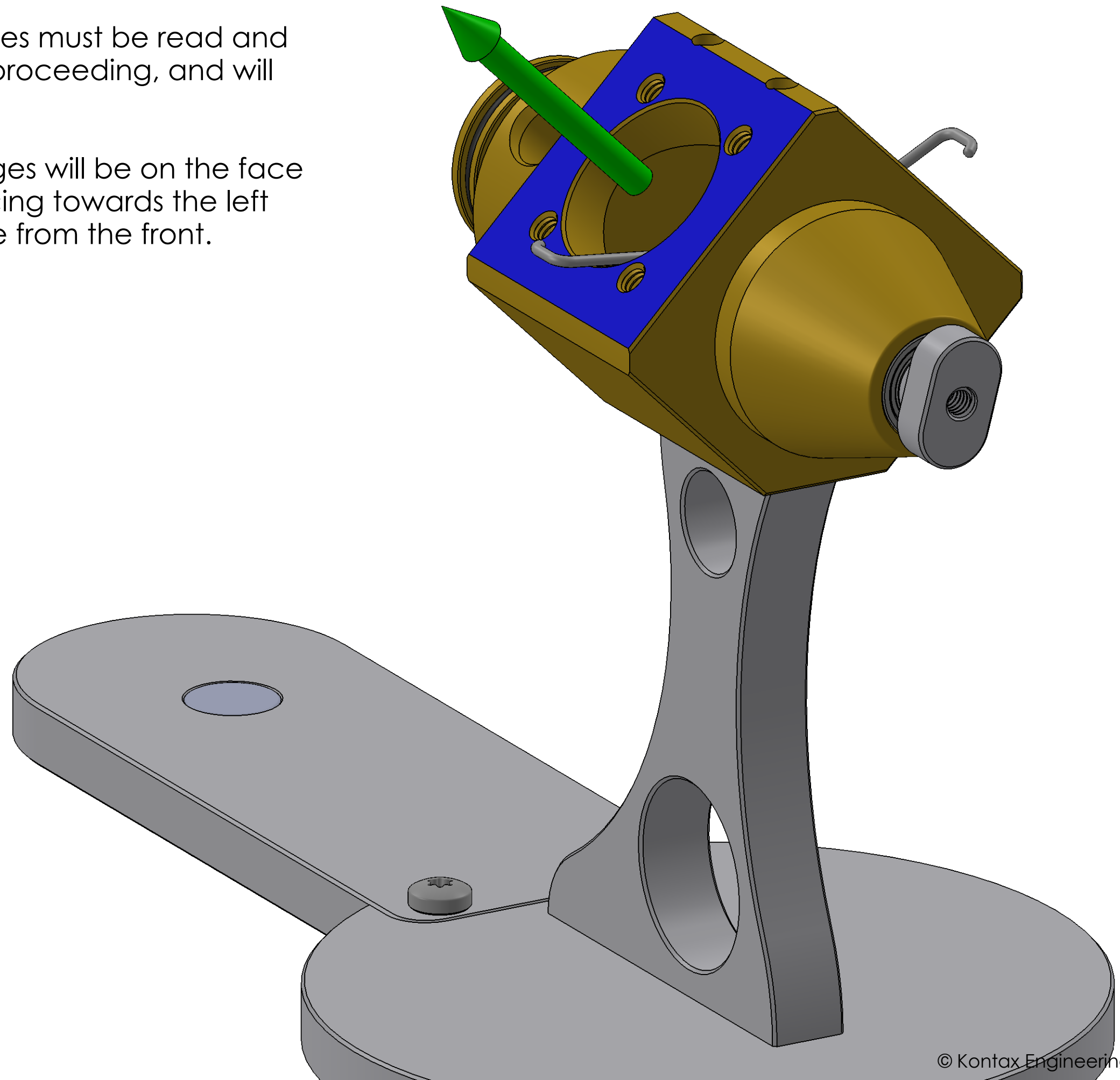
Repeat for the second cylinder.

Sitting above flange



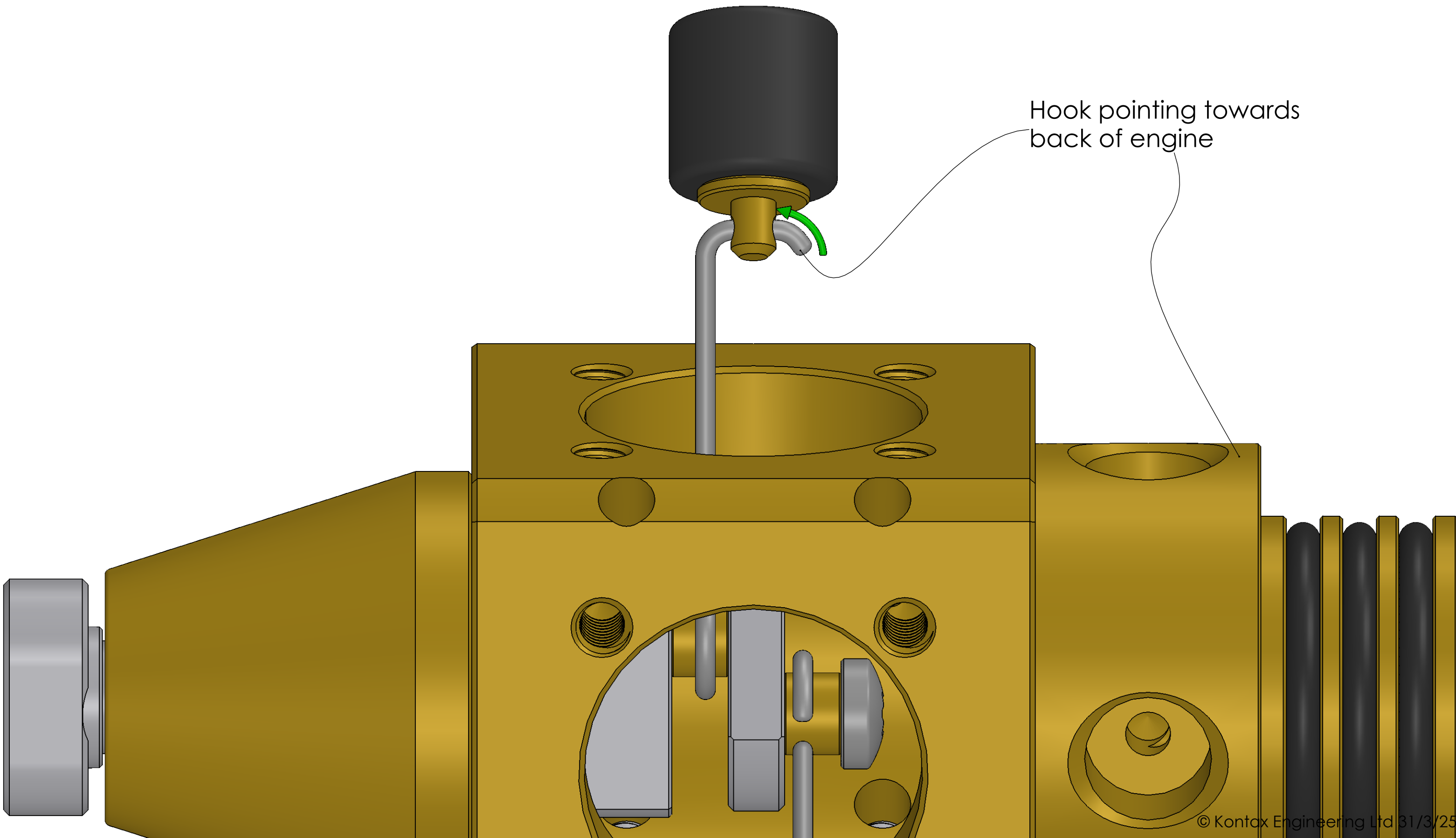
The next 5 assembly stages must be read and understood fully before proceeding, and will require some dexterity.

All work in the next 5 stages will be on the face highlighted blue and facing towards the left when viewing the engine from the front.



Fit the first piston over the hook on the end of the conrod. Remember to work on the conrod facing left when viewing the engine from the front.

Note: this should be the conrod with the hook pointing towards the back of the engine.

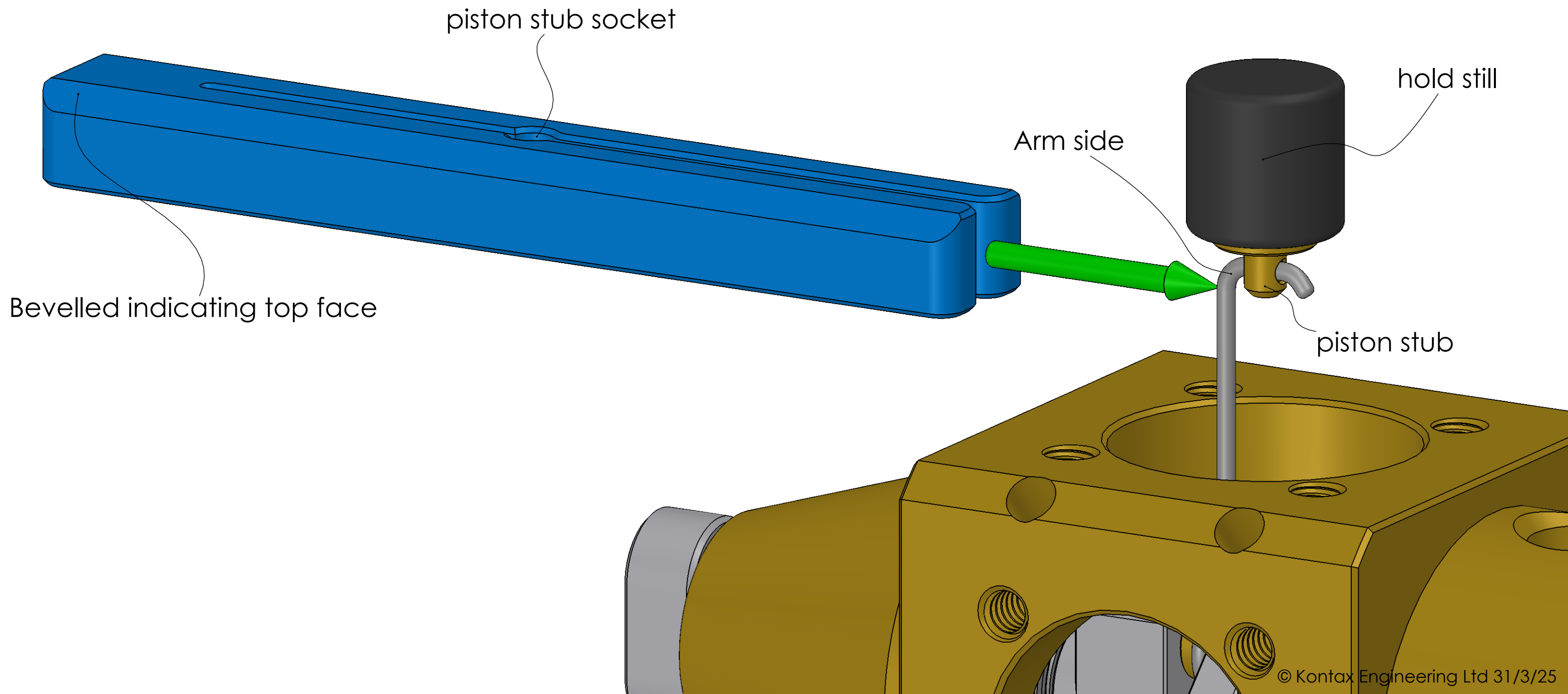


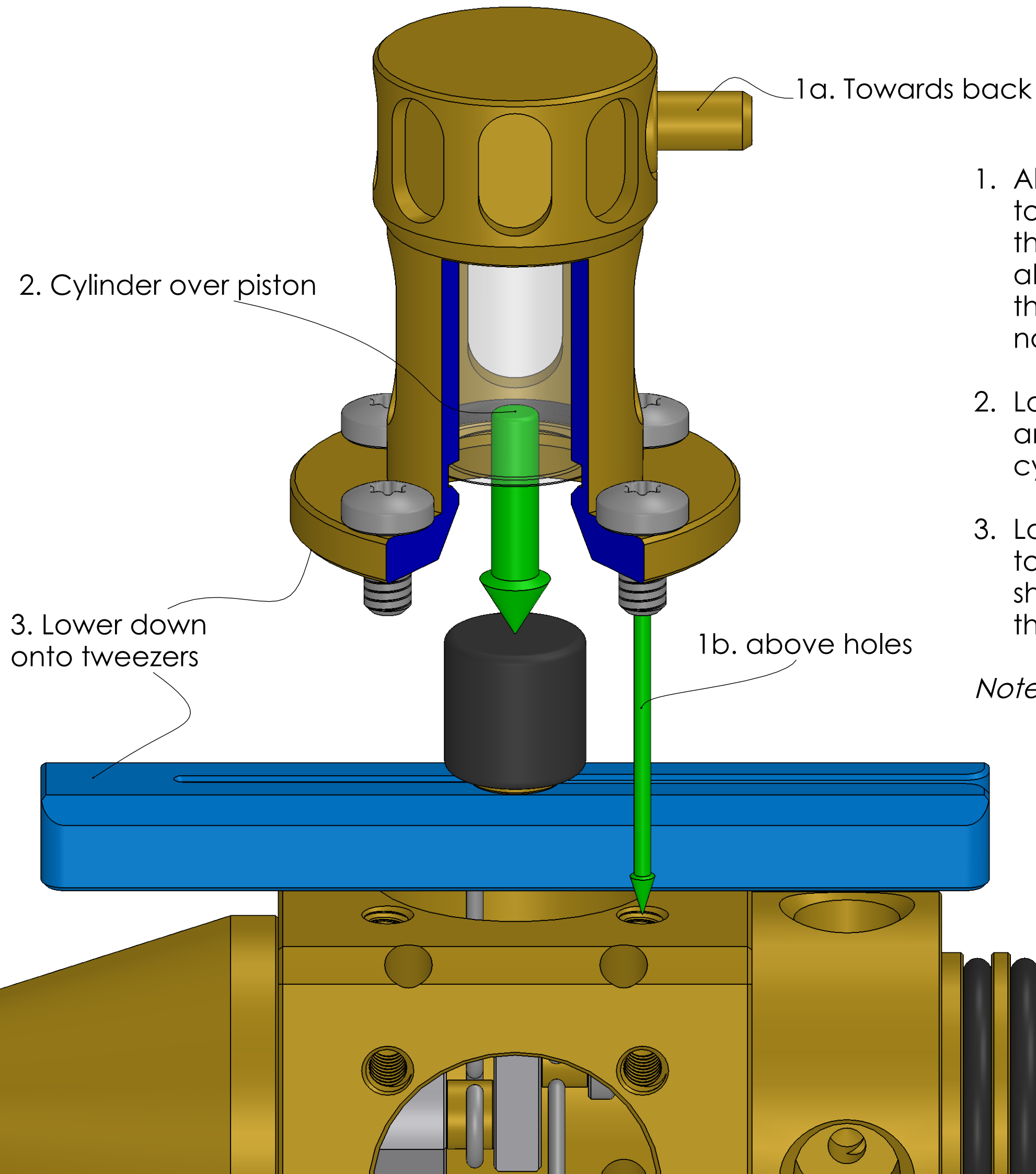
Note: The top face of the piston tweezers can be identified by the bevels on the outside long edges.

Hold the piston still with a finger and thumb and with the top face of the piston tool upwards push the open end of the tweezers over the conrod and piston stub in the direction shown.

It is important that the tweezers are pushed against the arm side of the conrod rather than the hook side, as pushing against the arm side will constrain the conrod in the tweezers and prevent it from becoming disconnected during assembly.

Push until the piston stub clicks into the piston stub socket. This will hold the piston and conrod securely for the next few assembly stages.





1. Align the cylinder with the port facing towards the back of the engine and the four previously fitted screws above their corresponding holes in the manifold. Take care the screws do not fall out.
2. Lower the cylinder onto the piston and guide the glass tube inside the cylinder over the piston.
3. Lower the cylinder all the way down to the tweezers, the four screw should hang just above the holes in the manifold.

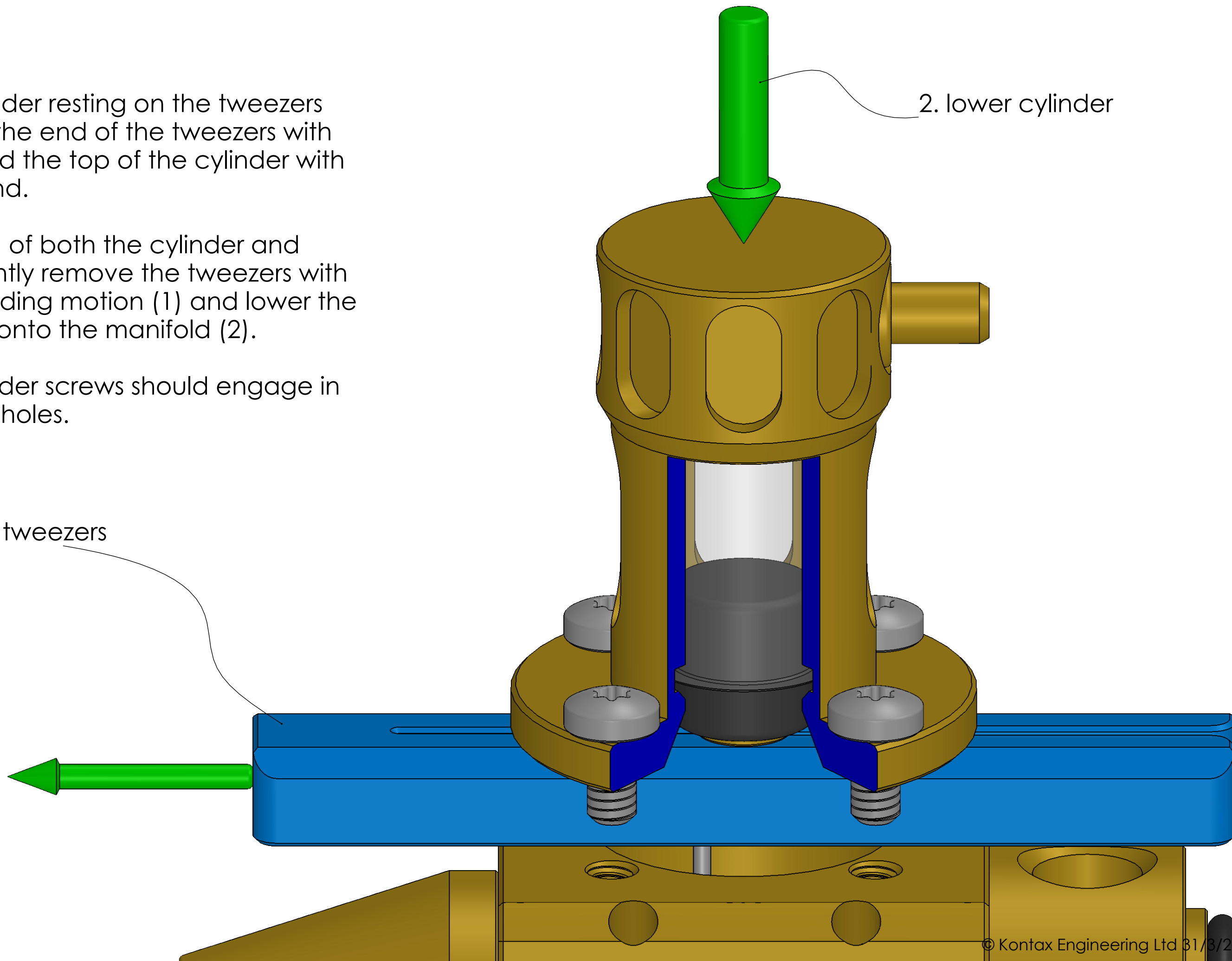
Note: cylinder shown cutaway for clarity.

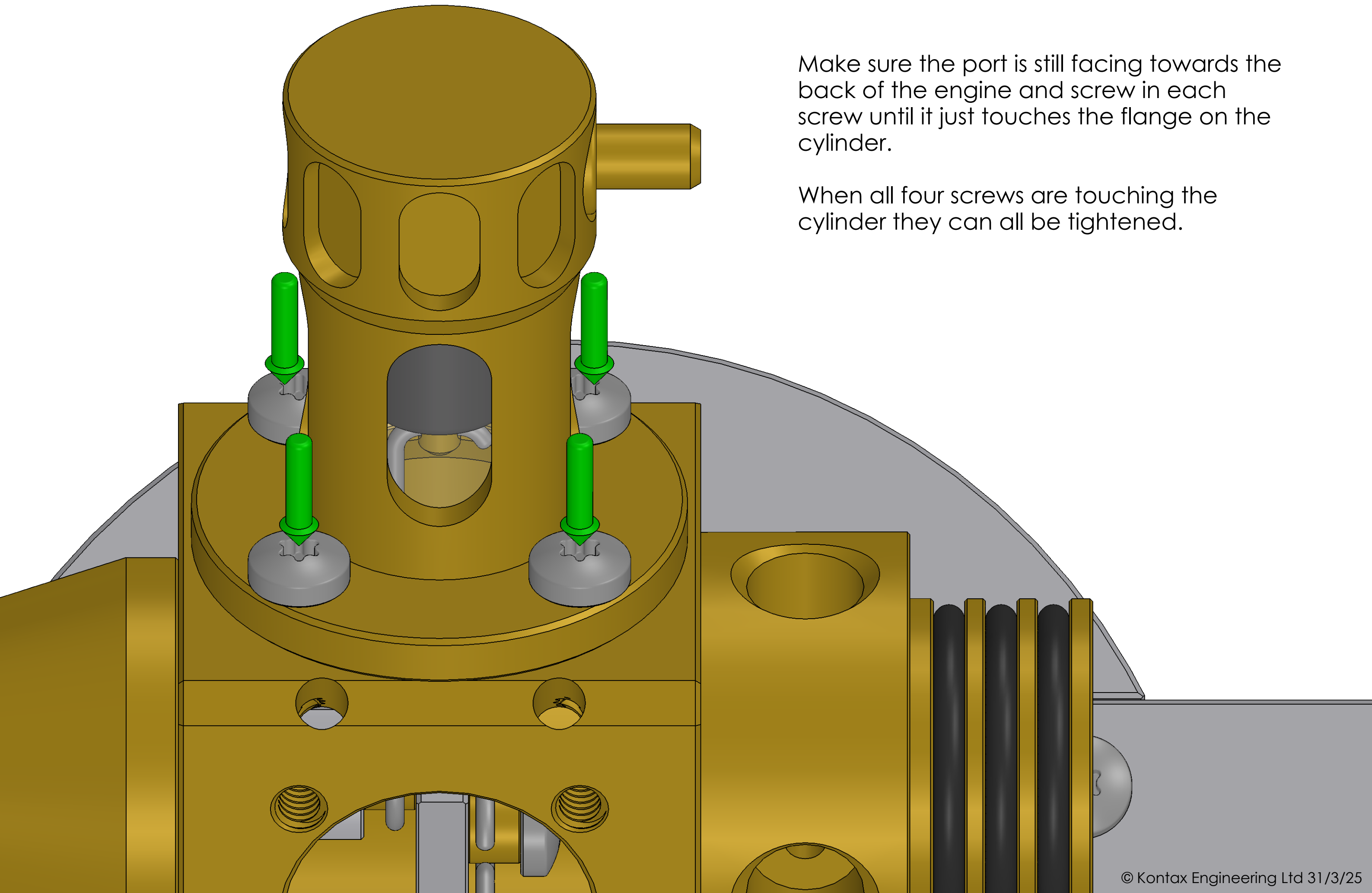
With the cylinder resting on the tweezers take hold of the end of the tweezers with one hand and the top of the cylinder with the other hand.

Keeping hold of both the cylinder and tweezers, gently remove the tweezers with a sideways sliding motion (1) and lower the cylinder fully onto the manifold (2).

The four cylinder screws should engage in the manifold holes.

1. Remove tweezers





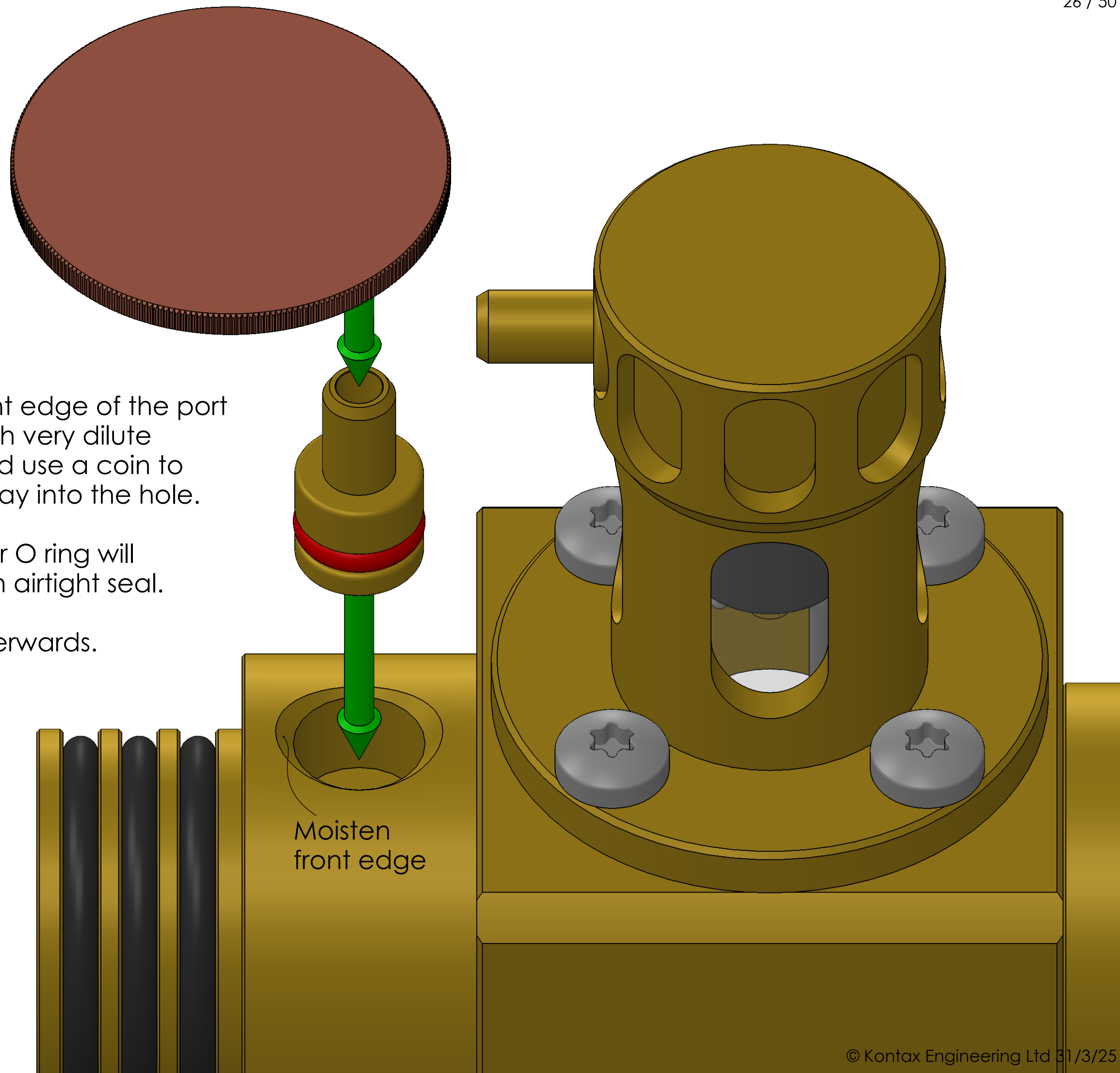
Make sure the port is still facing towards the back of the engine and screw in each screw until it just touches the flange on the cylinder.

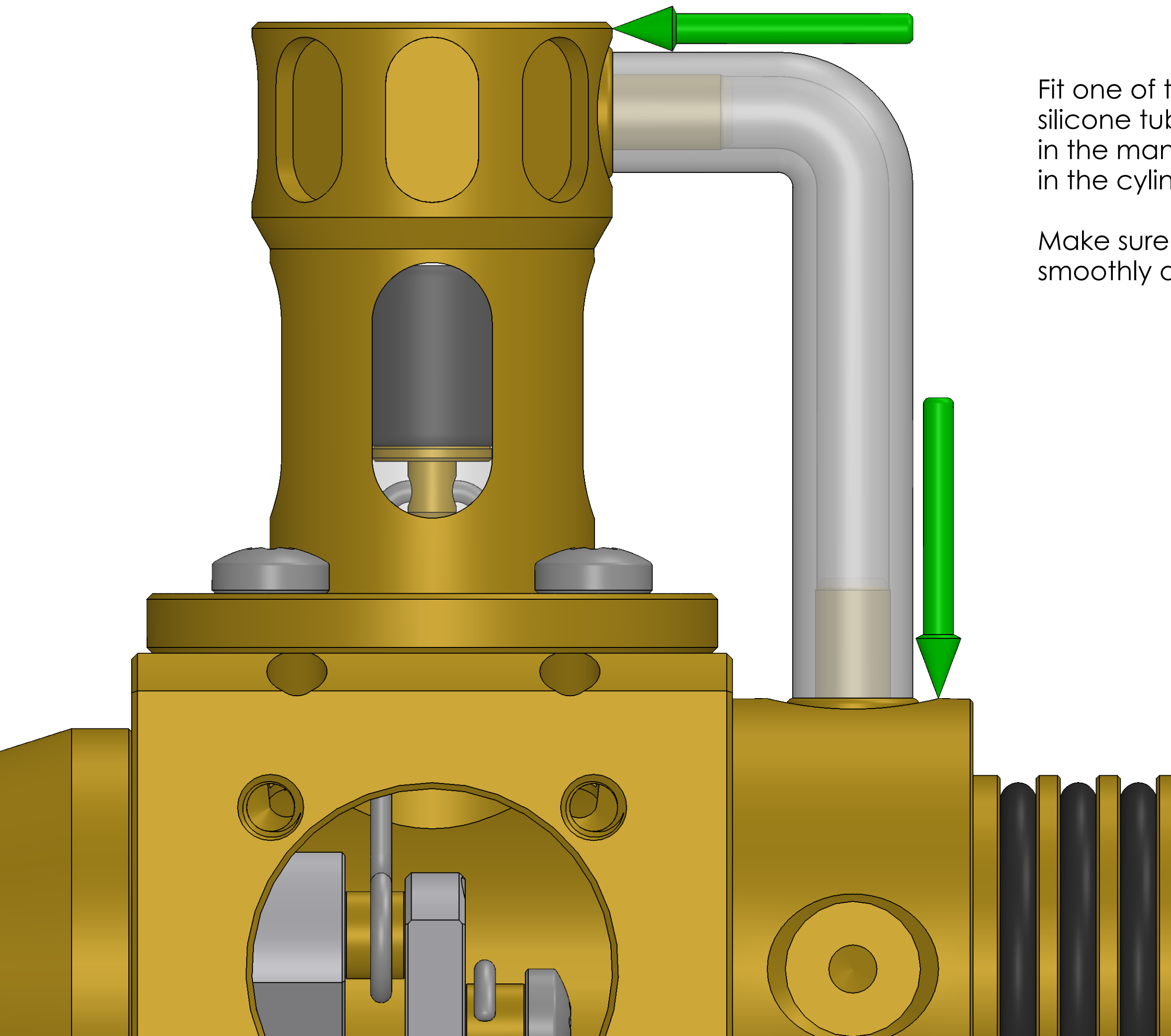
When all four screws are touching the cylinder they can all be tightened.

Very sparingly moisten the front edge of the port hole in one of the cylinders with very dilute soapy water for lubrication and use a coin to push one of the ports all the way into the hole.

As you push it in the red rubber O ring will compress slightly to provide an airtight seal.

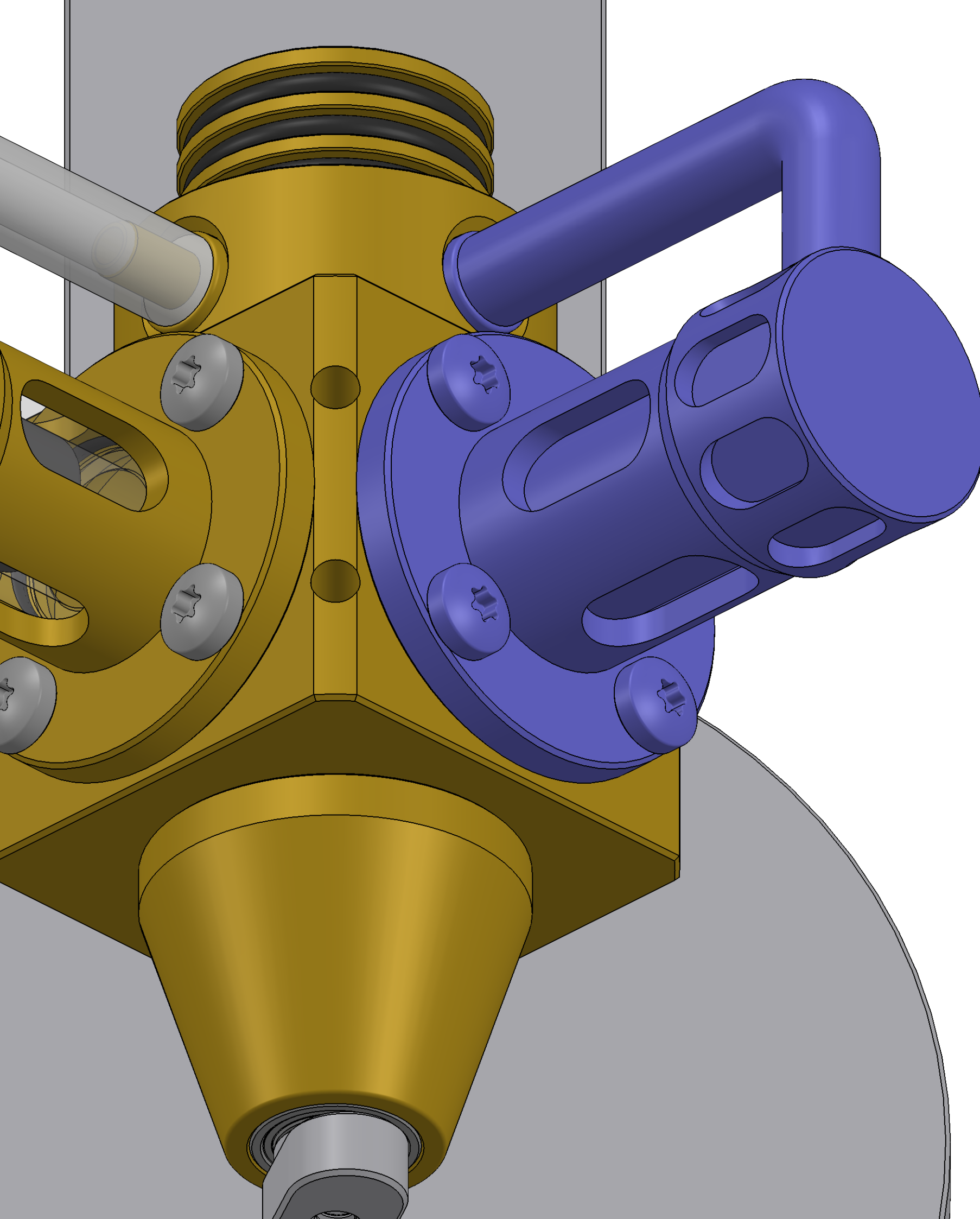
Wipe off any excess water afterwards.





Fit one of the flexible silicone tubes over the port in the manifold and the port in the cylinder.

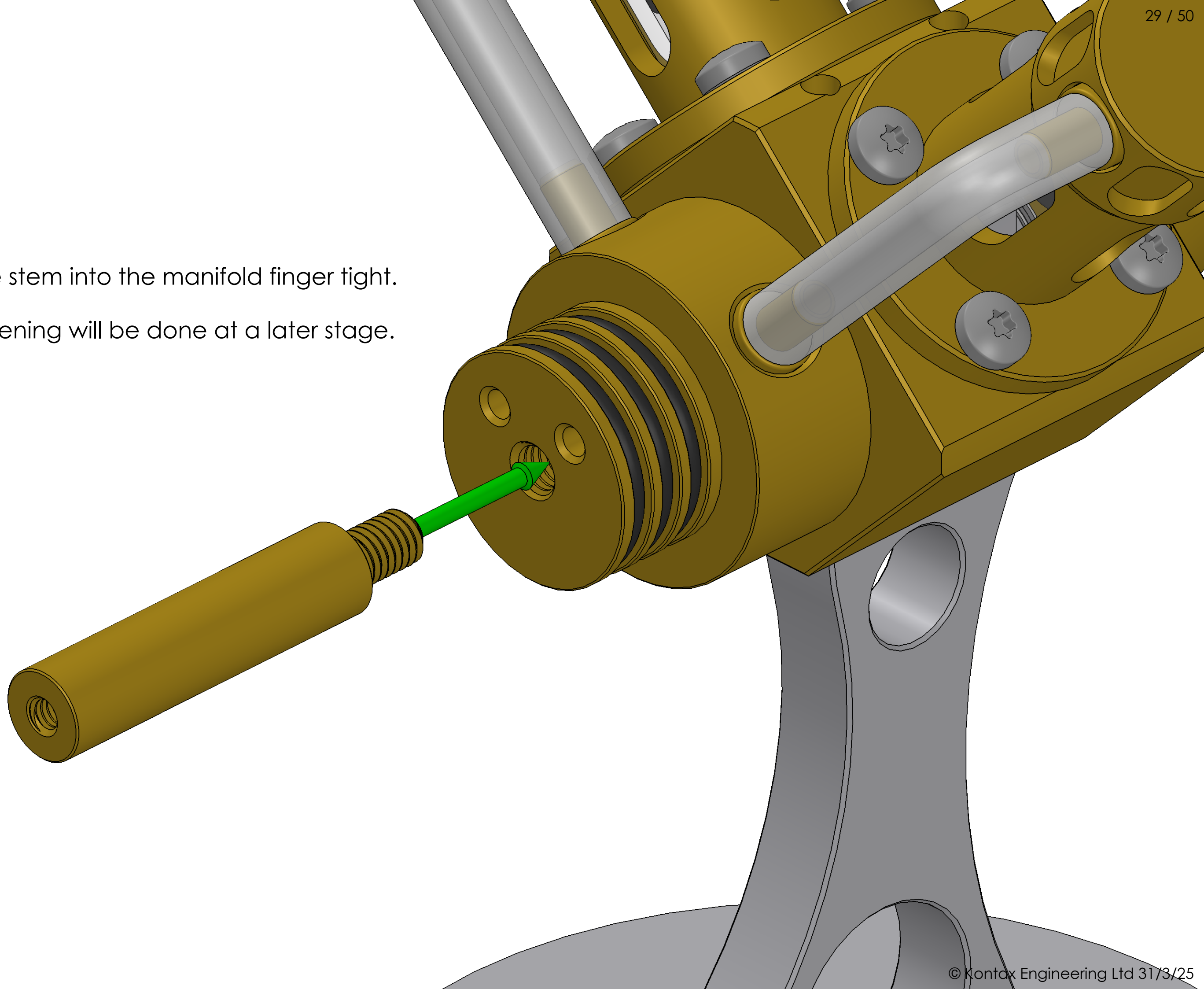
Make sure the tube bends smoothly and has no kinks.



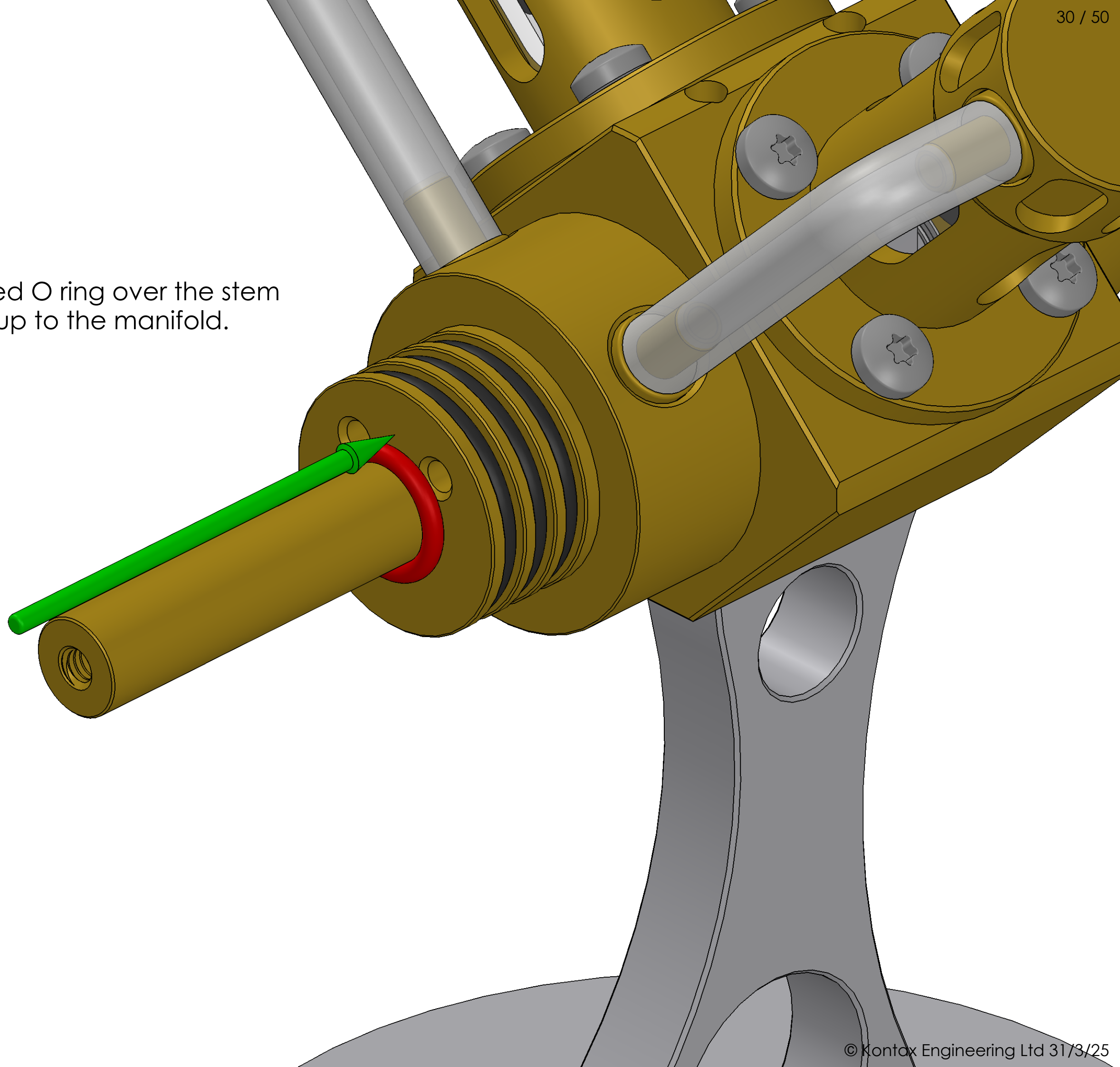
Repeat the first cylinder assembly stages for the second cylinder:

- Fit port and screws to cylinder.
- Fit piston to conrod and tweezers to piston.
- fit cylinder to piston and remove tweezers
- Lower cylinder to manifold and tighten screws.
- Fit port to manifold and connecting tube to ports.

Screw the stem into the manifold finger tight.
Final tightening will be done at a later stage.



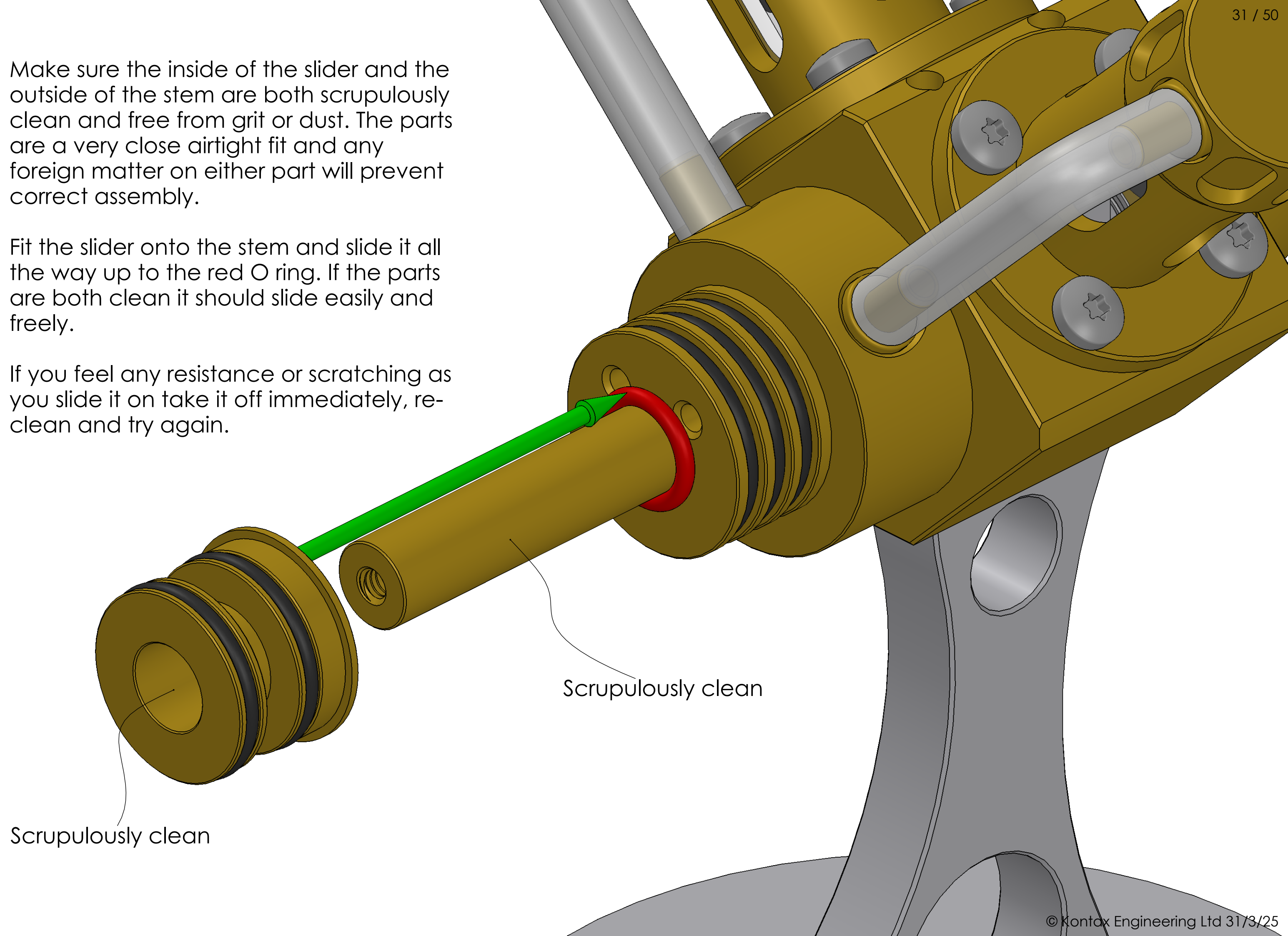
Gently stretch the first red O ring over the stem and push it all the way up to the manifold.



Make sure the inside of the slider and the outside of the stem are both scrupulously clean and free from grit or dust. The parts are a very close airtight fit and any foreign matter on either part will prevent correct assembly.

Fit the slider onto the stem and slide it all the way up to the red O ring. If the parts are both clean it should slide easily and freely.

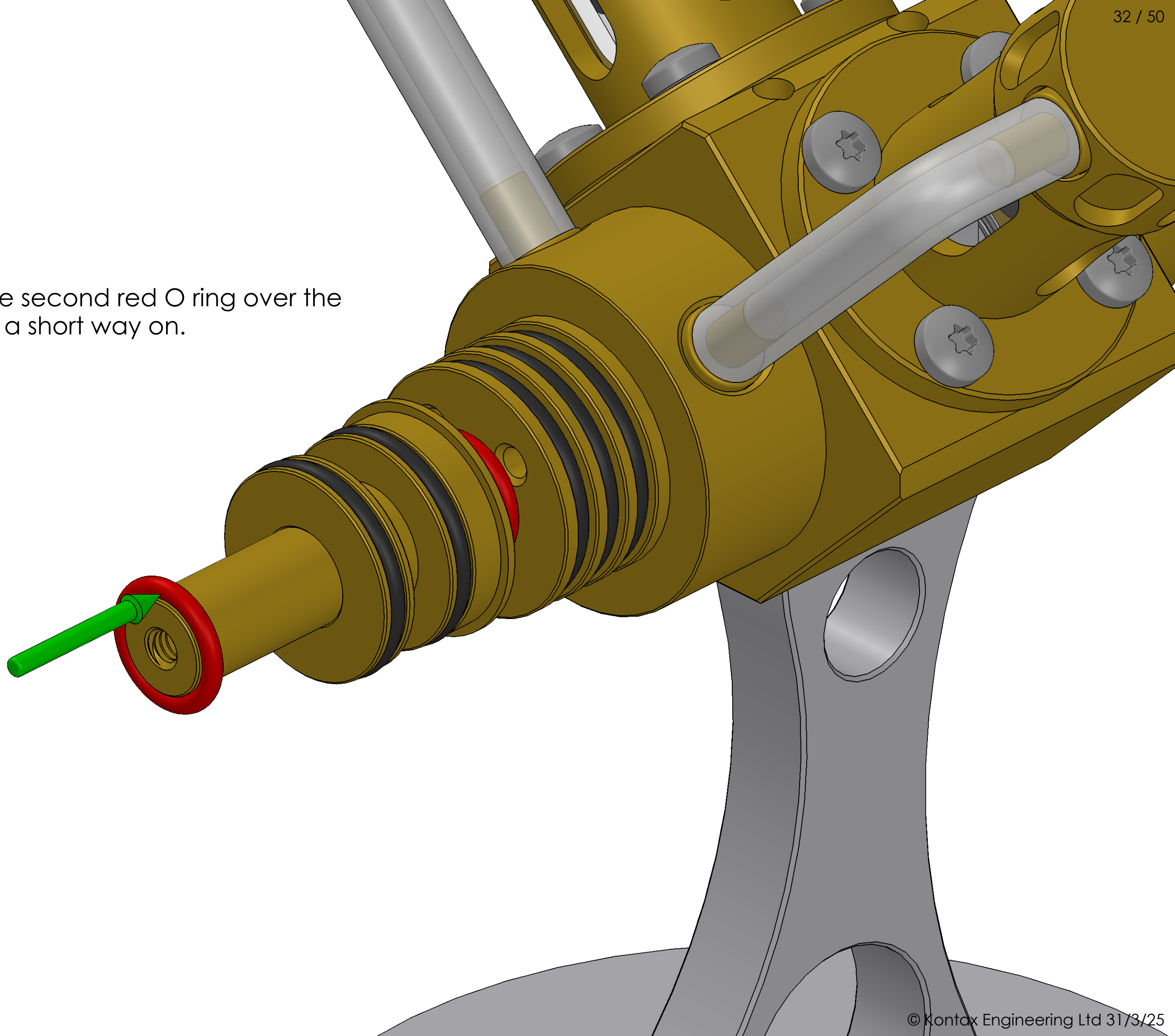
If you feel any resistance or scratching as you slide it on take it off immediately, re-clean and try again.



Scrupulously clean

Scrupulously clean

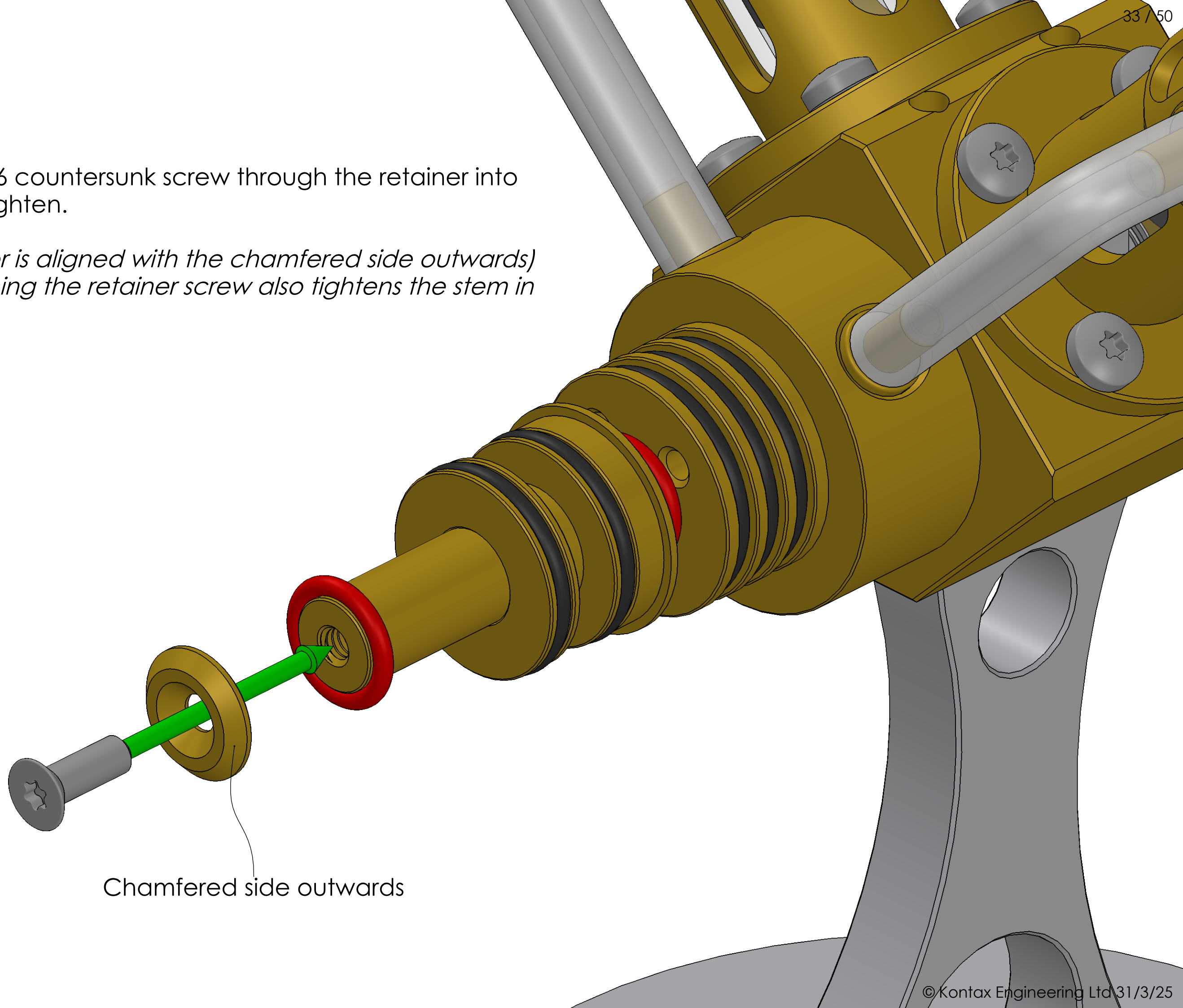
Gently stretch the second red O ring over the stem and push it a short way on.



Screw one M2x6 countersunk screw through the retainer into the stem and tighten.

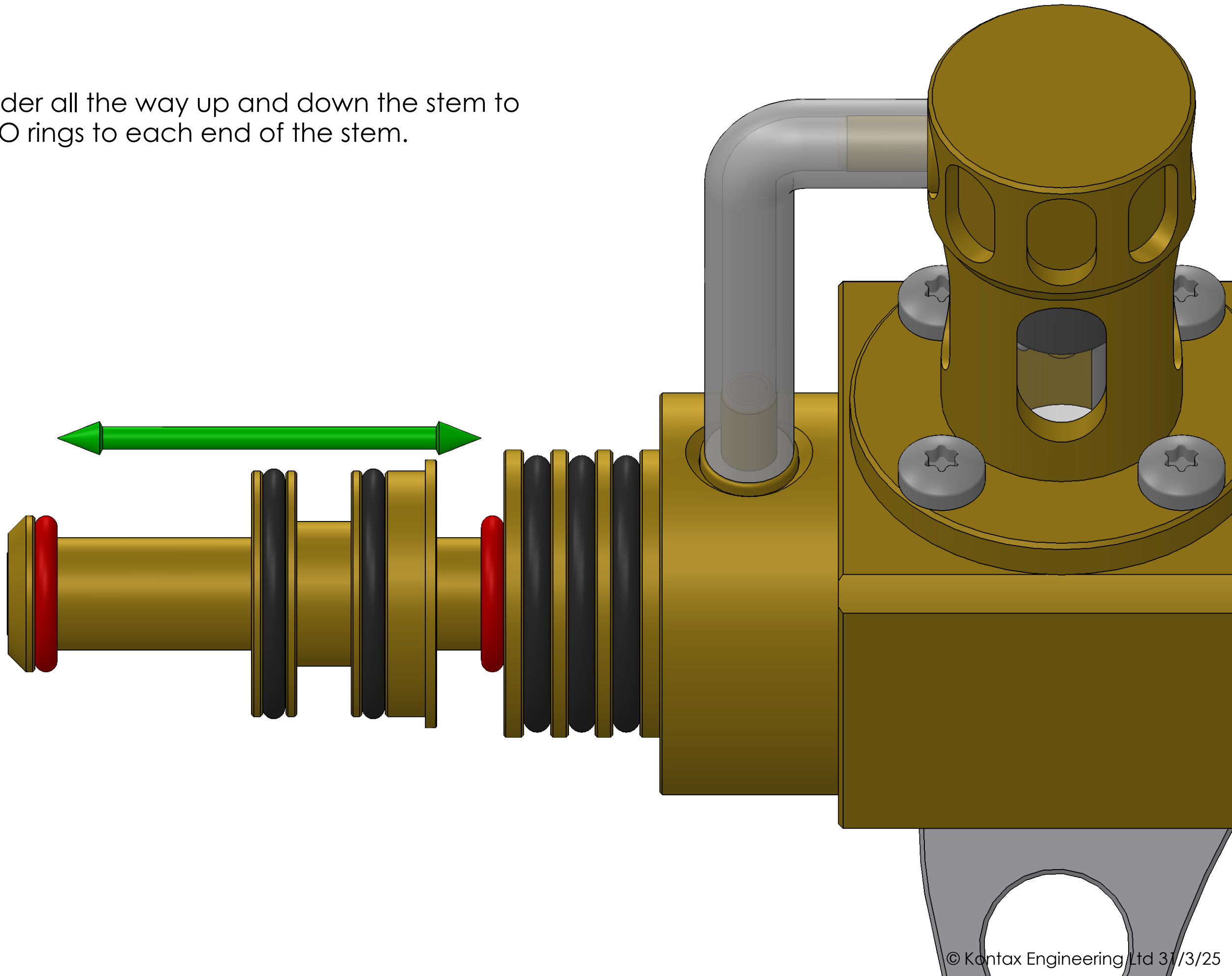
(Note 1: retainer is aligned with the chamfered side outwards)

(Note 2: tightening the retainer screw also tightens the stem in the manifold)



Chamfered side outwards

Gently slide the slider all the way up and down the stem to push the two red O rings to each end of the stem.



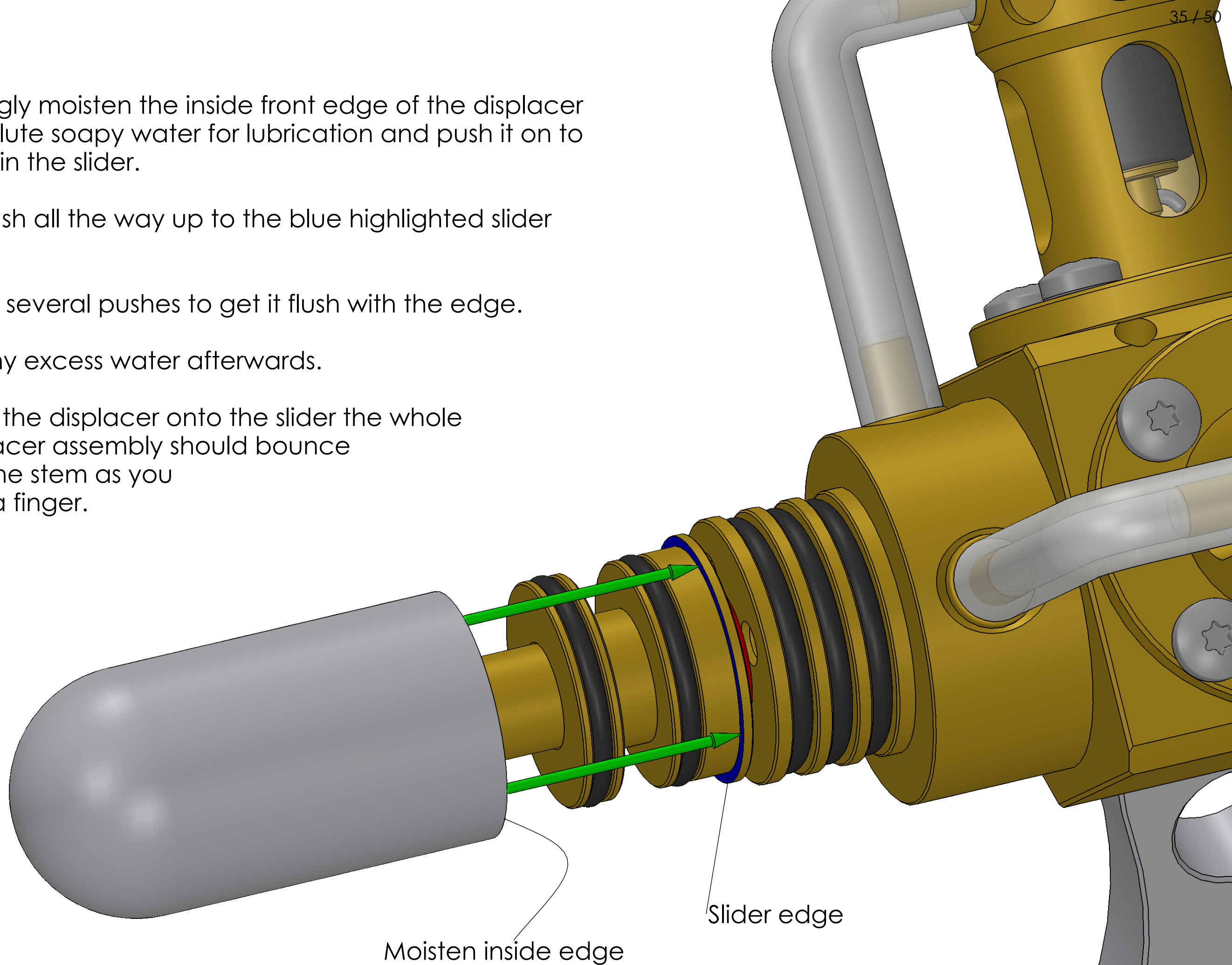
Very sparingly moisten the inside front edge of the displacer with very dilute soapy water for lubrication and push it on to the O rings in the slider.

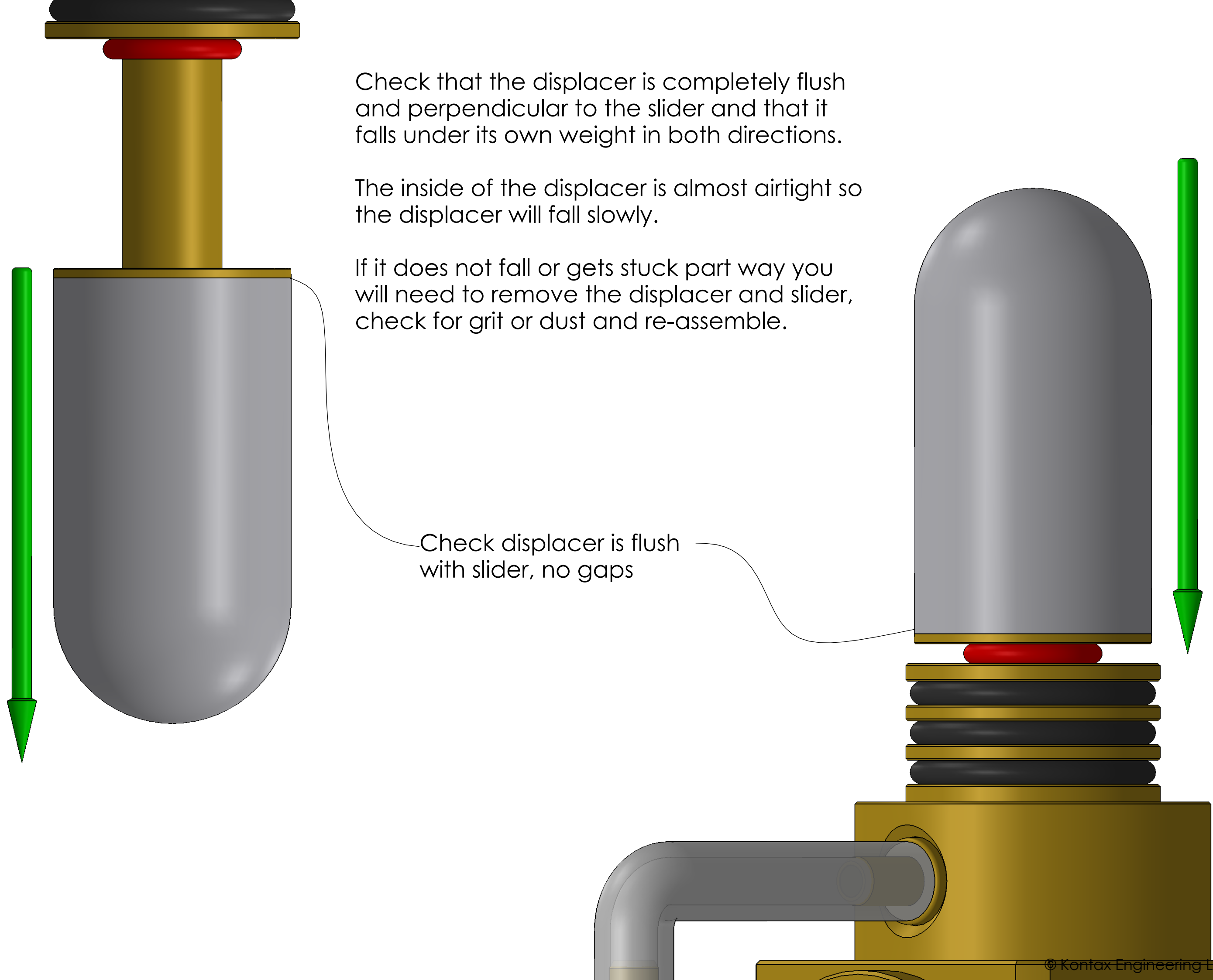
It should push all the way up to the blue highlighted slider edge.

It may take several pushes to get it flush with the edge.

Wipe off any excess water afterwards.

After fitting the displacer onto the slider the whole slider/displacer assembly should bounce gently on the stem as you tap it with a finger.



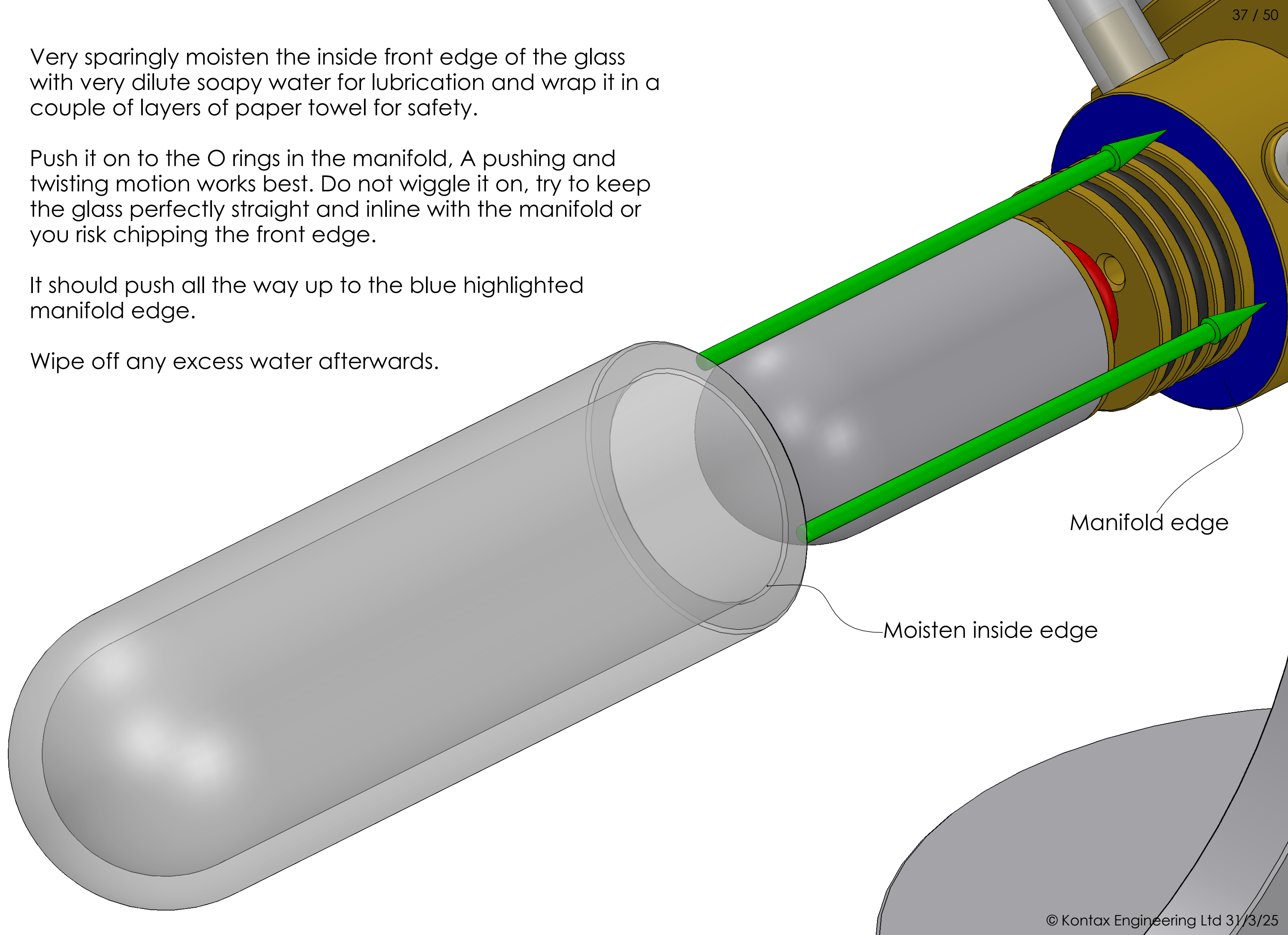


Very sparingly moisten the inside front edge of the glass with very dilute soapy water for lubrication and wrap it in a couple of layers of paper towel for safety.

Push it on to the O rings in the manifold, A pushing and twisting motion works best. Do not wiggle it on, try to keep the glass perfectly straight and inline with the manifold or you risk chipping the front edge.

It should push all the way up to the blue highlighted manifold edge.

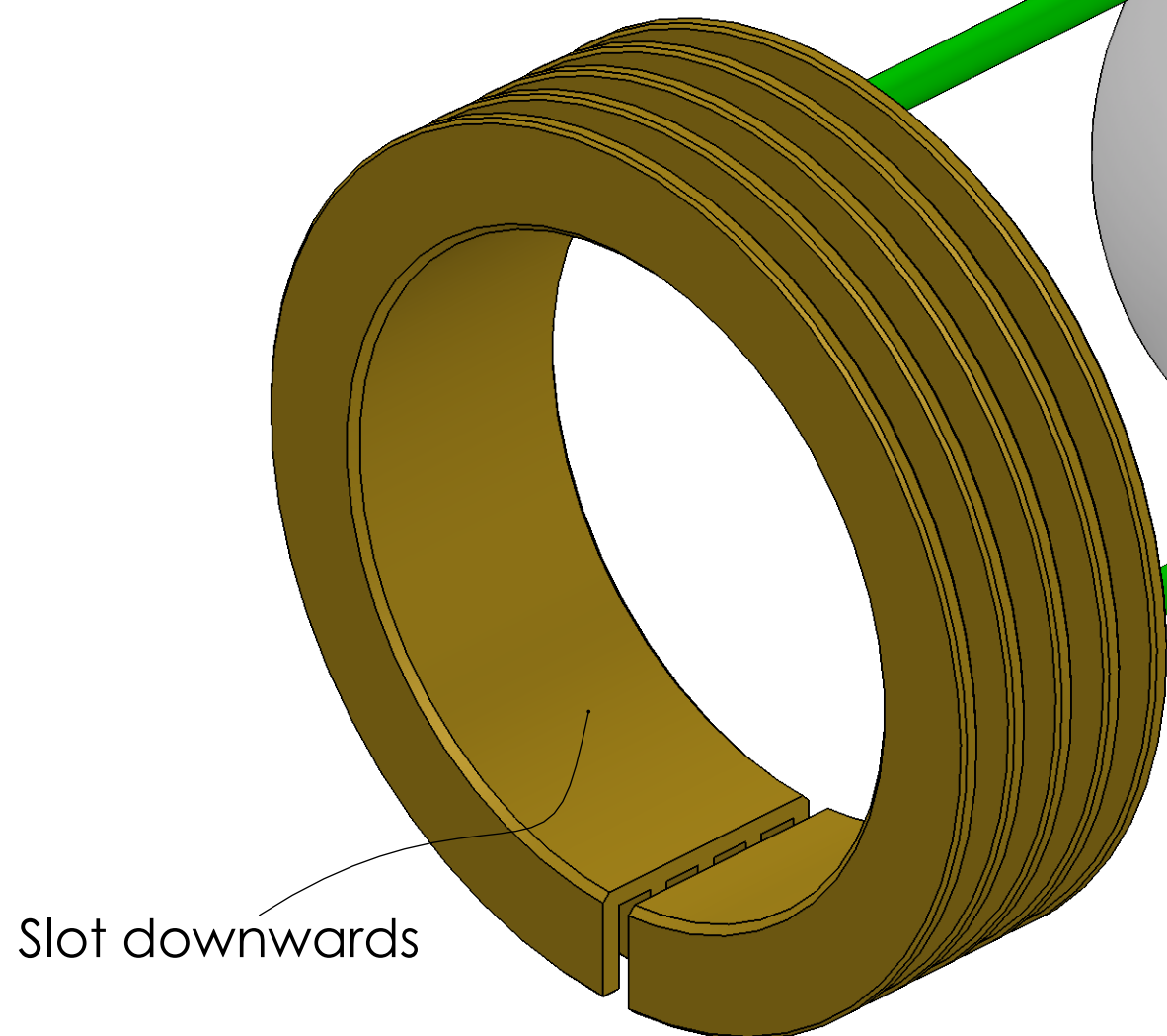
Wipe off any excess water afterwards.



Align the slot in the fins downwards and carefully push them on to the glass.

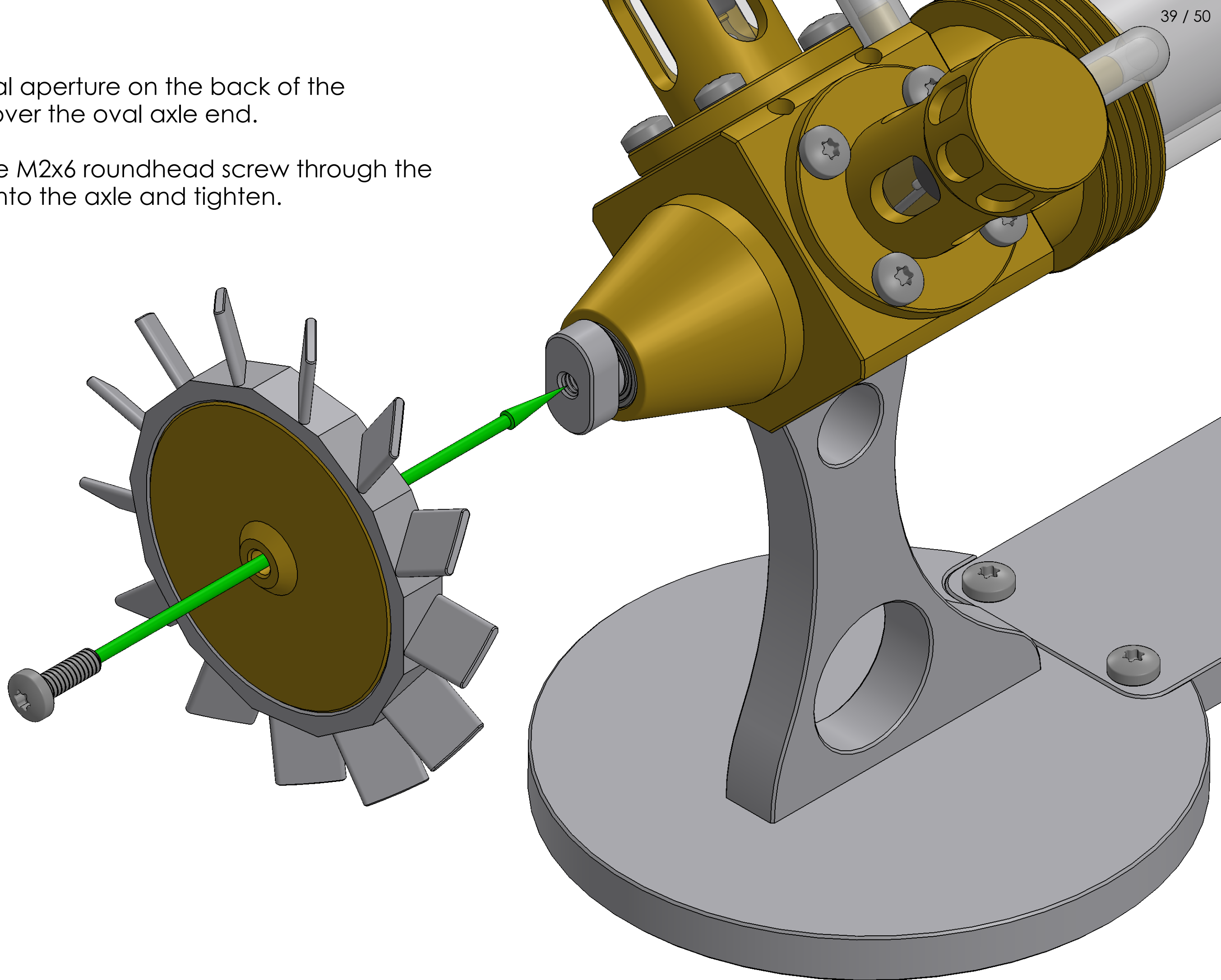
The fins are quite flexible and will safely and securely hold on to the glass.

Push the fins all the way up to the step on the manifold.



Fit the oval aperture on the back of the flywheel over the oval axle end.

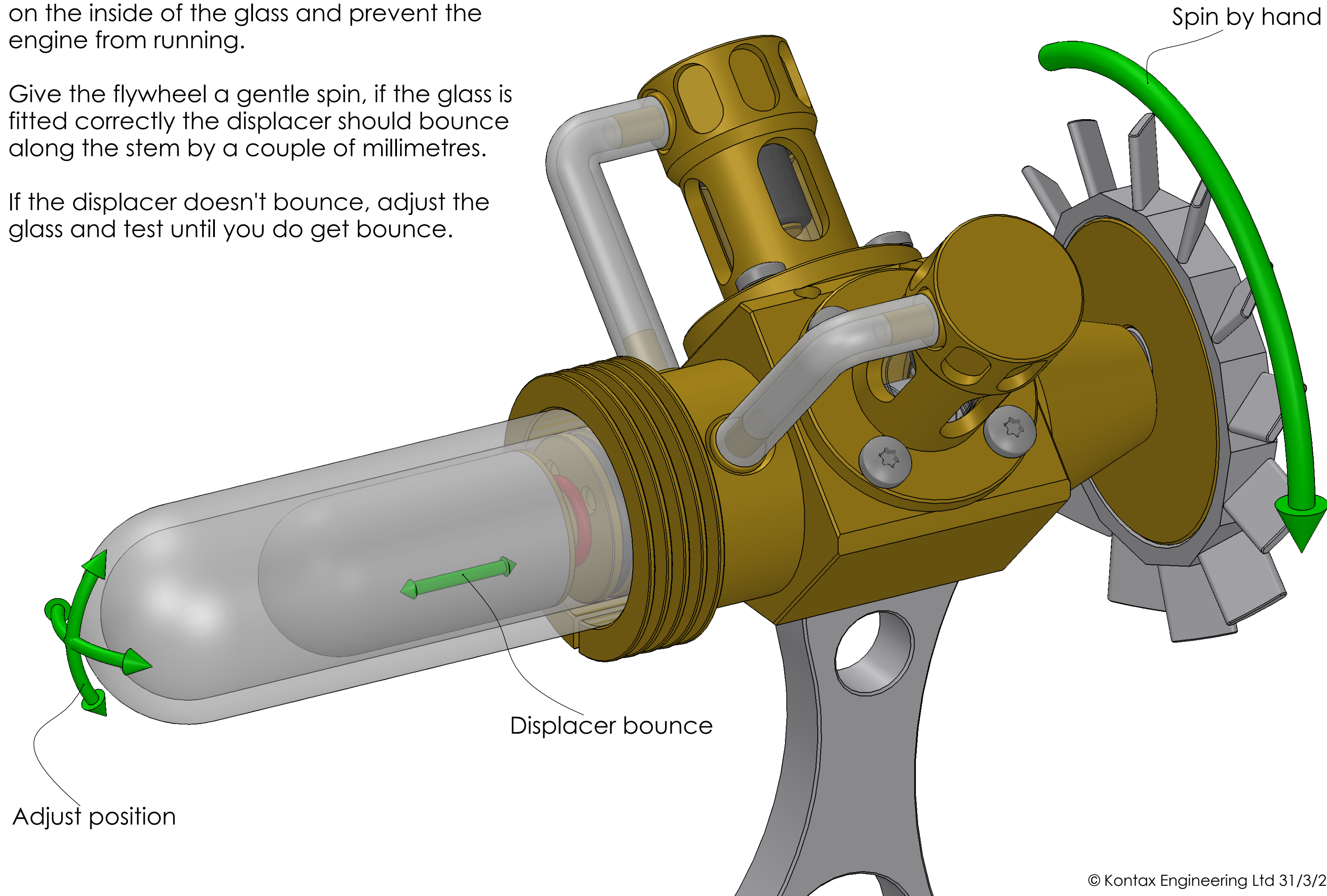
Screw one M2x6 roundhead screw through the flywheel into the axle and tighten.



Check that the glass is fitted correctly. With incorrectly fitted glass the displacer can rub on the inside of the glass and prevent the engine from running.

Give the flywheel a gentle spin, if the glass is fitted correctly the displacer should bounce along the stem by a couple of millimetres.

If the displacer doesn't bounce, adjust the glass and test until you do get bounce.

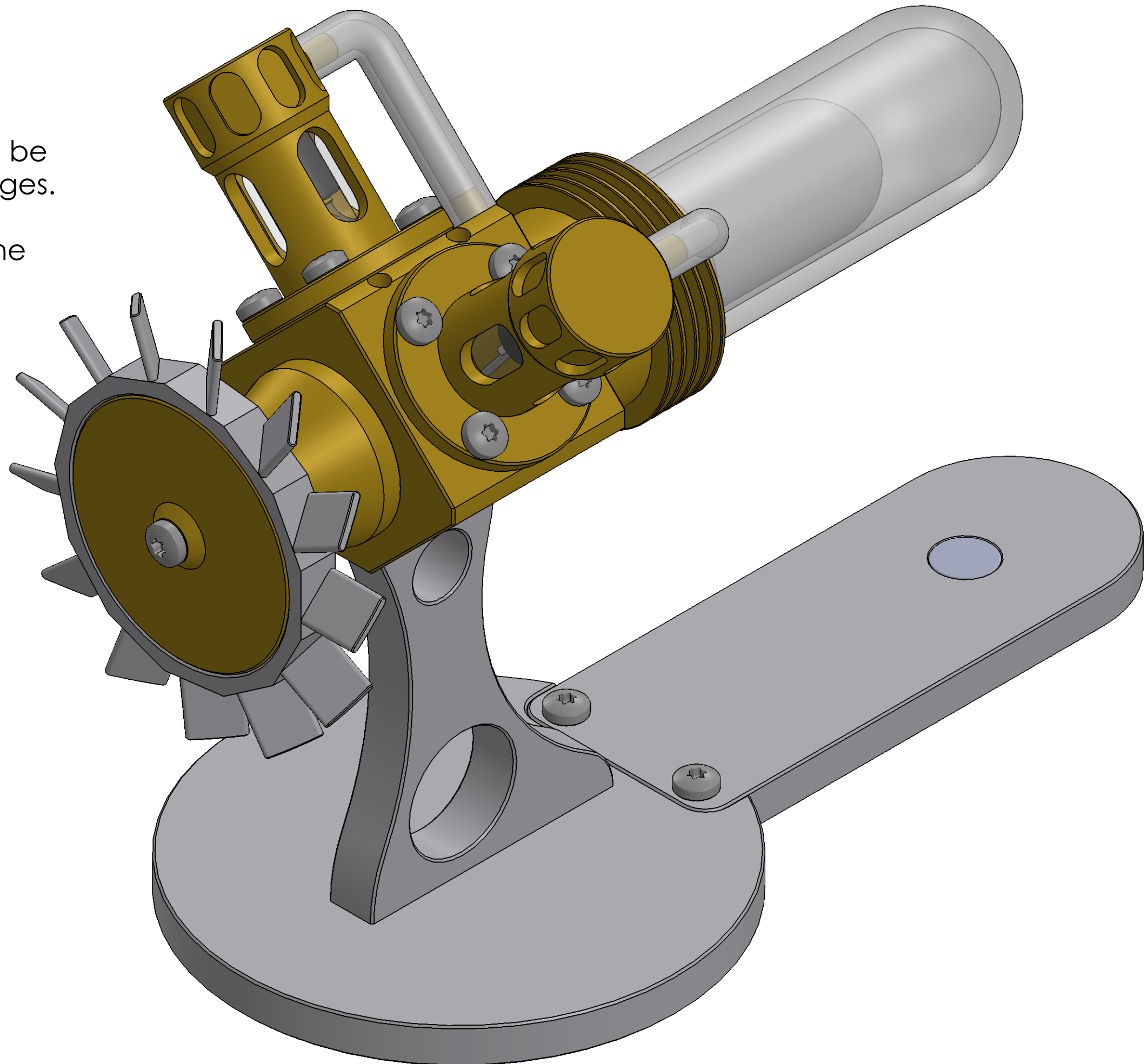


Your PROP engine is now fully assembled.

Operation, maintenance and troubleshooting instructions can be found on the next couple of pages.

If you need help with your engine you can email us at:

support@stirlingengine.co.uk

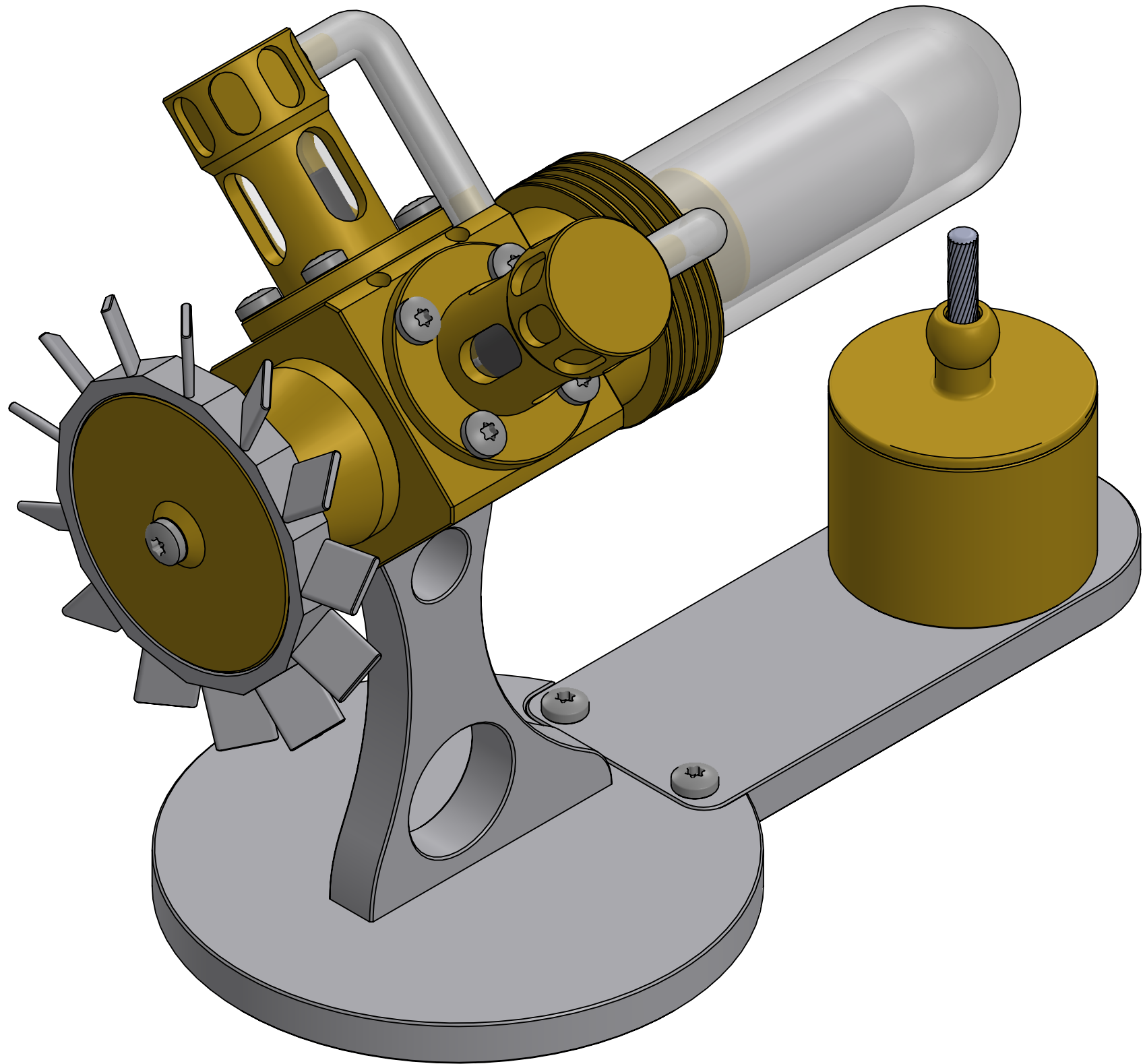


Your PROP V engine is now fully assembled.

Operation, maintenance and troubleshooting instructions can be found on the next couple of pages.

If you need help with your engine you can email us at:

support@stirlingengine.co.uk



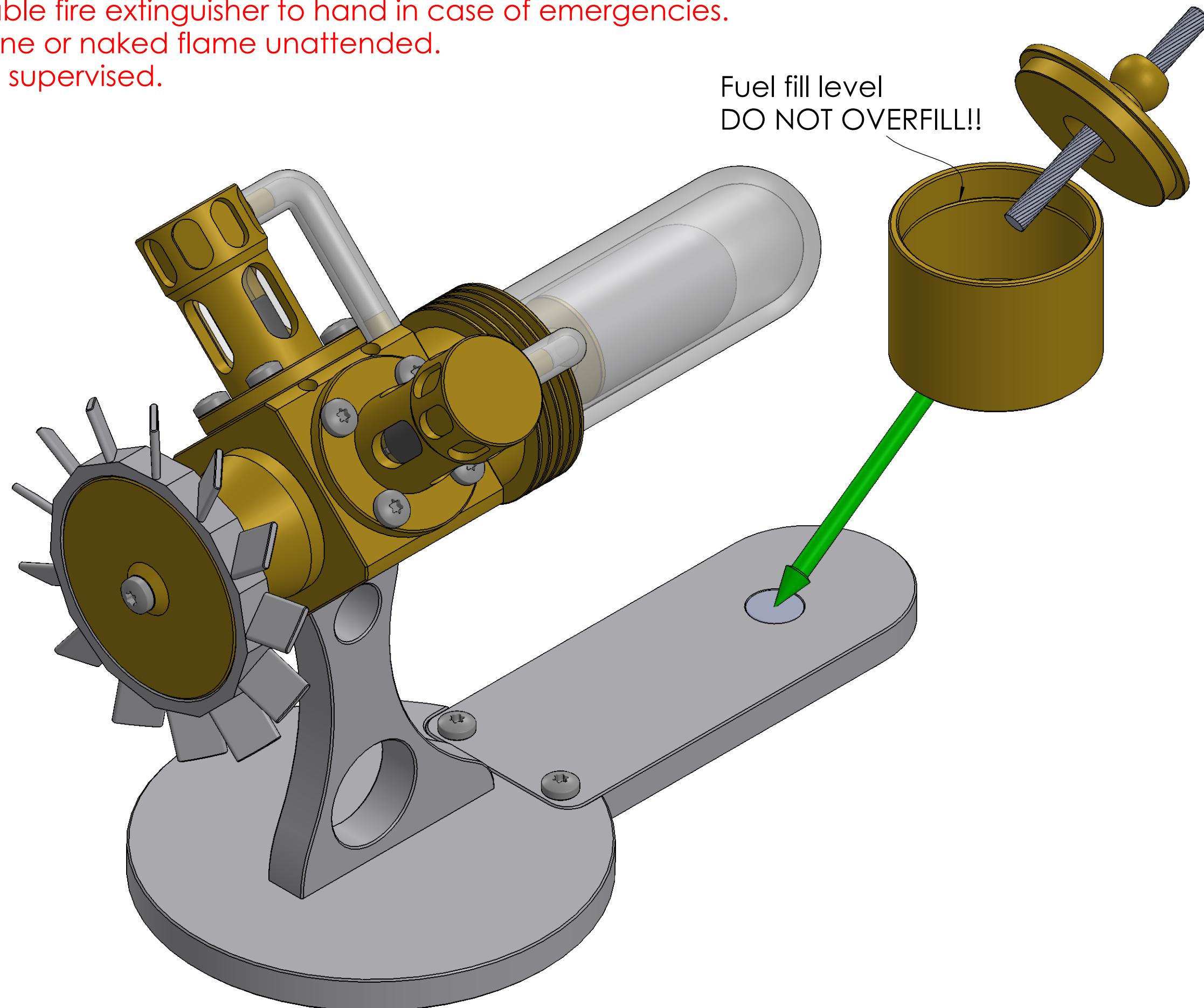
SAFETY NOTICE:

- All parts of the engine will be very hot while in operation and will take time to cool down after running.
- The flame produced by a steel wick can be almost invisible, ensure burner is extinguished after use.
- Make sure you have a suitable fire extinguisher to hand in case of emergencies.
- Never leave a running engine or naked flame unattended.
- Make sure children are fully supervised.

The engine uses Methylated Spirits or Denatured Alcohol as fuel.

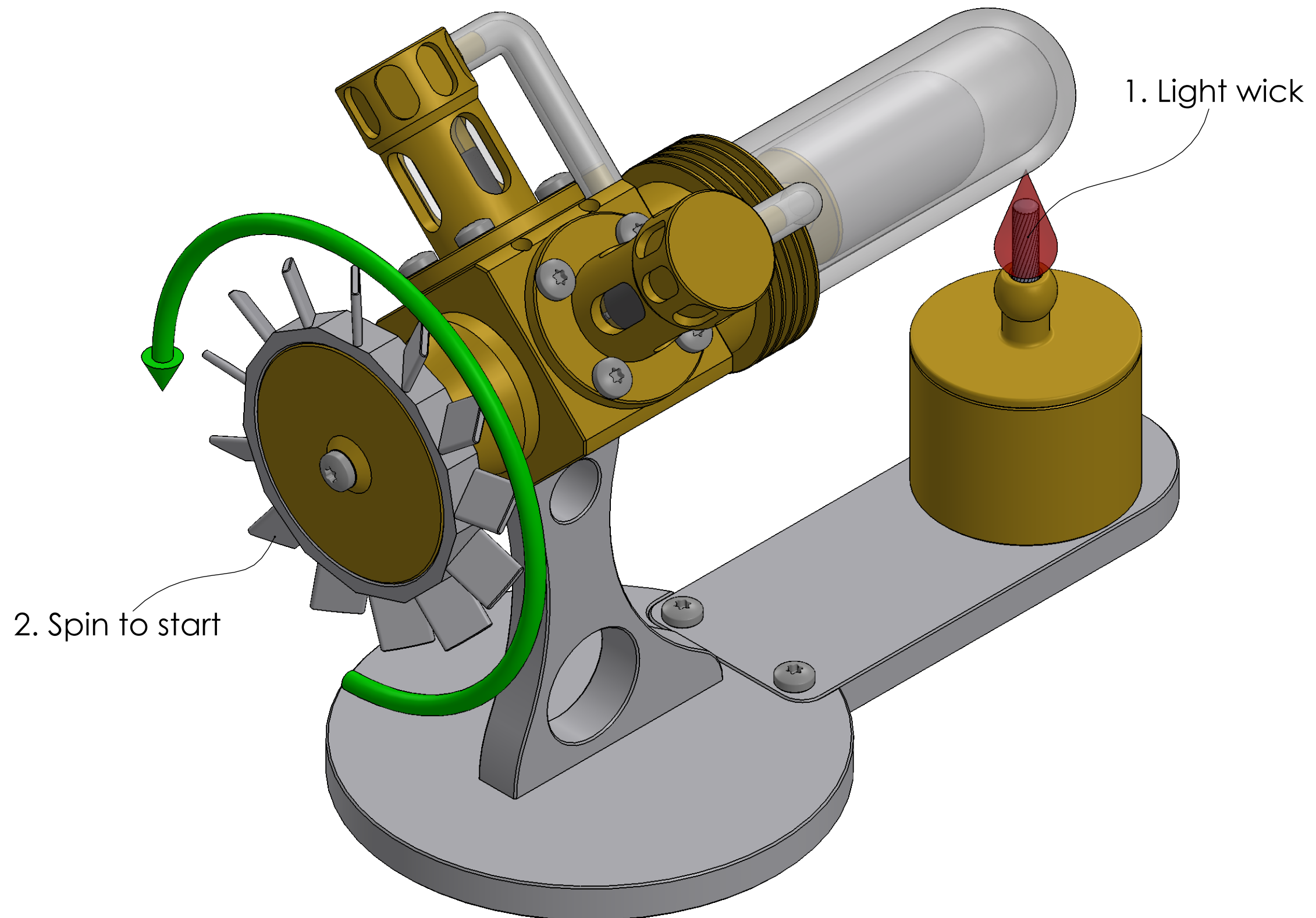
Remove the burner cap and wick from the burner body and fill with fuel to the fill level AND NO MORE.

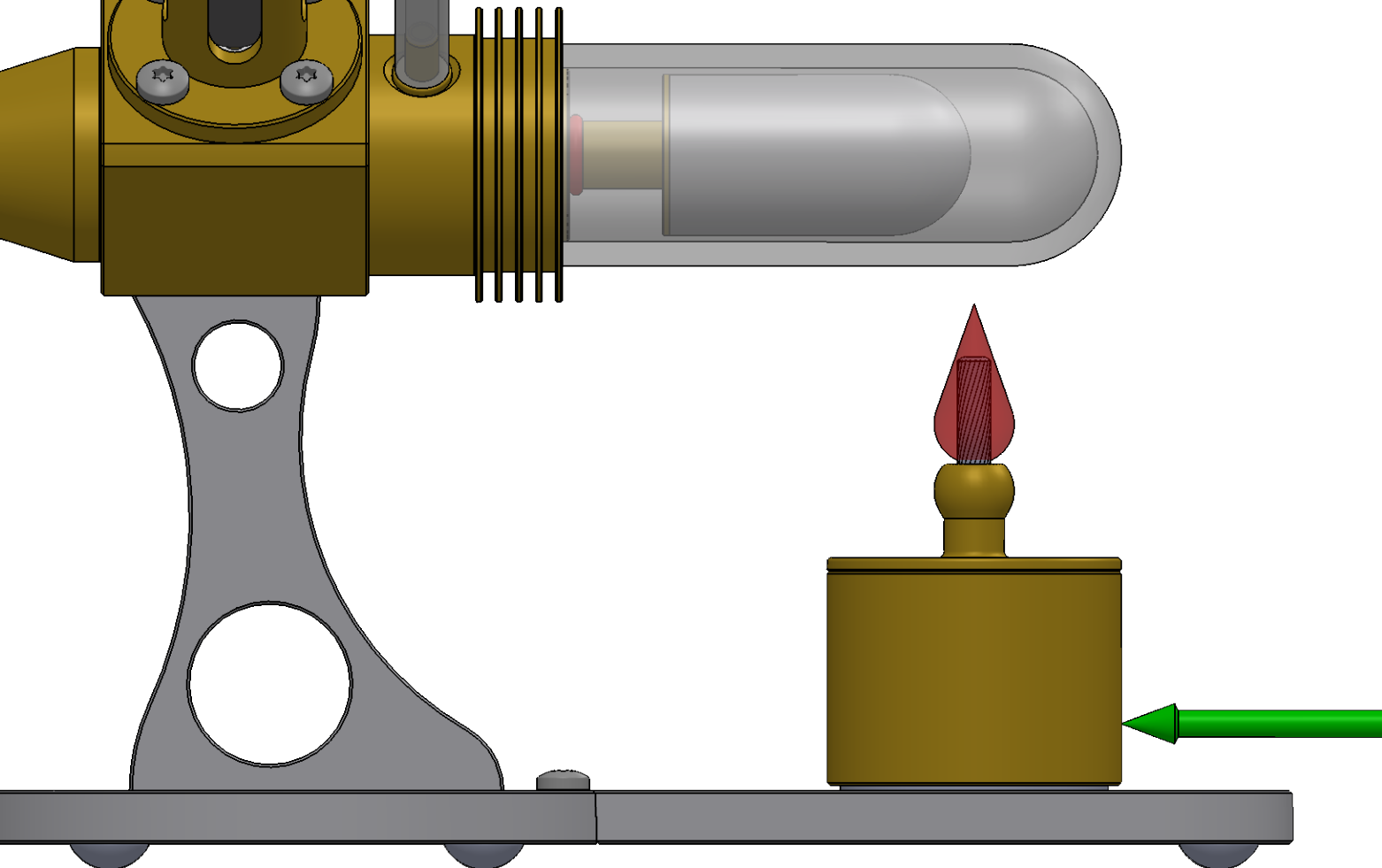
Re-fit the cap and wick and place the burner on the retaining magnet.



1. Light the wick and allow 2-3 minutes for the engine to warm up.
2. Spin the flywheel to start the engine, it might take several spins to get the engine started.

The engine will run in both directions but will run more reliably with the flywheel blades blowing the air forwards, pulling the flame towards the engine rather than blowing it away.



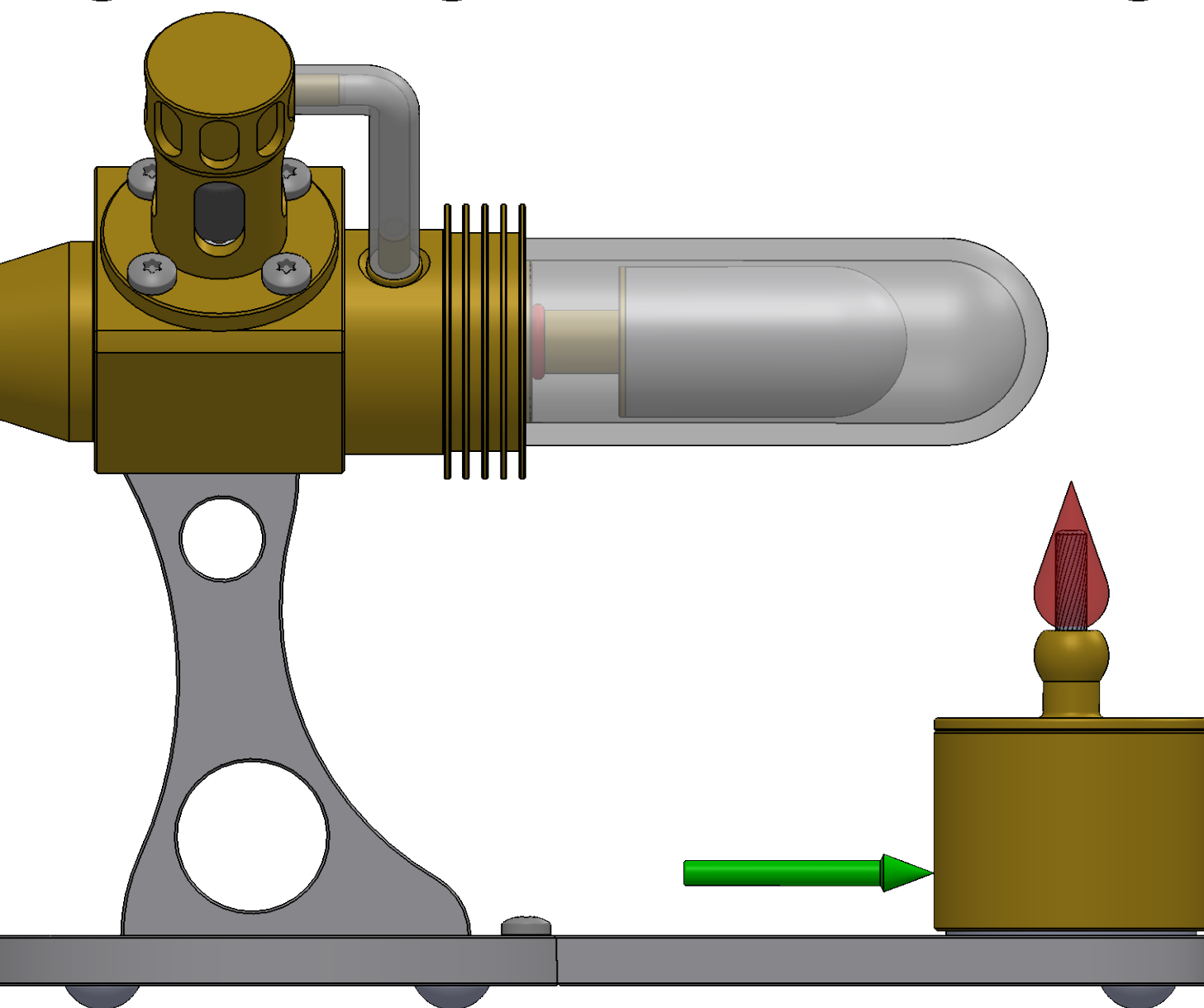


Running- The engine has a displacer that is not mechanically connected to the power pistons and therefore will sometimes surge up in speed and then slow down over and over.

In this situation the burner can be moved outwards to reduce the heat going into the engine, which should give smoother operation.

After the engine has been running for a few minutes the speed might drop slightly because the engine chassis has warmed up.

In this situation the burner can be moved inwards to increase the heat going into the engine, which should increase speed again.



The engine is not designed to run for extended periods of time. As a Stirling engine, it relies on a temperature difference between the end of the glass cylinder and the brass fin block. After about 10-15 minutes of running the heat from the flame will have transferred along the glass and into the brass fin block, thereby reducing the temperature difference to the point where the engine will not run.

In this situation the engine should be allowed to cool naturally before running again.

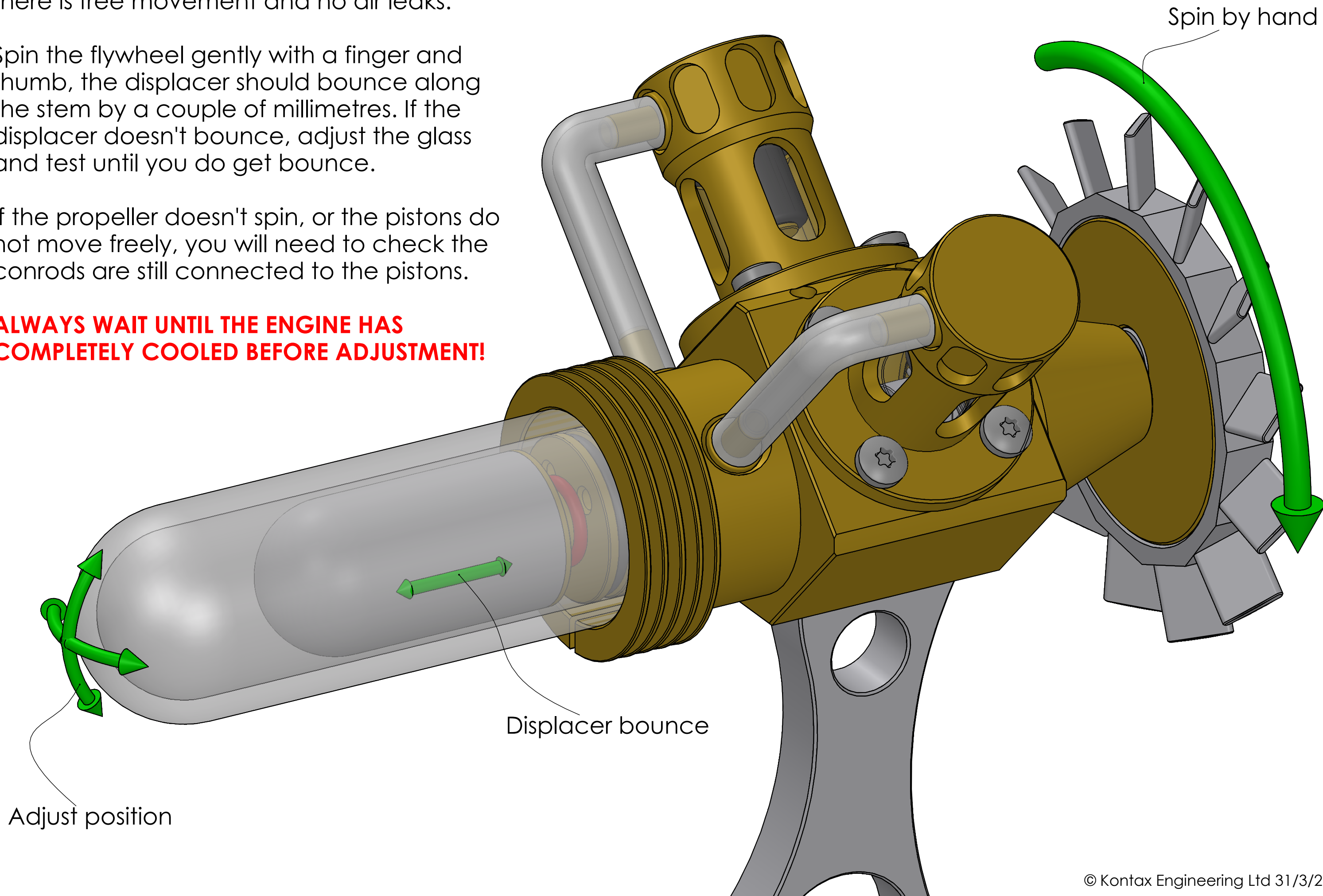
DO NOT USE EVER COLD WATER TO COOL THE ENGINE, THIS CAN CRACK THE GLASS!

Troubleshooting 1- If the engine struggles to run at all then you will need to check that there is free movement and no air leaks.

Spin the flywheel gently with a finger and thumb, the displacer should bounce along the stem by a couple of millimetres. If the displacer doesn't bounce, adjust the glass and test until you do get bounce.

If the propeller doesn't spin, or the pistons do not move freely, you will need to check the conrods are still connected to the pistons.

ALWAYS WAIT UNTIL THE ENGINE HAS COMPLETELY COOLED BEFORE ADJUSTMENT!



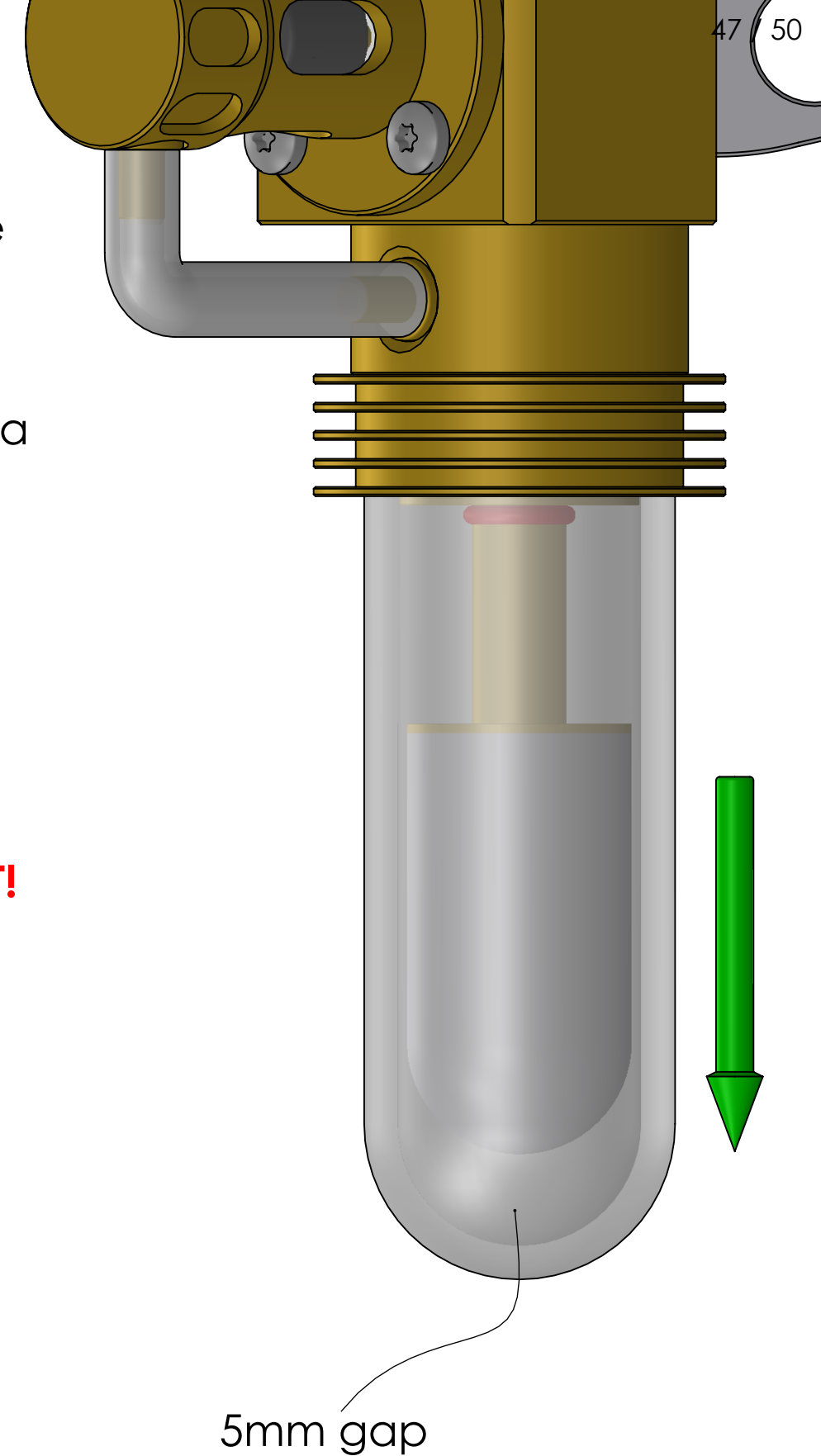
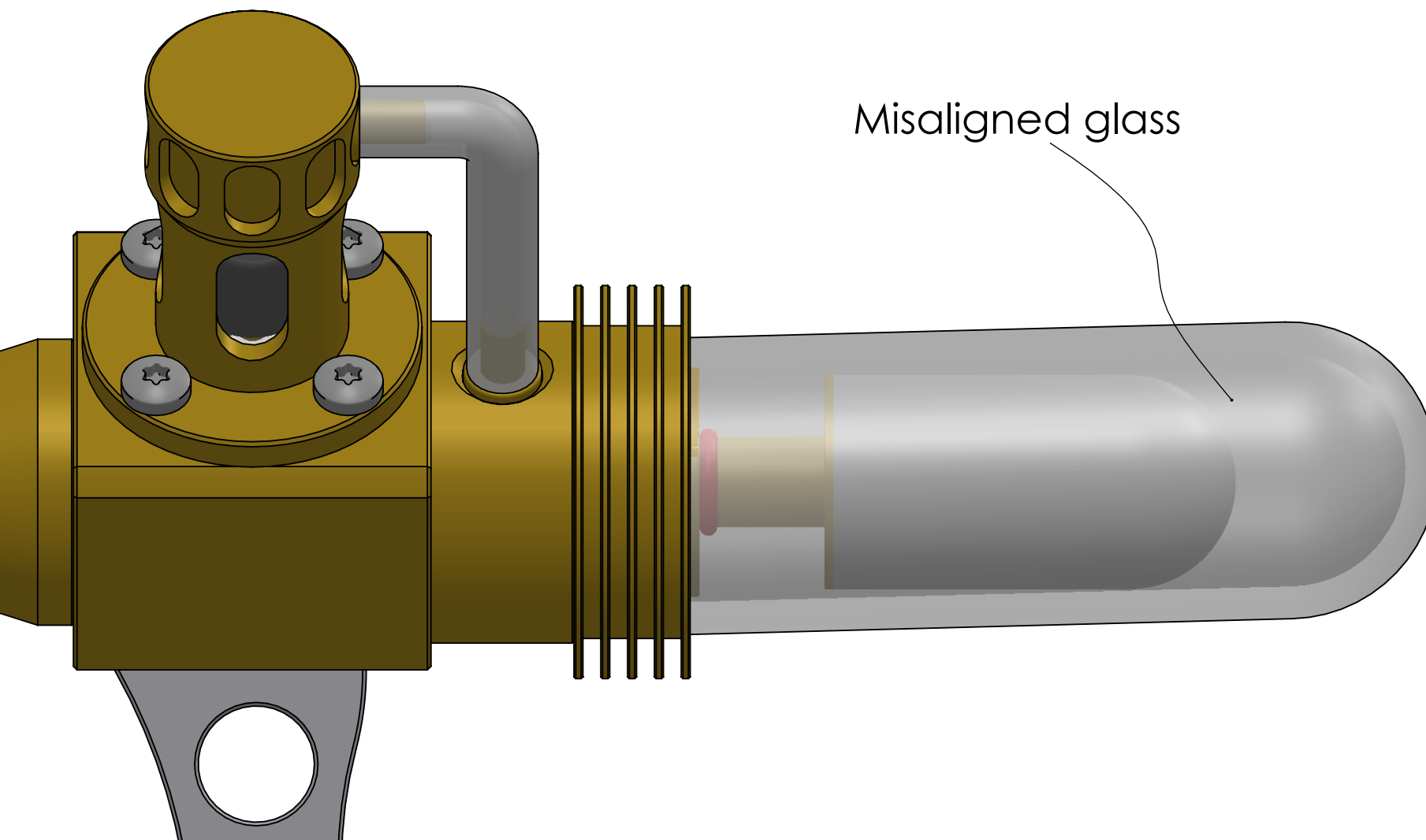
Troubleshooting 2- The commonest cause of a non-running engine is misaligned glass, causing the displacer to rub.

This can be difficult to test for with the usual bounce test because the bounce test only moves the displacer by a couple of millimetres and not along the whole length of the stem.

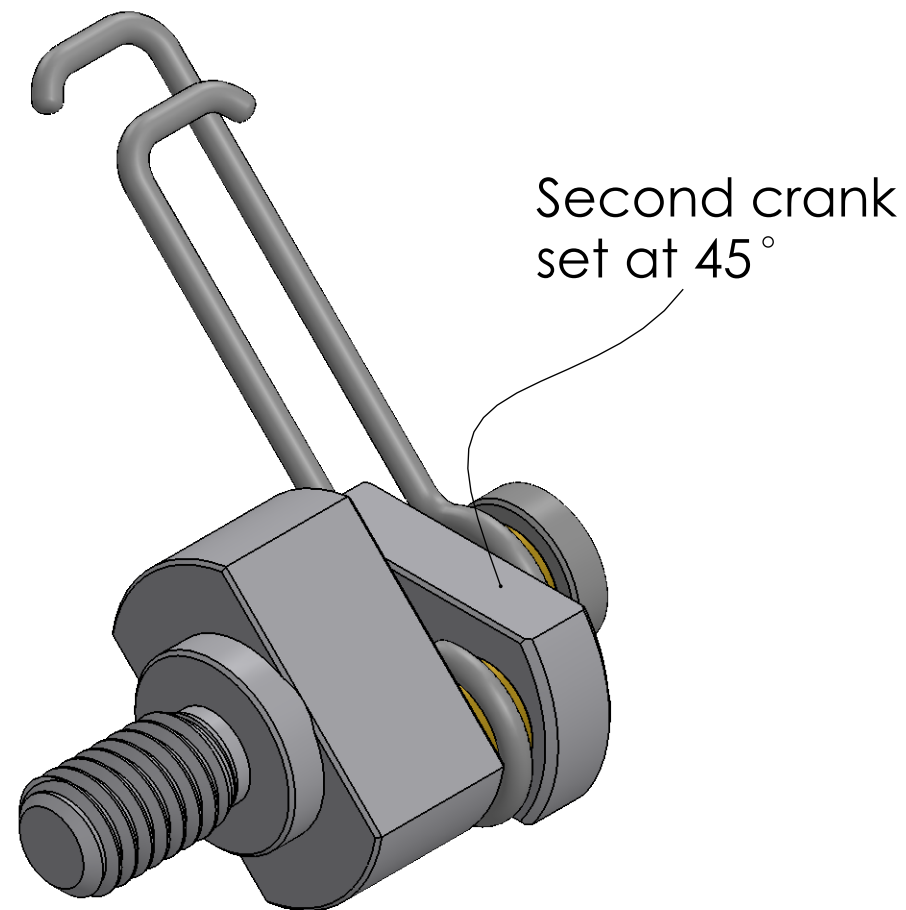
Allow the displacer to fall under its own weight to its full extension. There will be a 5mm gap between the end of the displacer and the inside of the glass dome when it is at full extension. If it doesn't fall this far then the glass will need adjusting.

The best course of action is to make tiny adjustments to the glass position and keep testing. Remember to check for sideways misalignment as well as up and down.

ALWAYS WAIT UNTIL THE ENGINE HAS COMPLETELY COOLED BEFORE ADJUSTMENT!

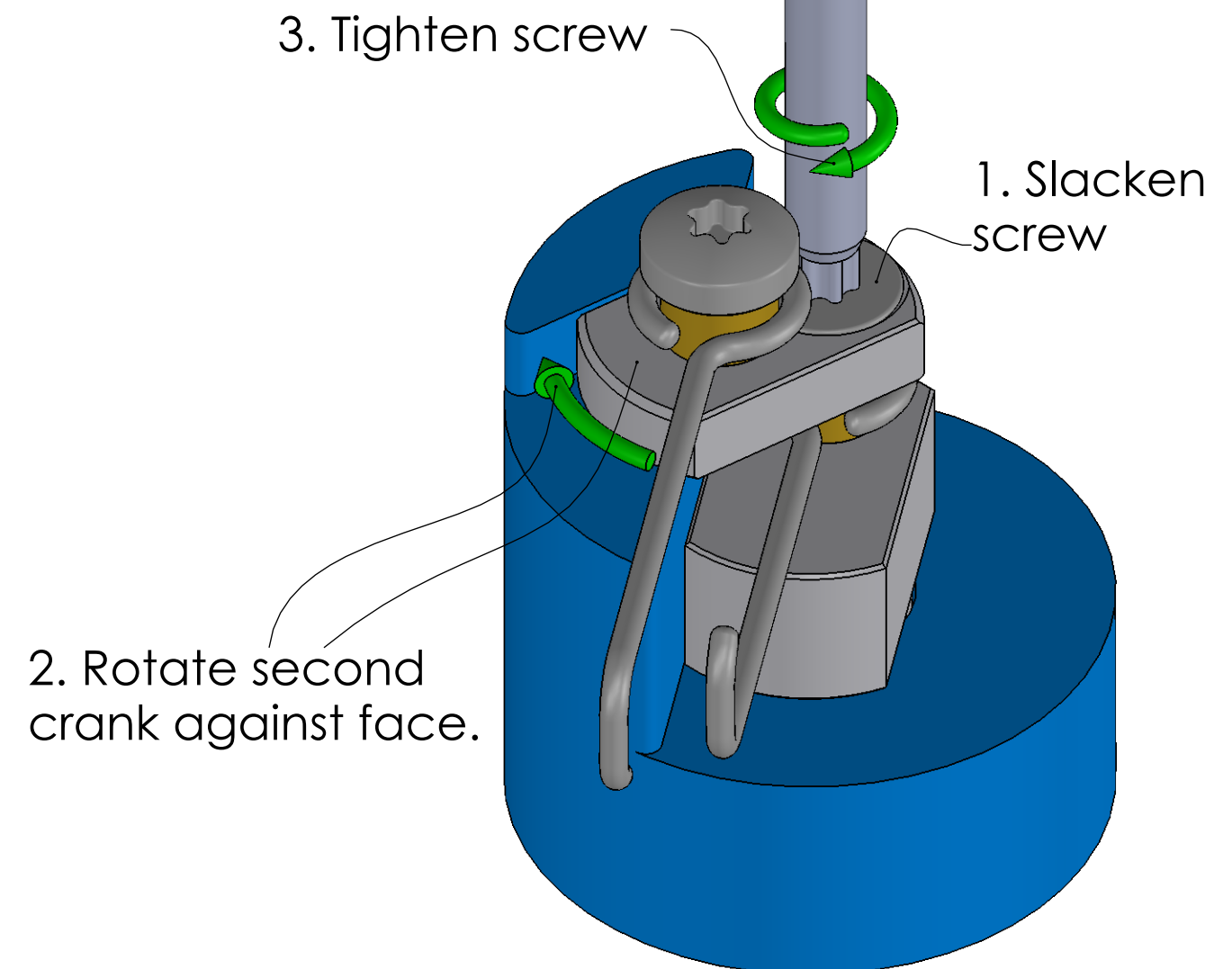


Troubleshooting 3- The crankset is supplied with a preset 45° angle on the second crank. If this angle becomes misaligned the engine will not run correctly.



To reset the angle slacken the crank screw slightly (1) and fit the crankset into the crank angle tool as shown.

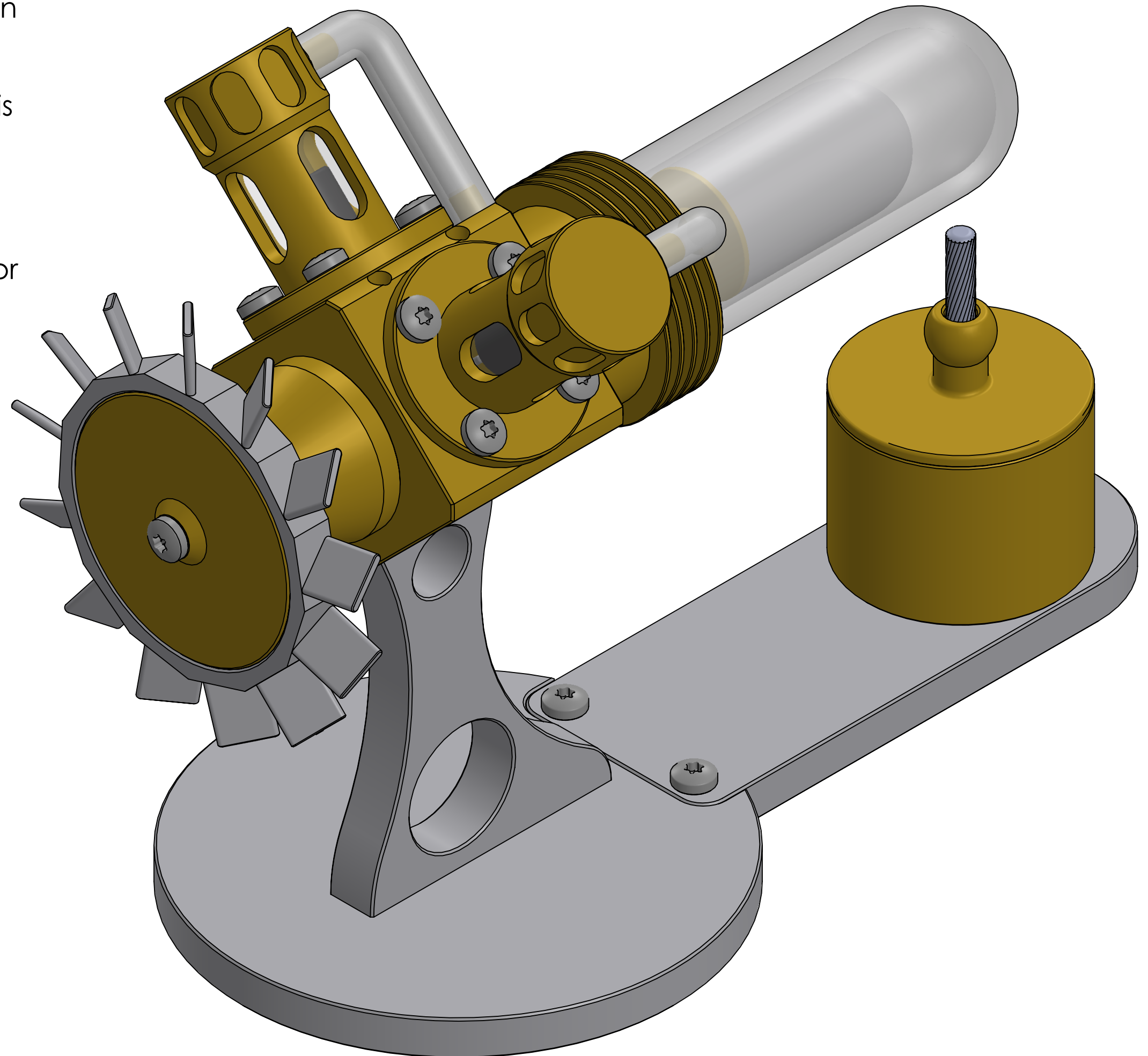
Rotate the second crank so that it is flush with the 45° angled face on the angle tool (2) and then tighten the crank screw (3).



Maintenance- The engine should require no maintenance if kept in a clean and dry environment.

If allowed to get dirty or dusty it is possible the front bearing could get need cleaning.

Both bearings can be removed and rinsed in Methylated Spirits or Denatured Alcohol and refitted.





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 4 CNC mills, 3 CNC lathes and 3 CNC mill-turn centres.