Vulcan Ultra Stove Fan

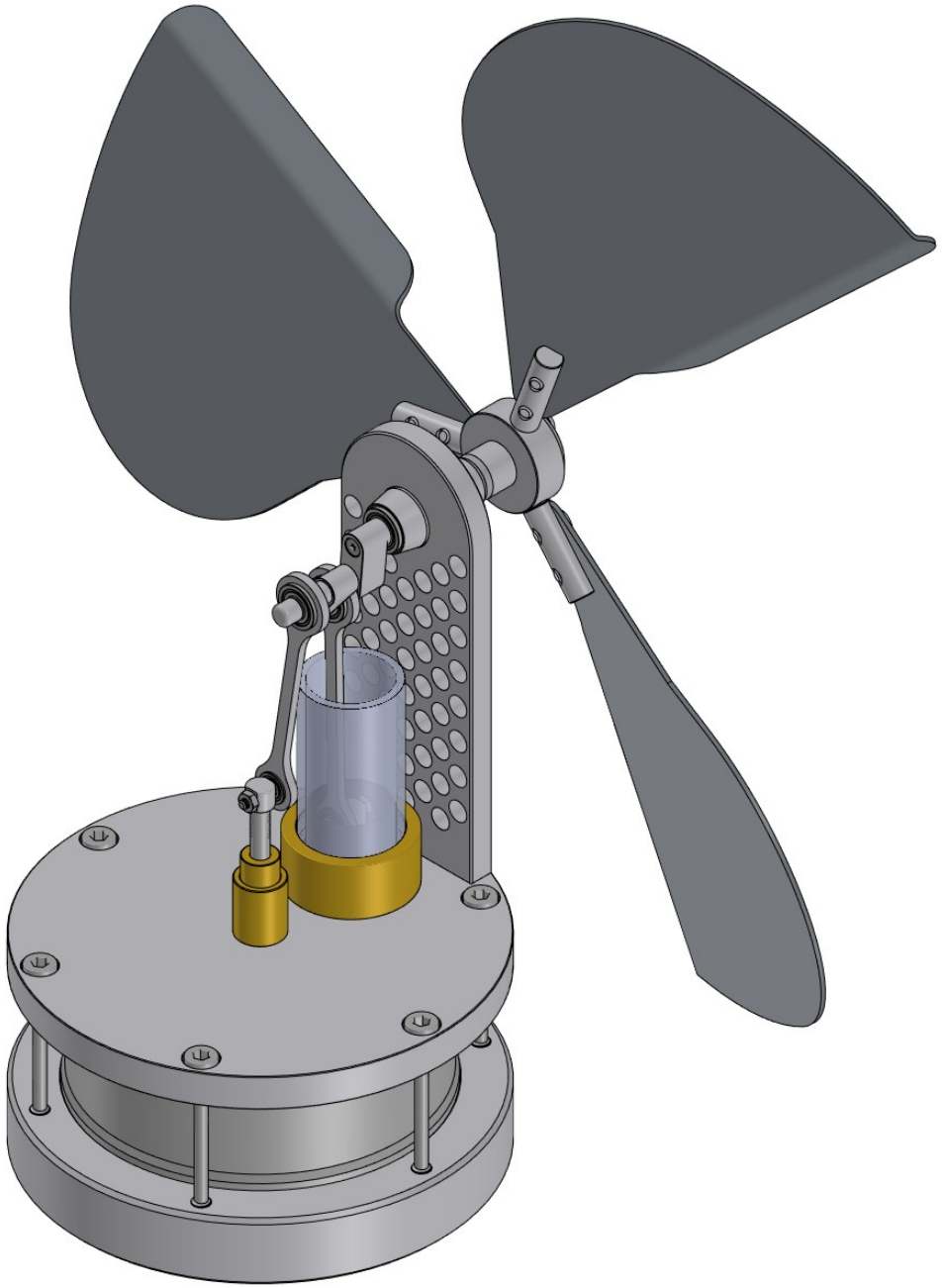
Please read all the way through the assembly instructions to familiarise yourself with the process before you start and pay close attention to the alignment of all the parts in the diagrams.

Full assembly should take approximately 25 minutes.

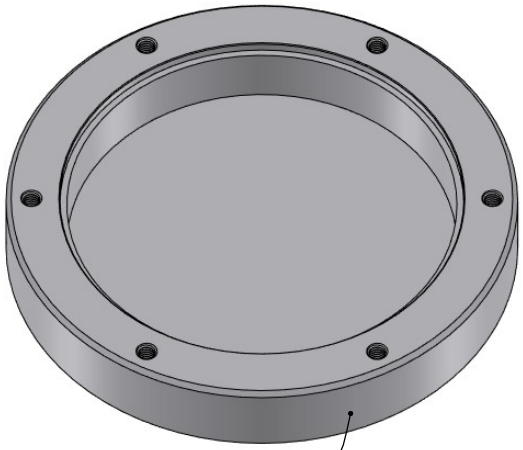
If you have an assembled Vulcan and just need to fit the blades you can skip forward to page 38.

Operation and maintenance instructions can be found at the end of this document.

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

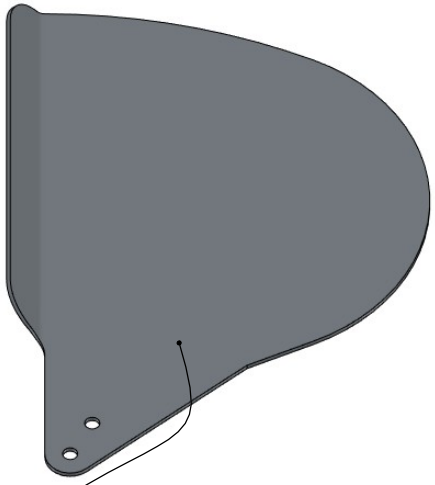


Parts 1

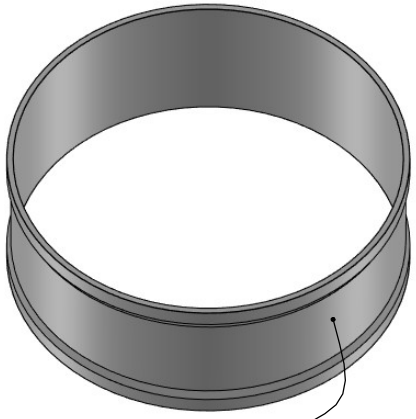


1x Base

1x Top plate
(with pre-fitted gasket and pressure ring)



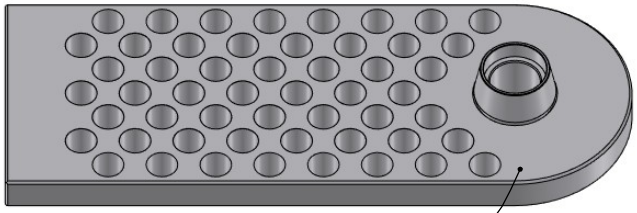
3x Blade



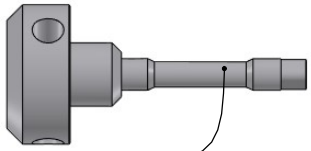
1x Chamber wall

1x Displacer

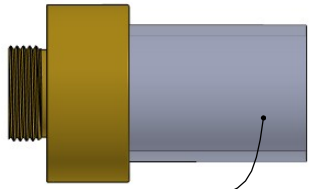
Parts 2



1x Main pillar



1x Hub/axle



1x Cylinder
(pre-assembled)

1x Piston conrod
(pre-assembled)

1x Displacer conrod
(pre-assembled)

1x Gland
(pre-assembled)

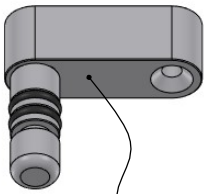
1x Piston

Parts 2

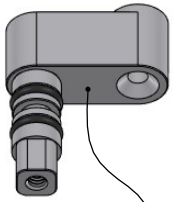
6x Chamber screw

1x Displacer stem

3x Spoke



1x Displacer crank
(pre-assembled)



1x Piston crank
(pre-assembled)

1x 22mm O ring

1x 7mm O ring

2x 10mm bearing

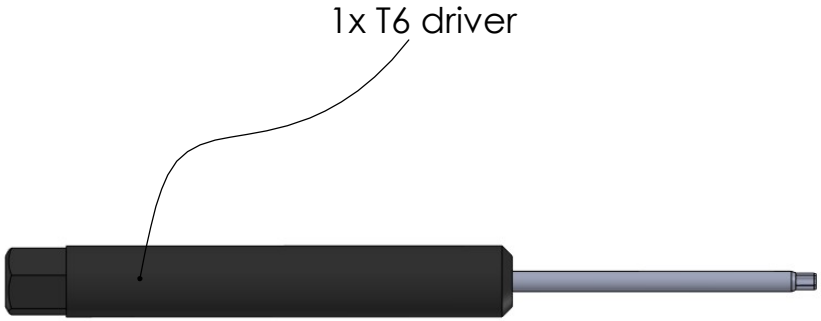
6x Locking washer

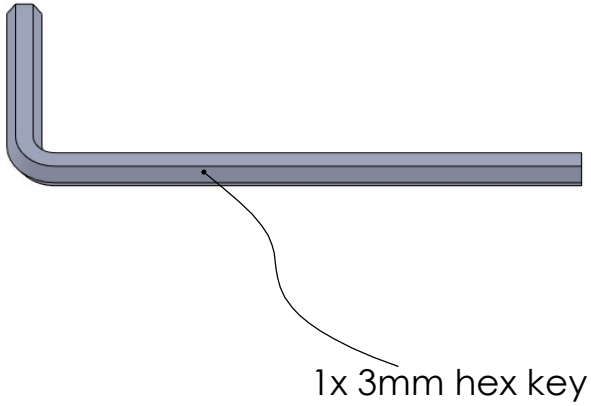
2x M3x12 screw

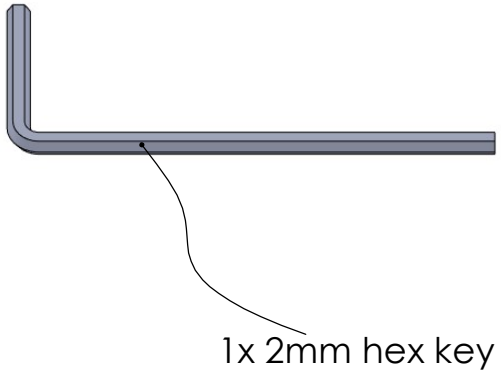
10x M3x6 screw

2x M2x8 screw

Tools



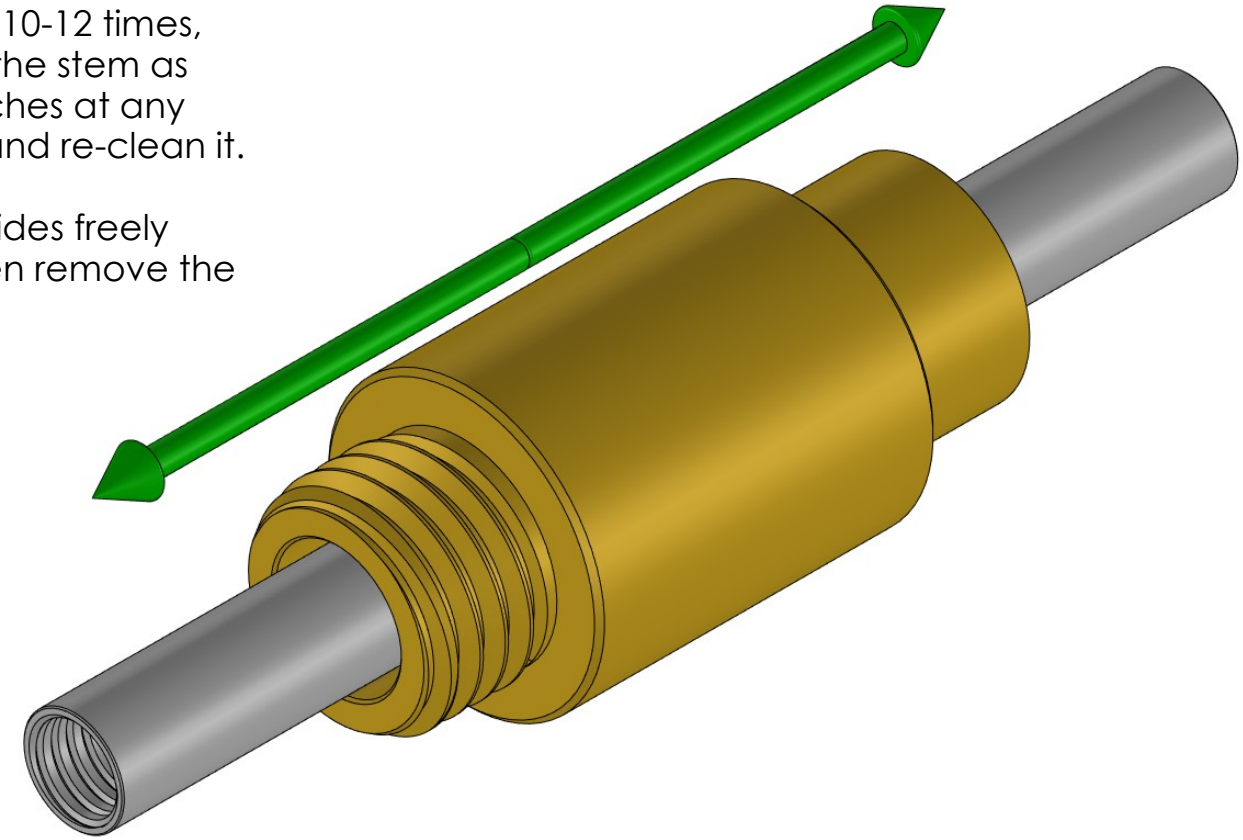




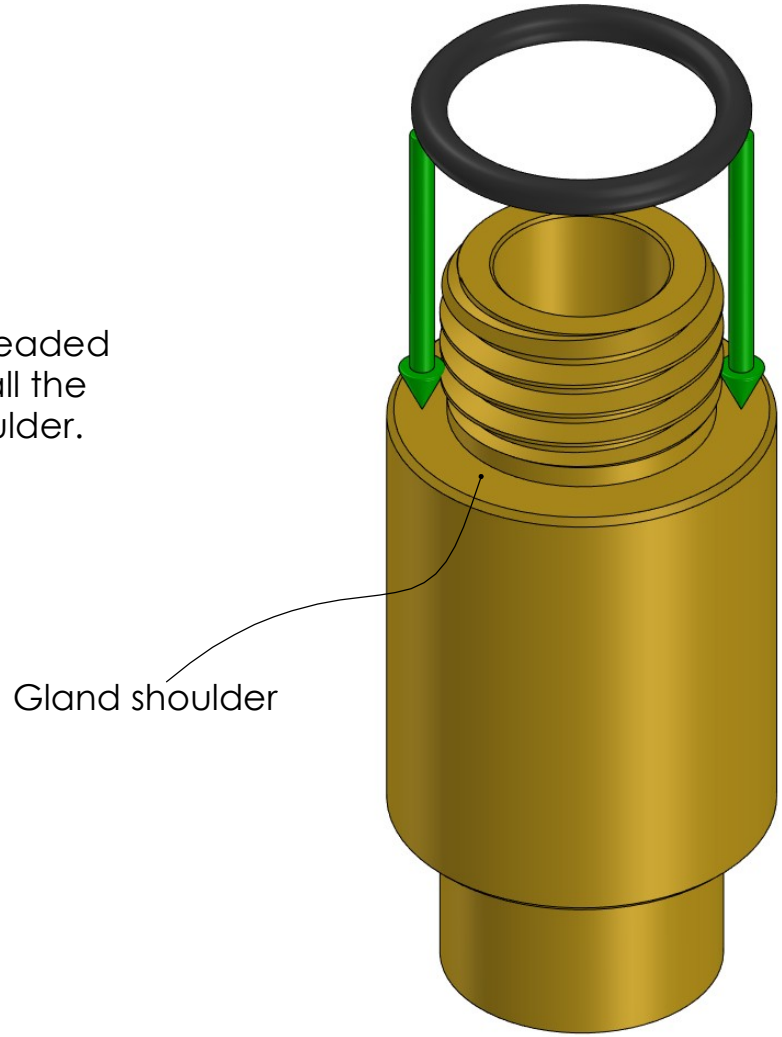
Clean the stem with a lint-free cloth to remove all particles and fibres.

Fit the stem into the gland and slide the gland up and down 10-12 times, rotating them gland on the stem as you go. If it binds or catches at any point remove the stem and re-clean it.

Repeat until the gland slides freely without binding, and then remove the stem from the gland.

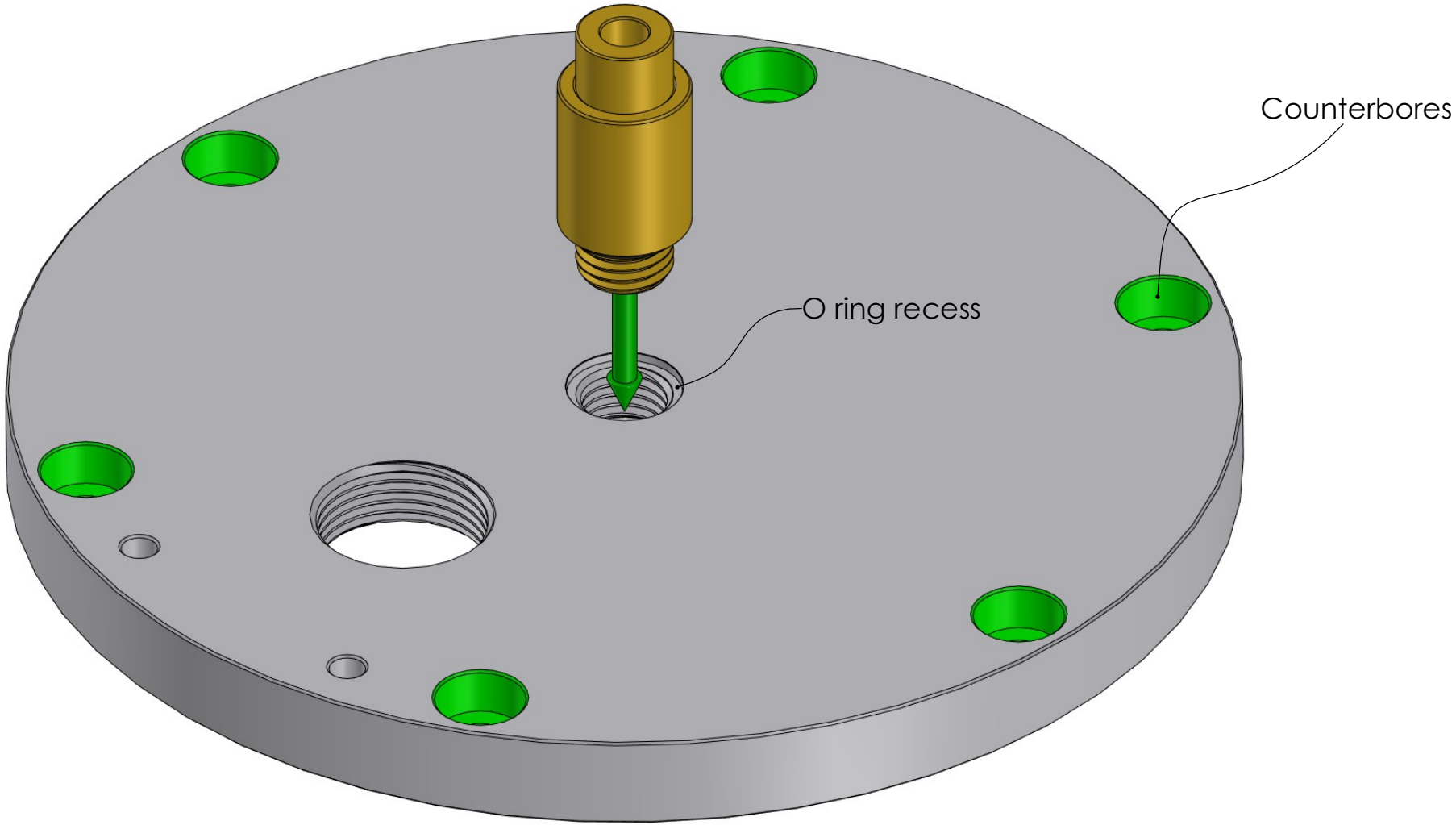


Fit the 7mm O ring over the threaded end of the gland so that it sits all the way down onto the gland shoulder.

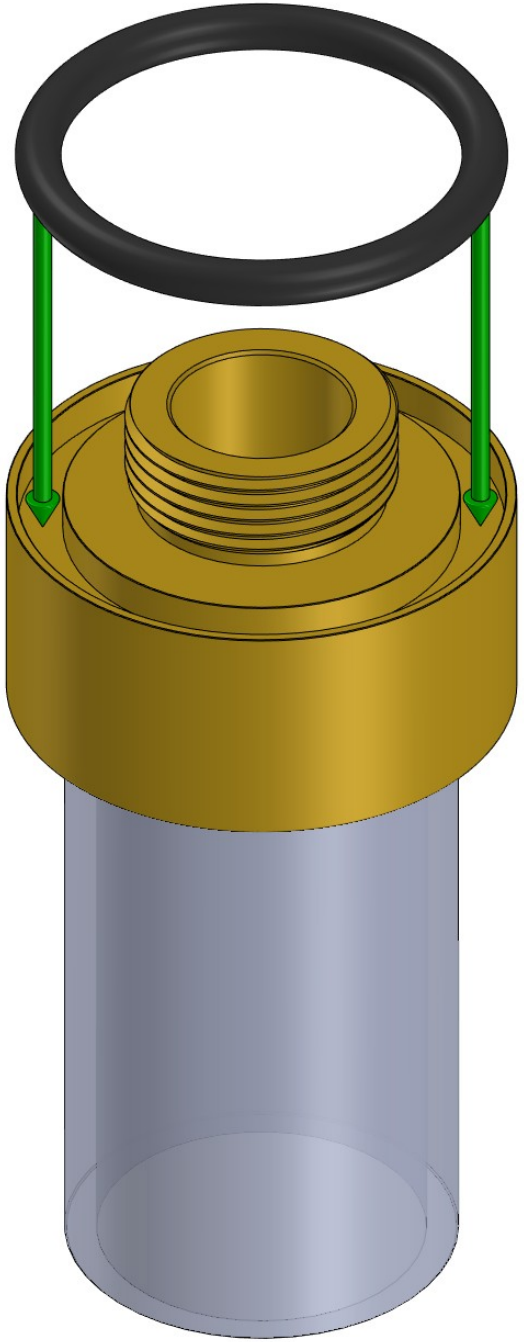


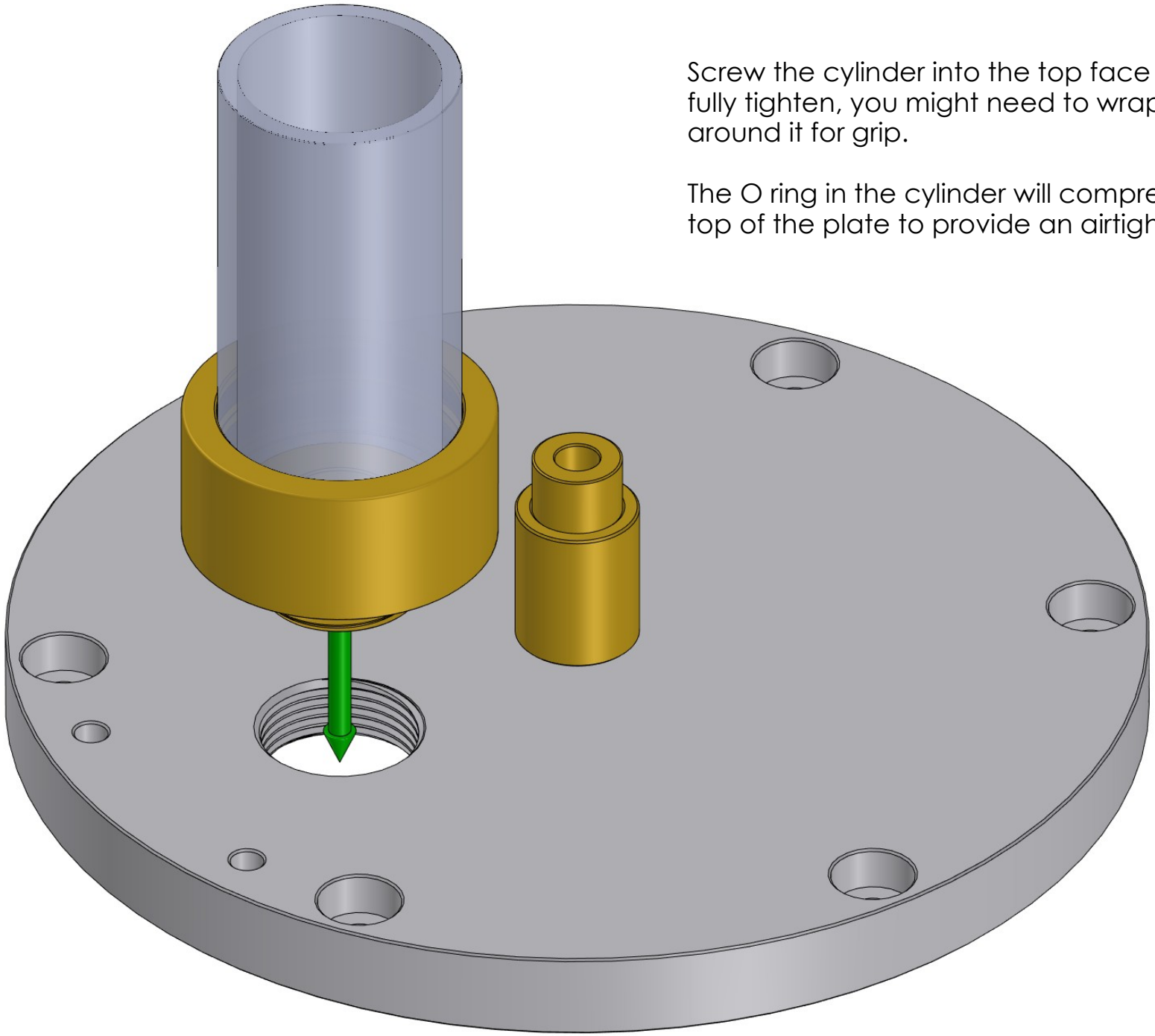
Identify the top face of the top plate, this is the face with the counterbores on the six holes as shown. Screw the gland into the TOP face of the top plate and fully tighten, you might need to wrap an elastic band around it for grip.

The O ring on the gland will fit down into the O ring recess in the top plate and compress slightly to provide an airtight seal.



Fit the 22mm O ring into the groove in the bottom of the cylinder. Make sure is is pressed fully into the bottom of the groove.

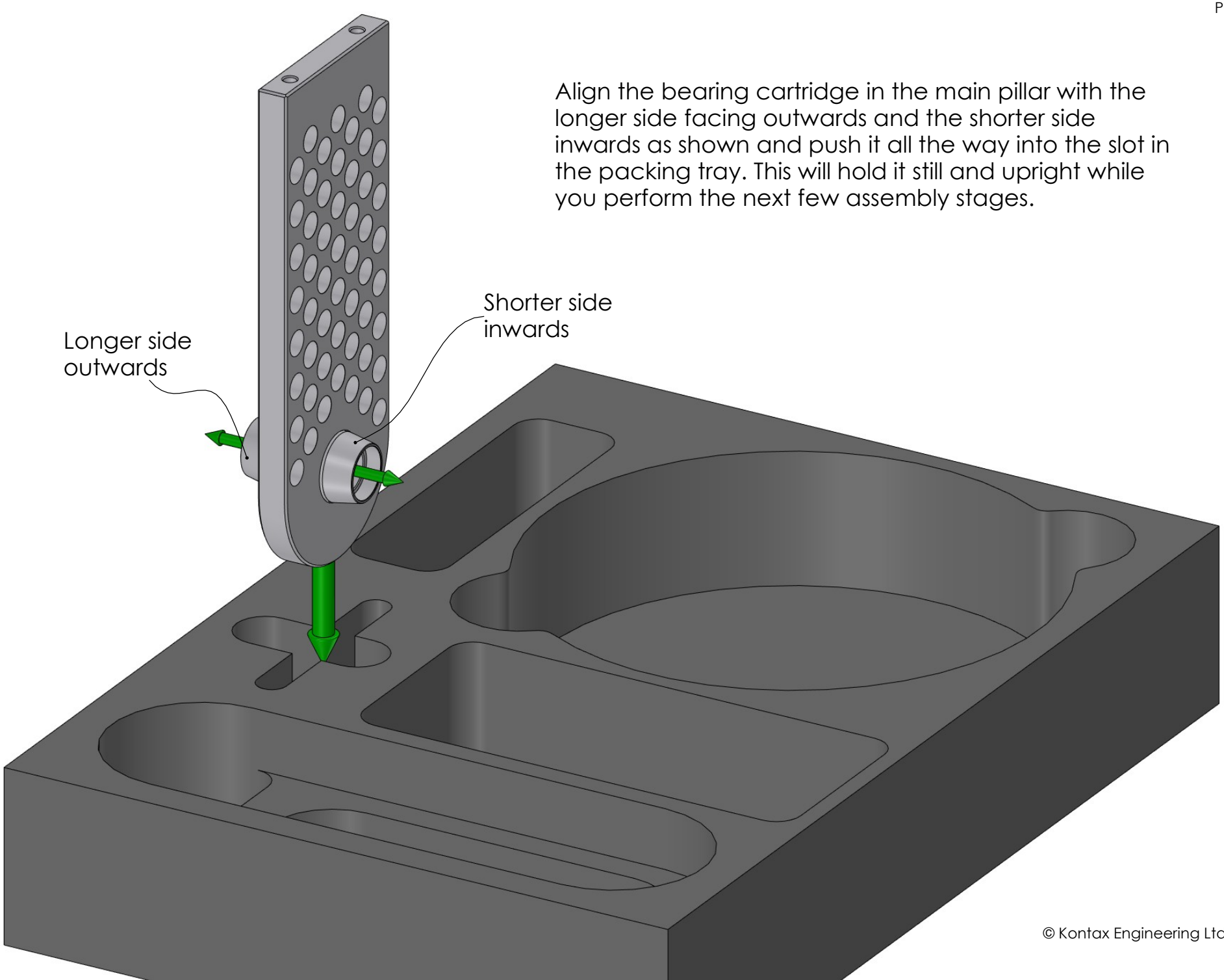


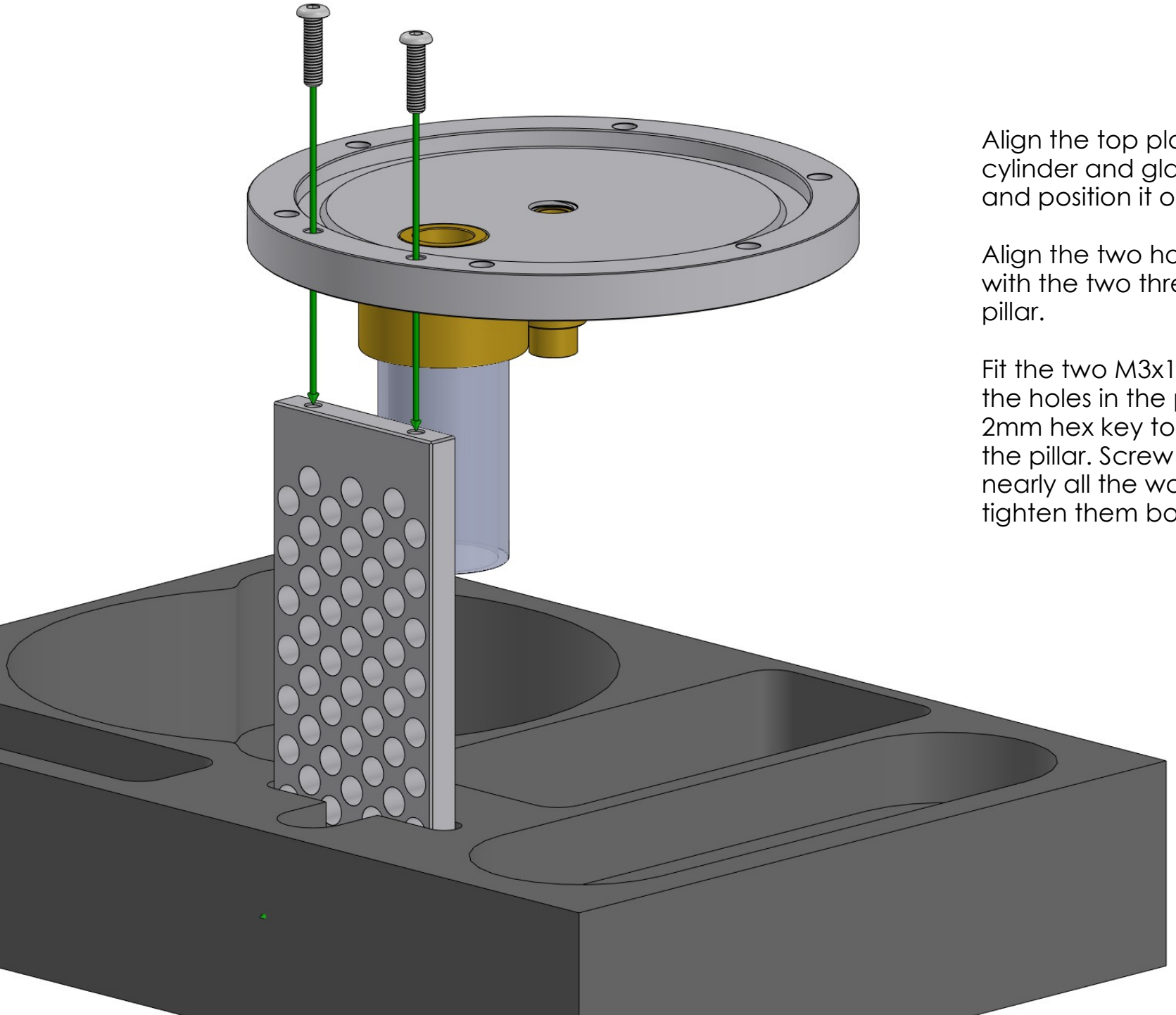


Screw the cylinder into the top face of the top plate and fully tighten, you might need to wrap an elastic band around it for grip.

The O ring in the cylinder will compress slightly onto the top of the plate to provide an airtight seal.

Align the bearing cartridge in the main pillar with the longer side facing outwards and the shorter side inwards as shown and push it all the way into the slot in the packing tray. This will hold it still and upright while you perform the next few assembly stages.



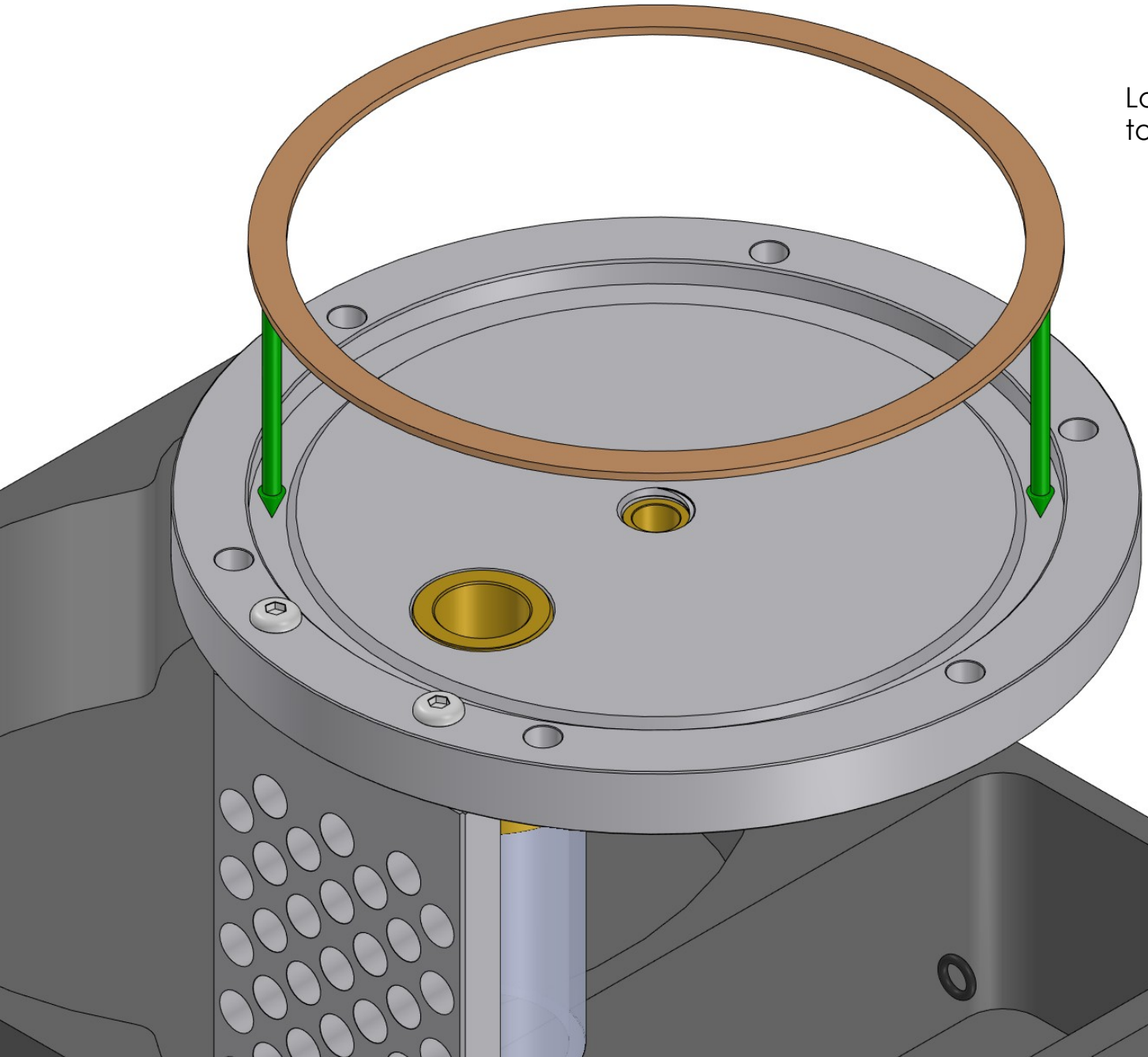


Align the top plate with the cylinder and gland downwards and position it over the main pillar.

Align the two holes in the plate with the two threaded holes in the pillar.

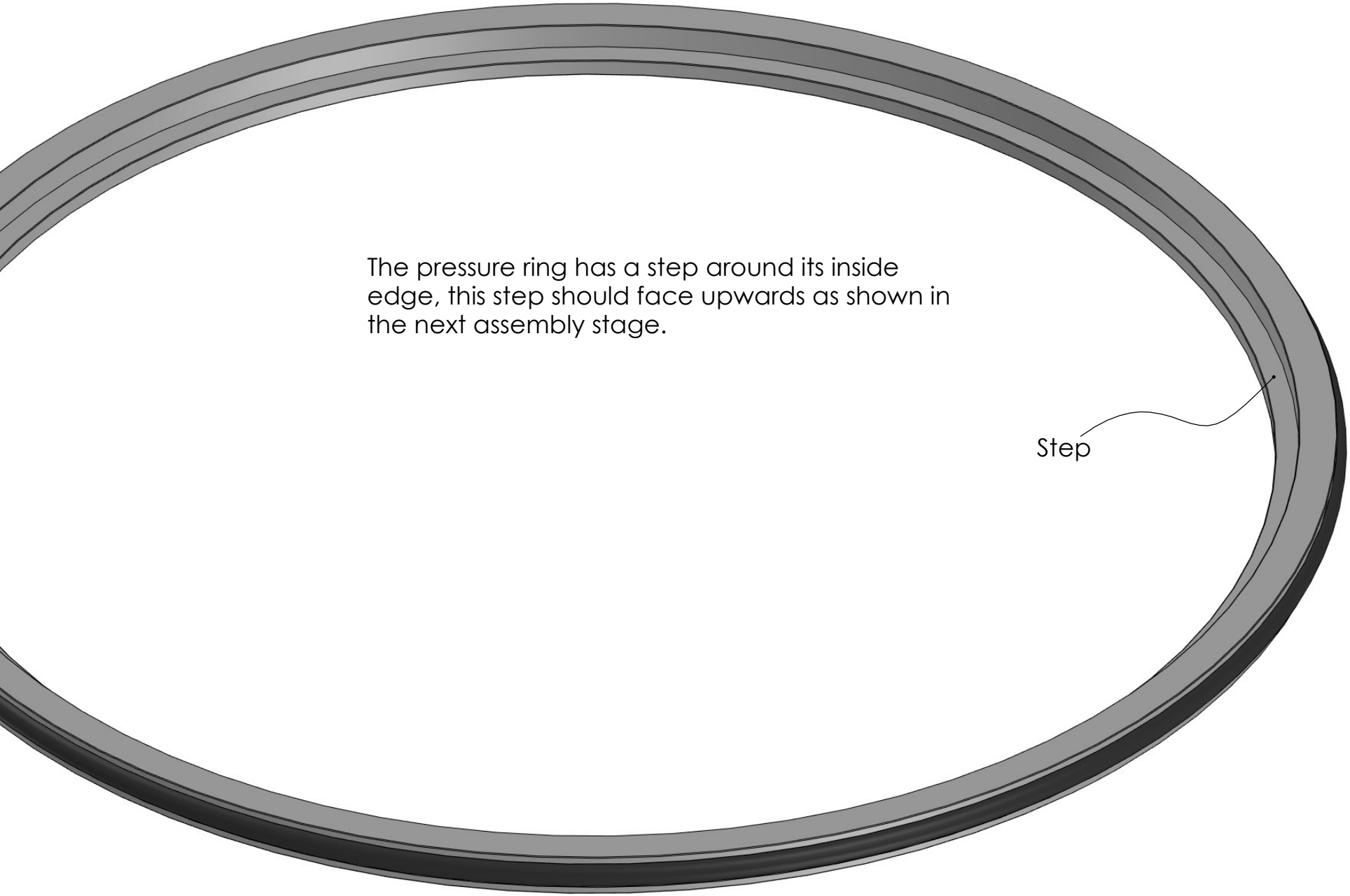
Fit the two M3x12mm screws into the holes in the plate and use the 2mm hex key to screw them into the pillar. Screw them both in nearly all the way and then fully tighten them both.

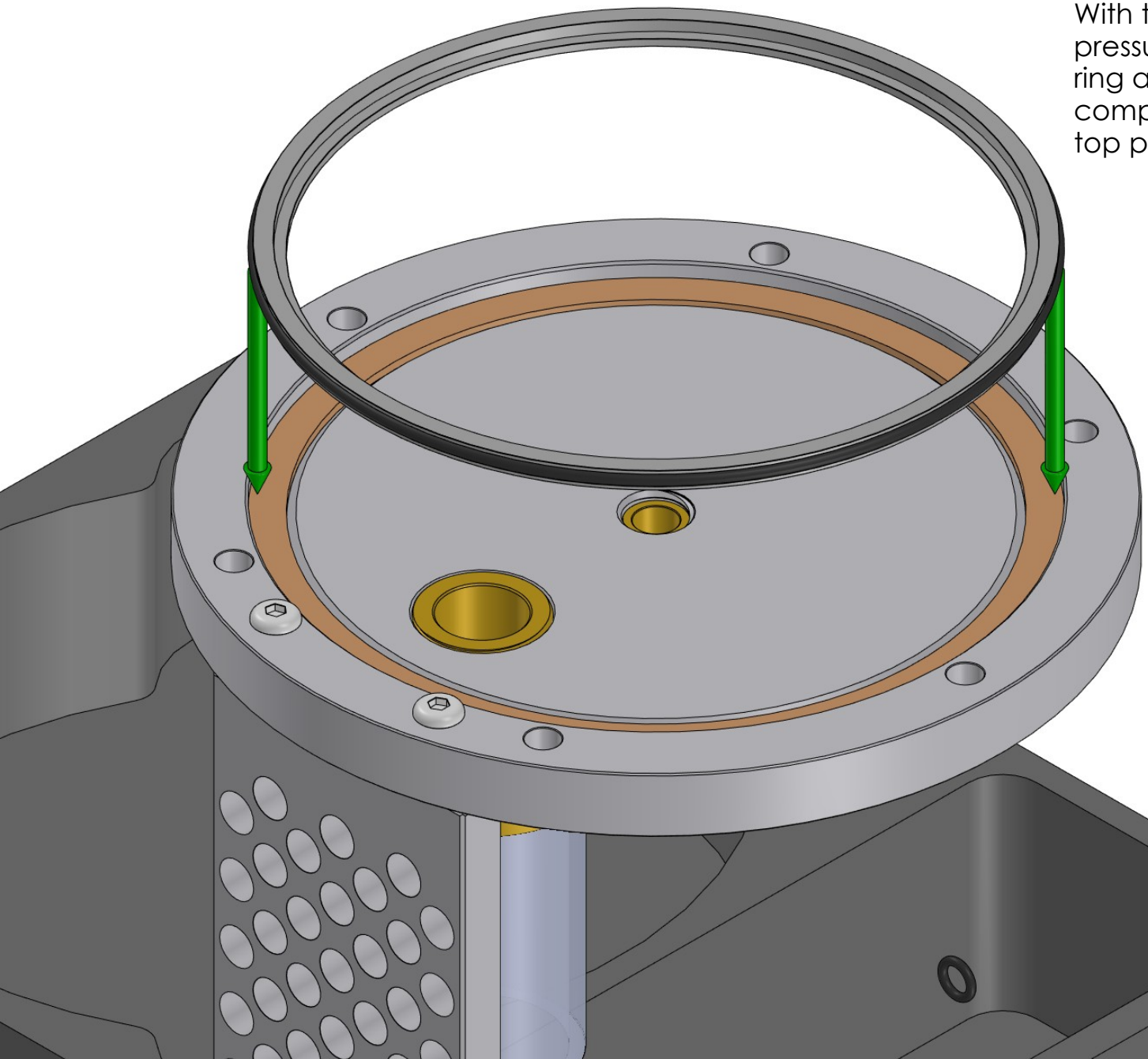
The gasket and pressure ring are shipped pre-assembled in the top plate, if they become dislodged in transit the next two assembly stages show the correct re-assembly procedure.



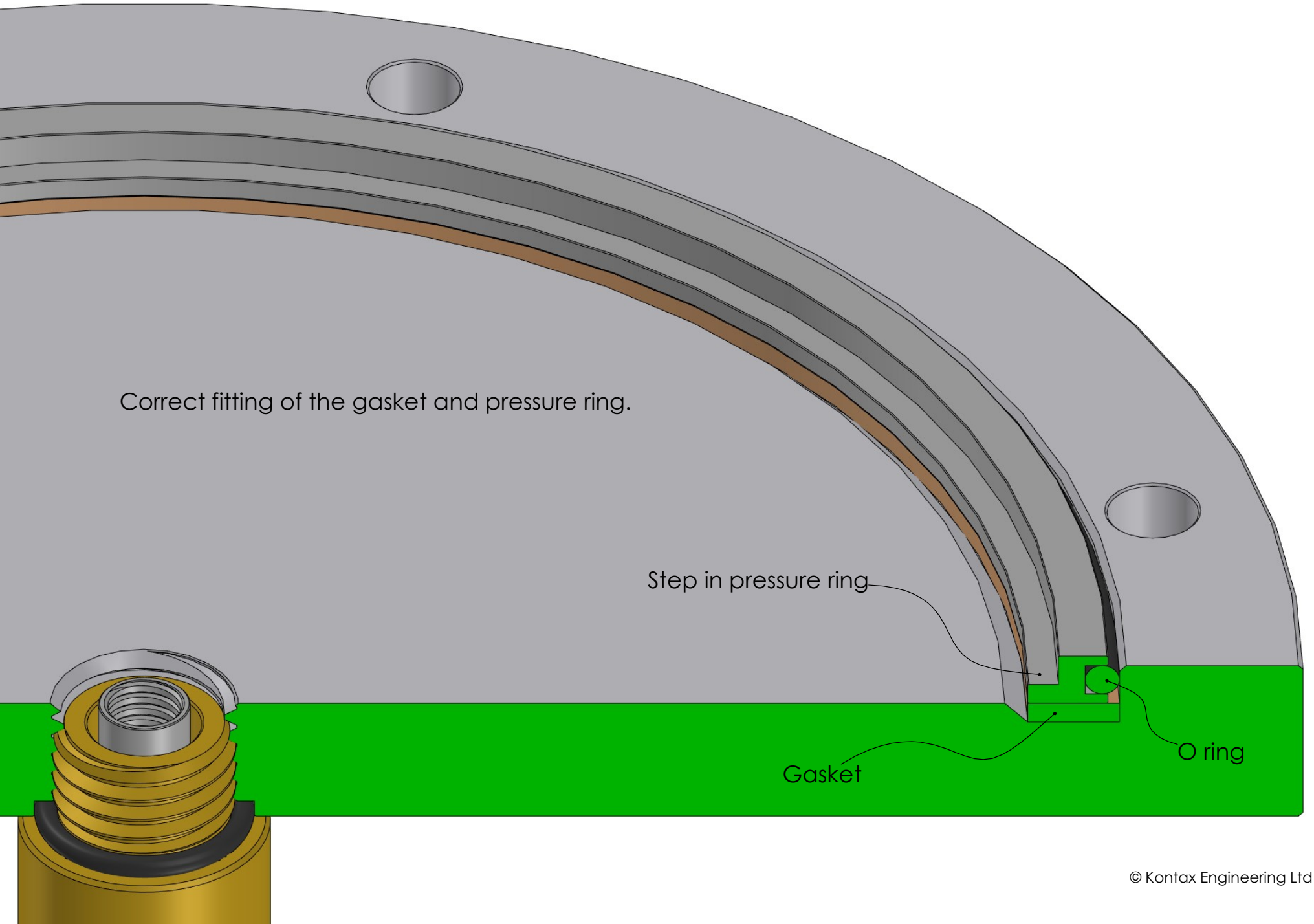
Lower the gasket into the recess in the top plate.

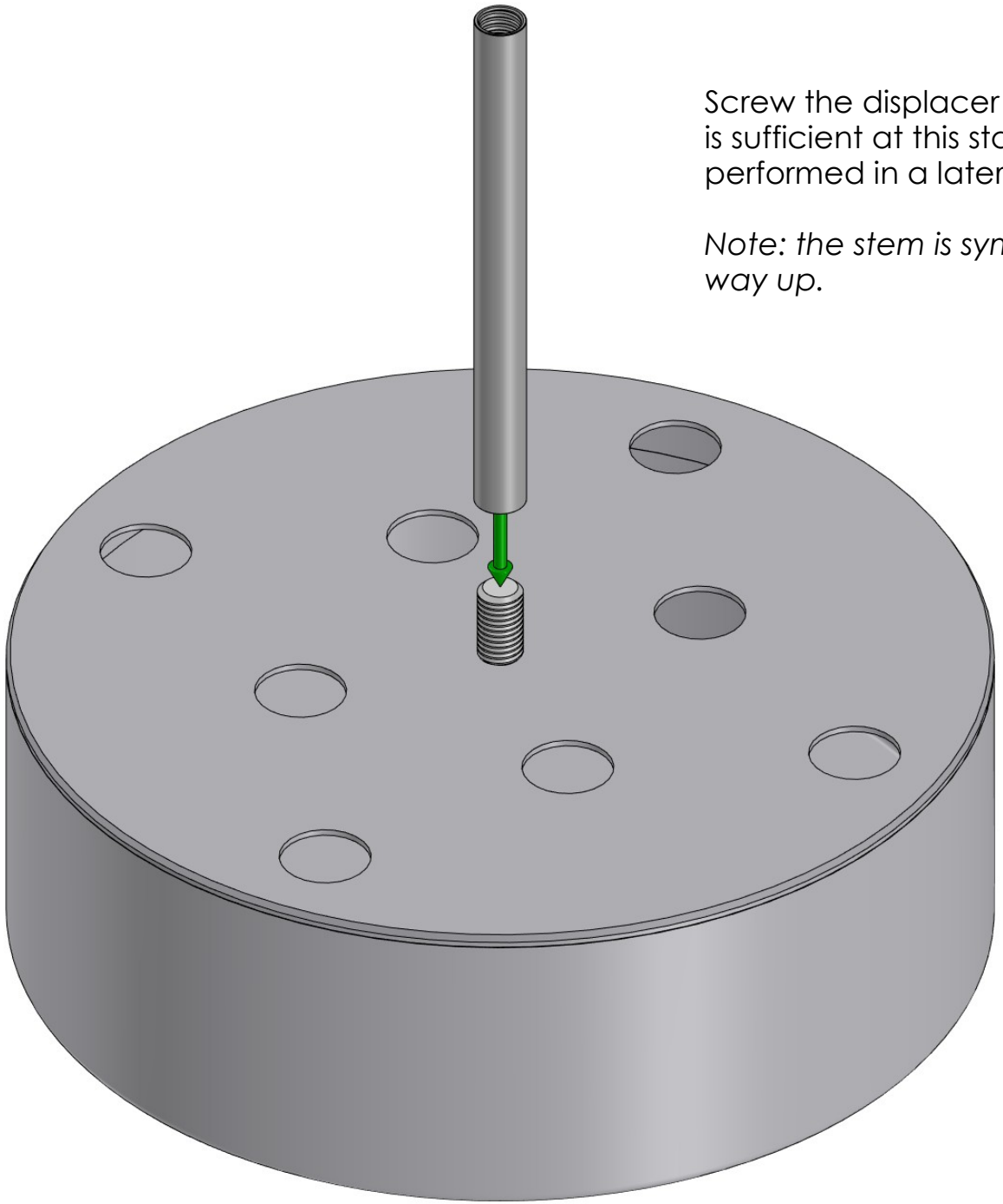
The pressure ring has a step around its inside edge, this step should face upwards as shown in the next assembly stage.





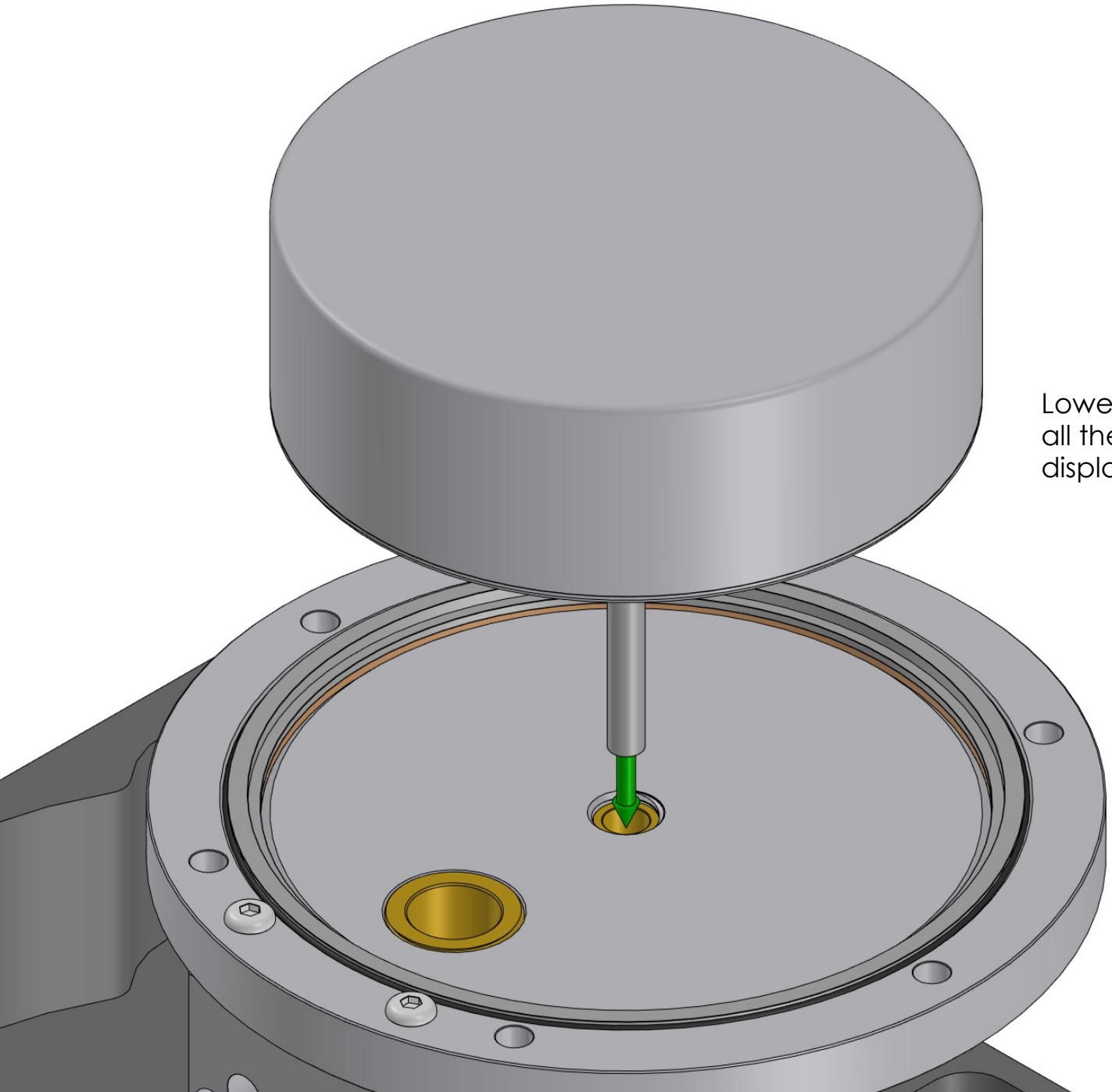
With the step upwards, lower the pressure ring onto the gasket. The O ring around the pressure ring will compress slightly into the recess in the top plate.





Screw the displacer stem onto the displacer, finger tight is sufficient at this stage. Final tightening will be performed in a later stage.

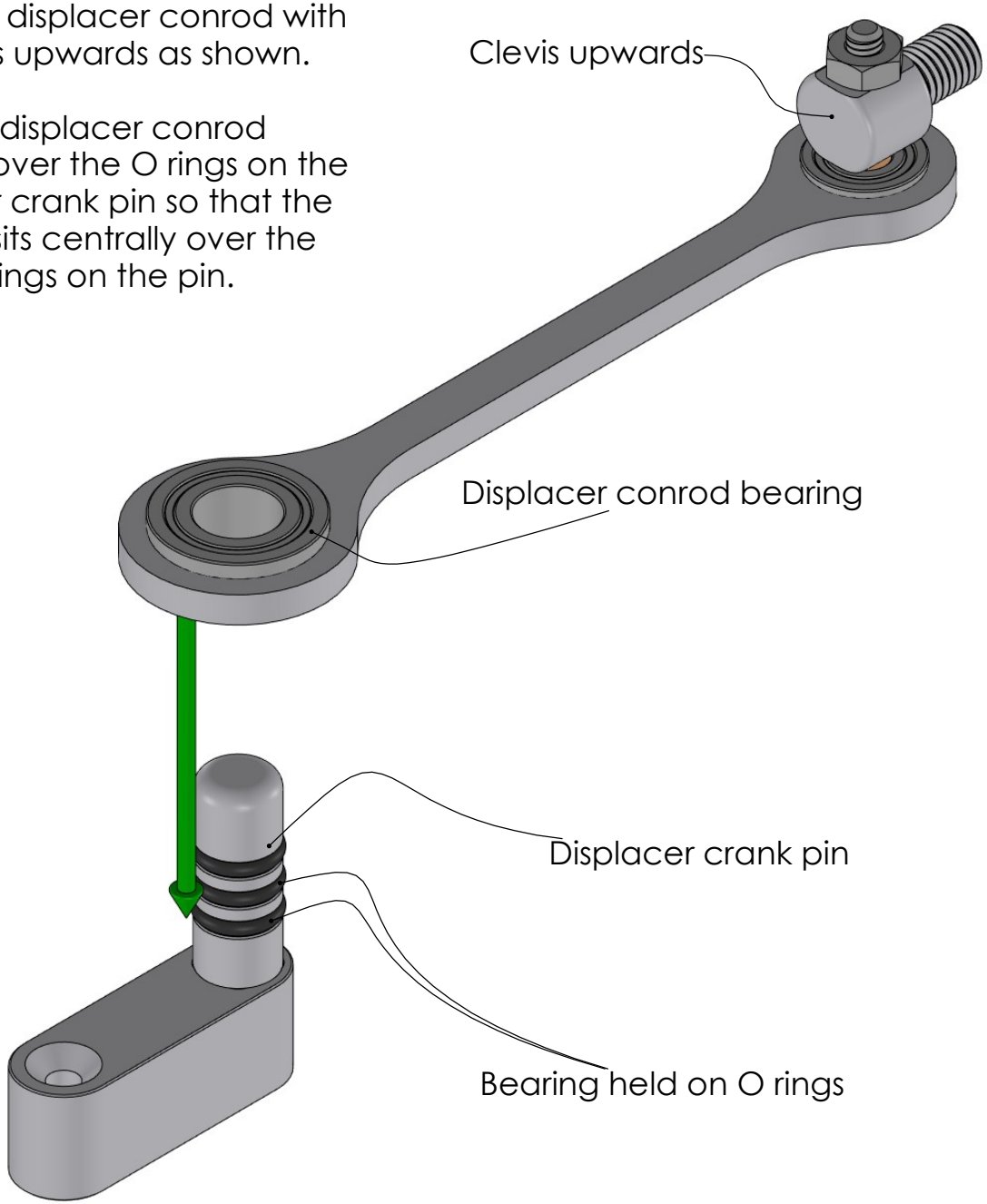
Note: the stem is symmetrical and can by fitted either way up.



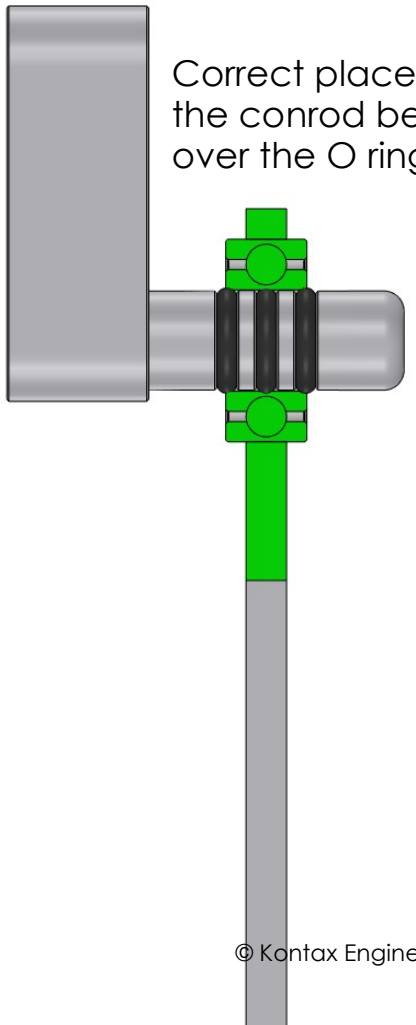
Lower the displacer stem and displacer all the way into the gland so that the displacer rests on the top plate.

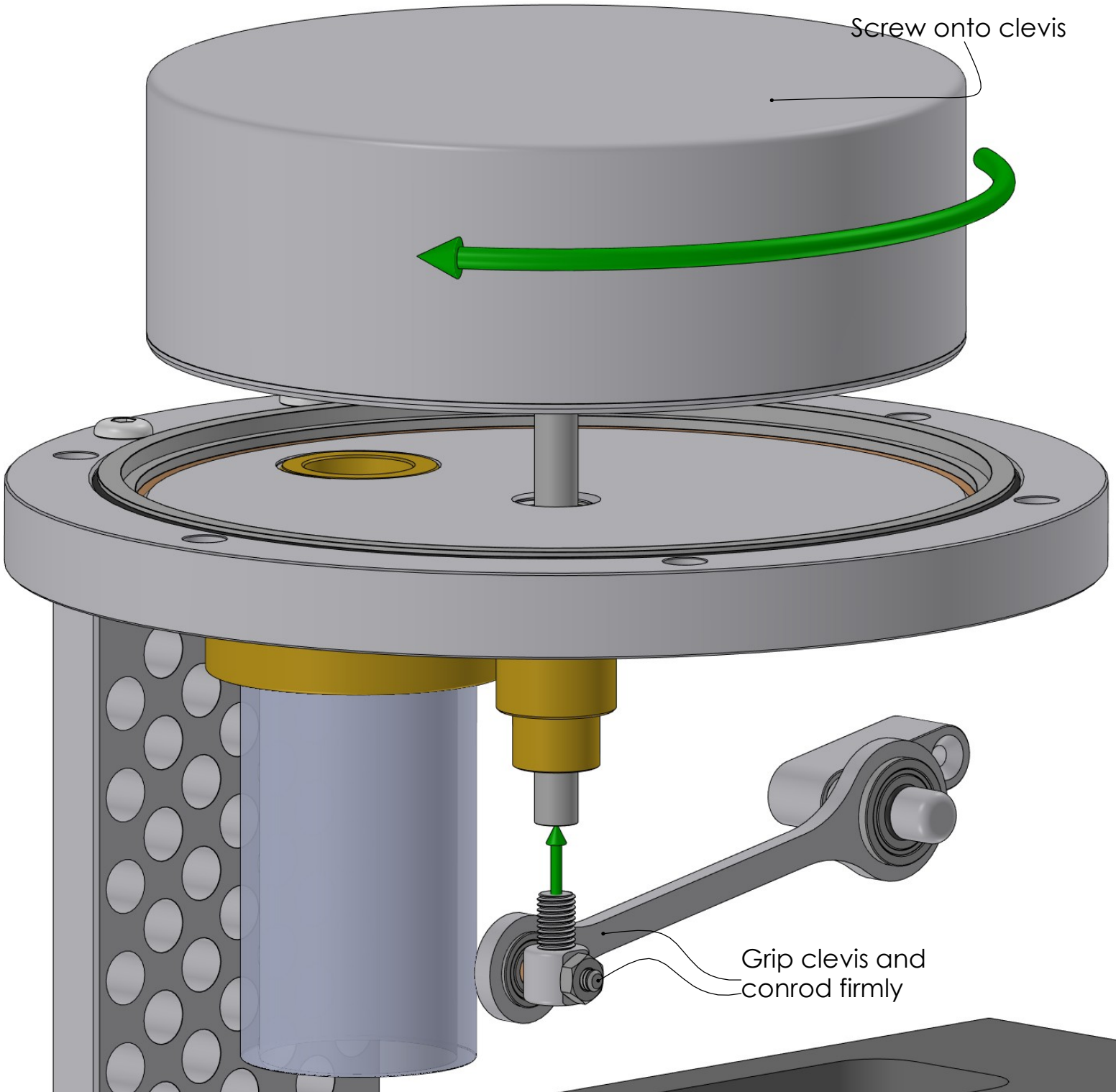
Align the displacer conrod with the clevis upwards as shown.

Push the displacer conrod bearing over the O rings on the displacer crank pin so that the bearing sits centrally over the three O rings on the pin.



Correct placement of the conrod bearing over the O rings.



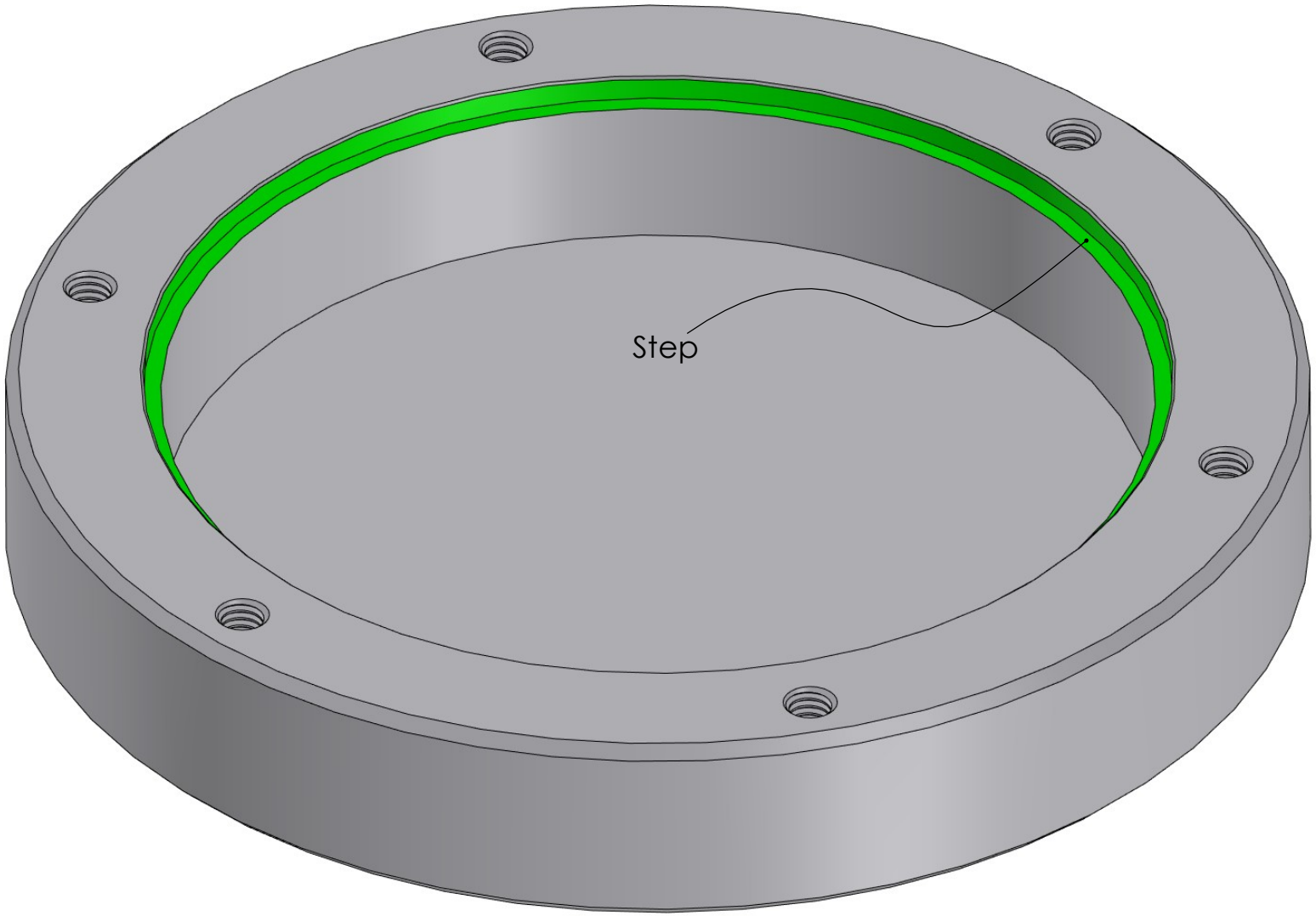


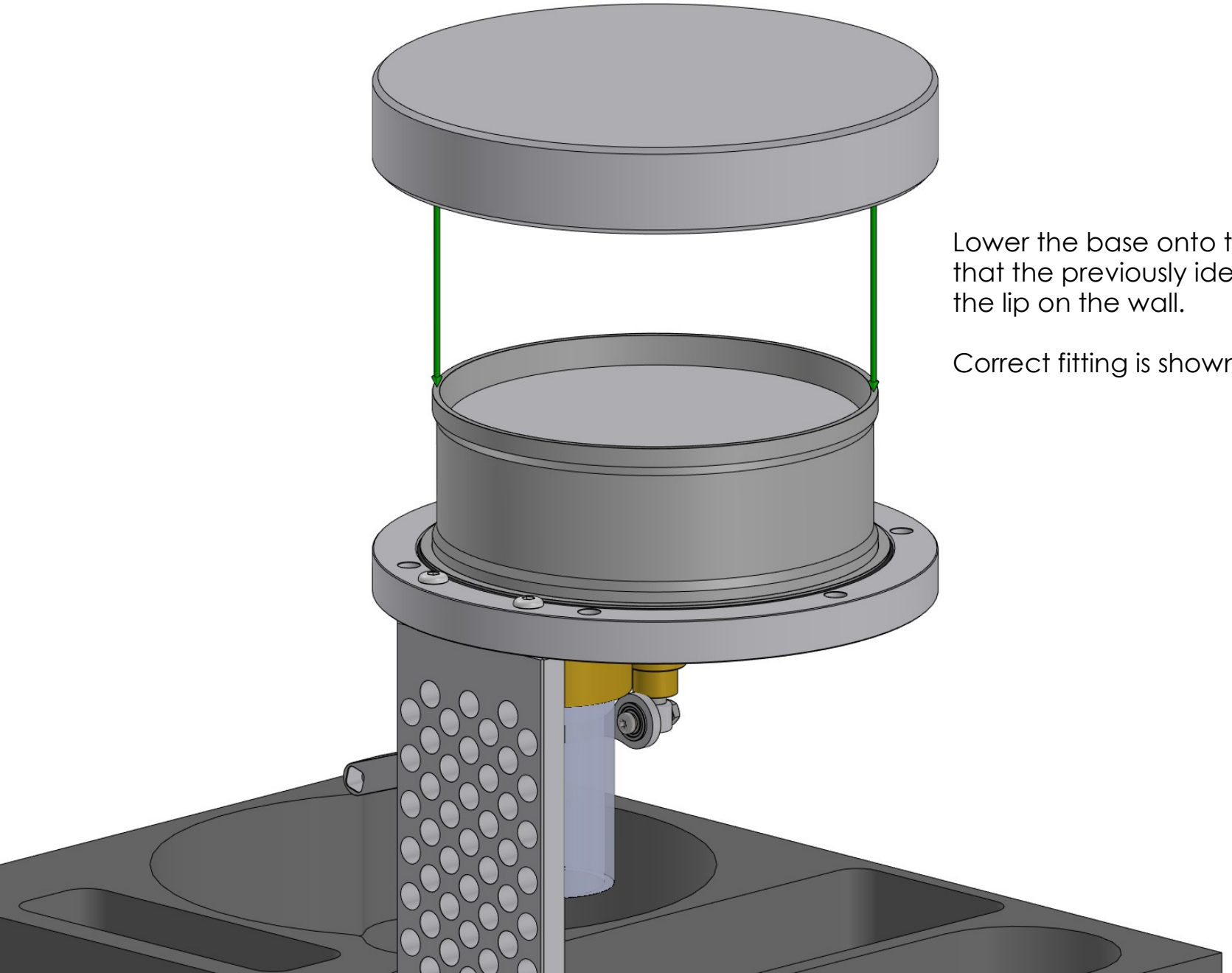
Grip the clevis and conrod firmly with your thumb and finger of one hand and use your other hand to screw the displacer and stem onto the clevis by hand.

A firm tightness is required, take care that you are gripping both the clevis and conrod together.

DO NOT use the conrod as a lever to tighten the clevis into the stem, you risk bending it.

Identify the step in the base recess for the next assembly stage.

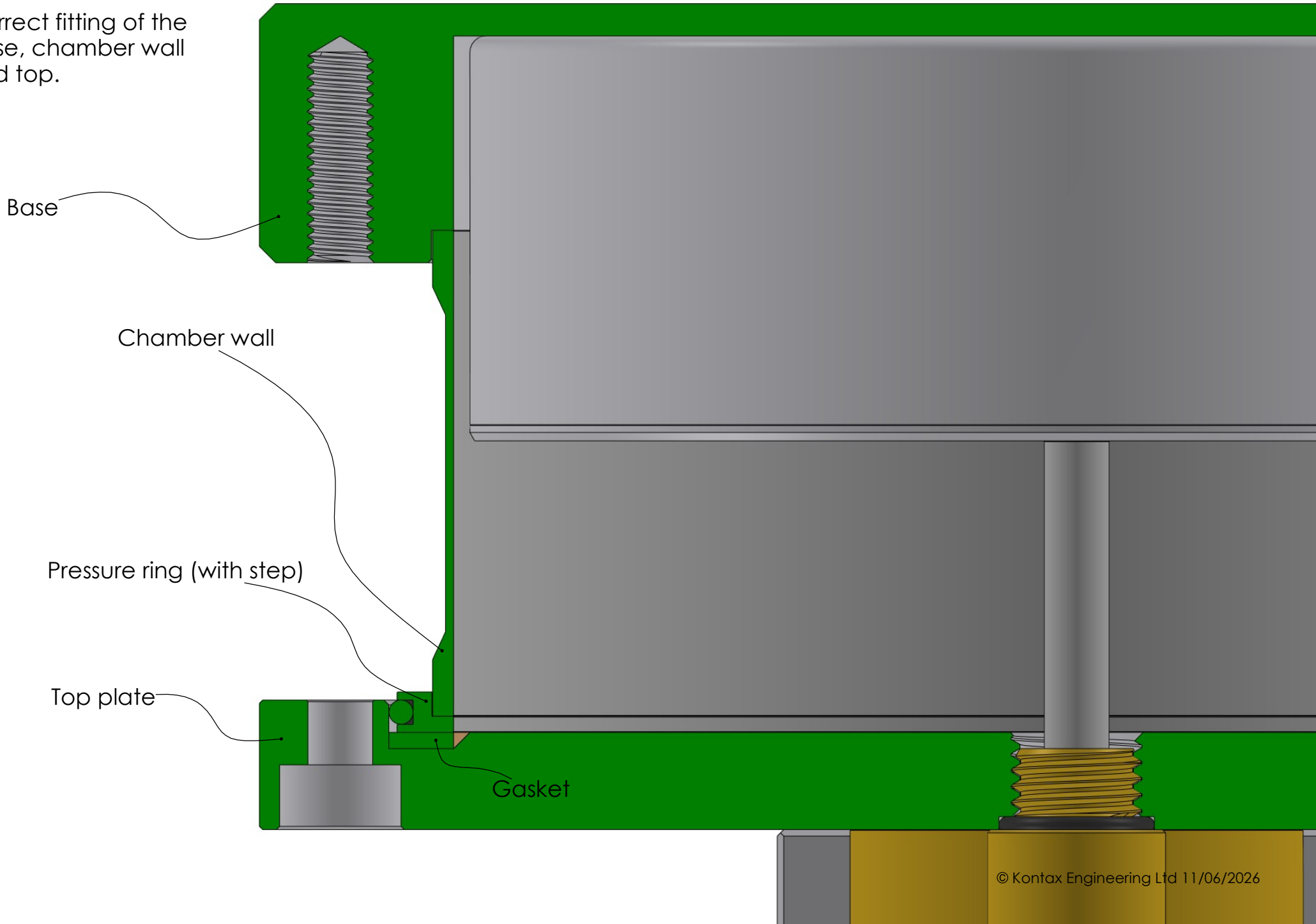




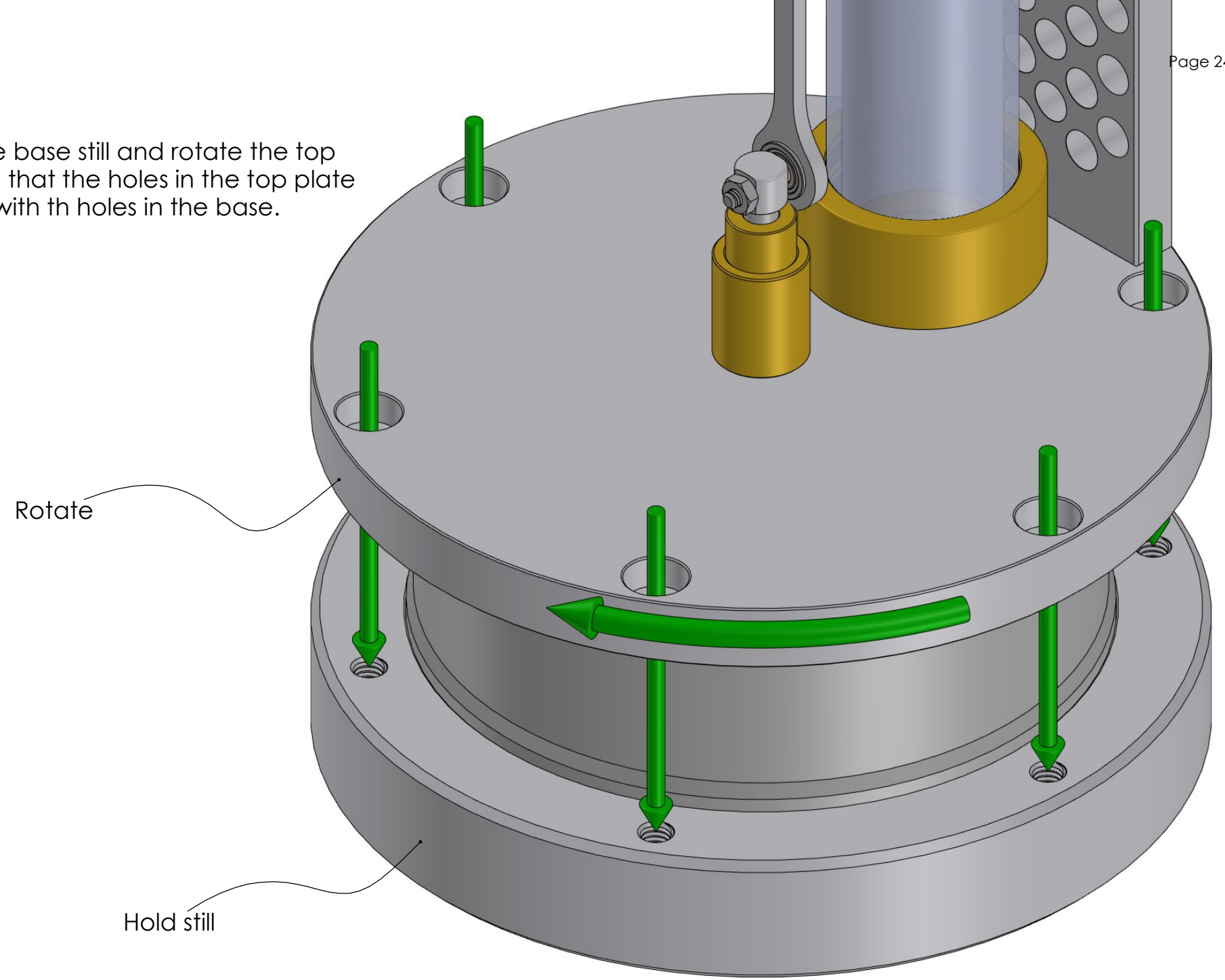
Lower the base onto the chamber wall so that the previously identified step fits over the lip on the wall.

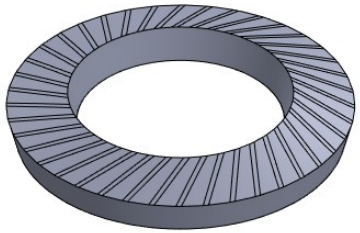
Correct fitting is shown on the next page.

Correct fitting of the base, chamber wall and top.



Hold the base still and rotate the top plate so that the holes in the top plate line up with th holes in the base.



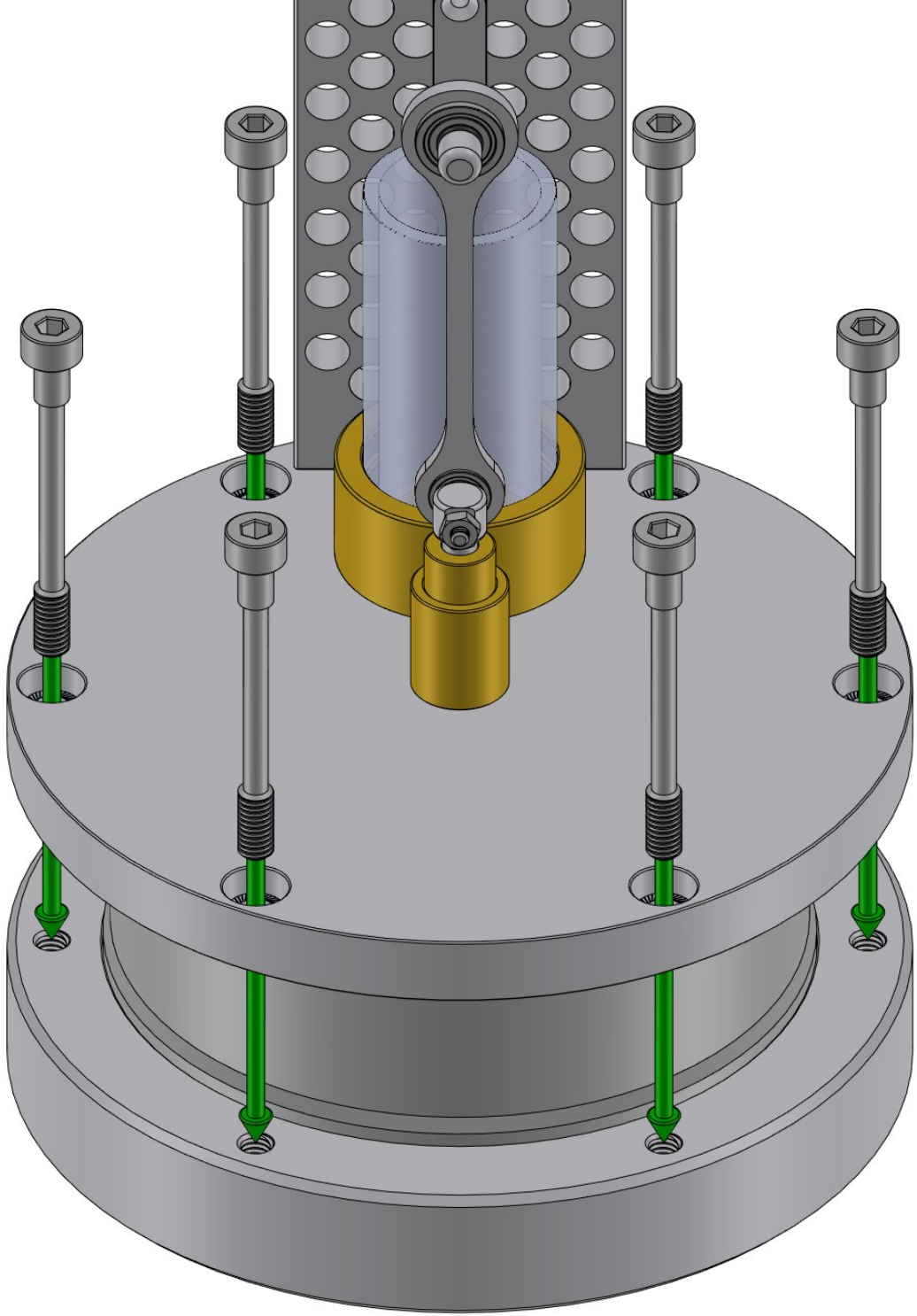


The locking washers are convex on one side and concave on the other.

Align the washers with their convex sides upwards and fit them into the six holes in the top plate.

Fit the six chamber screws through the holes in the top plate and use the 3mm hex key to screw them all in until they just touch the locking washers.

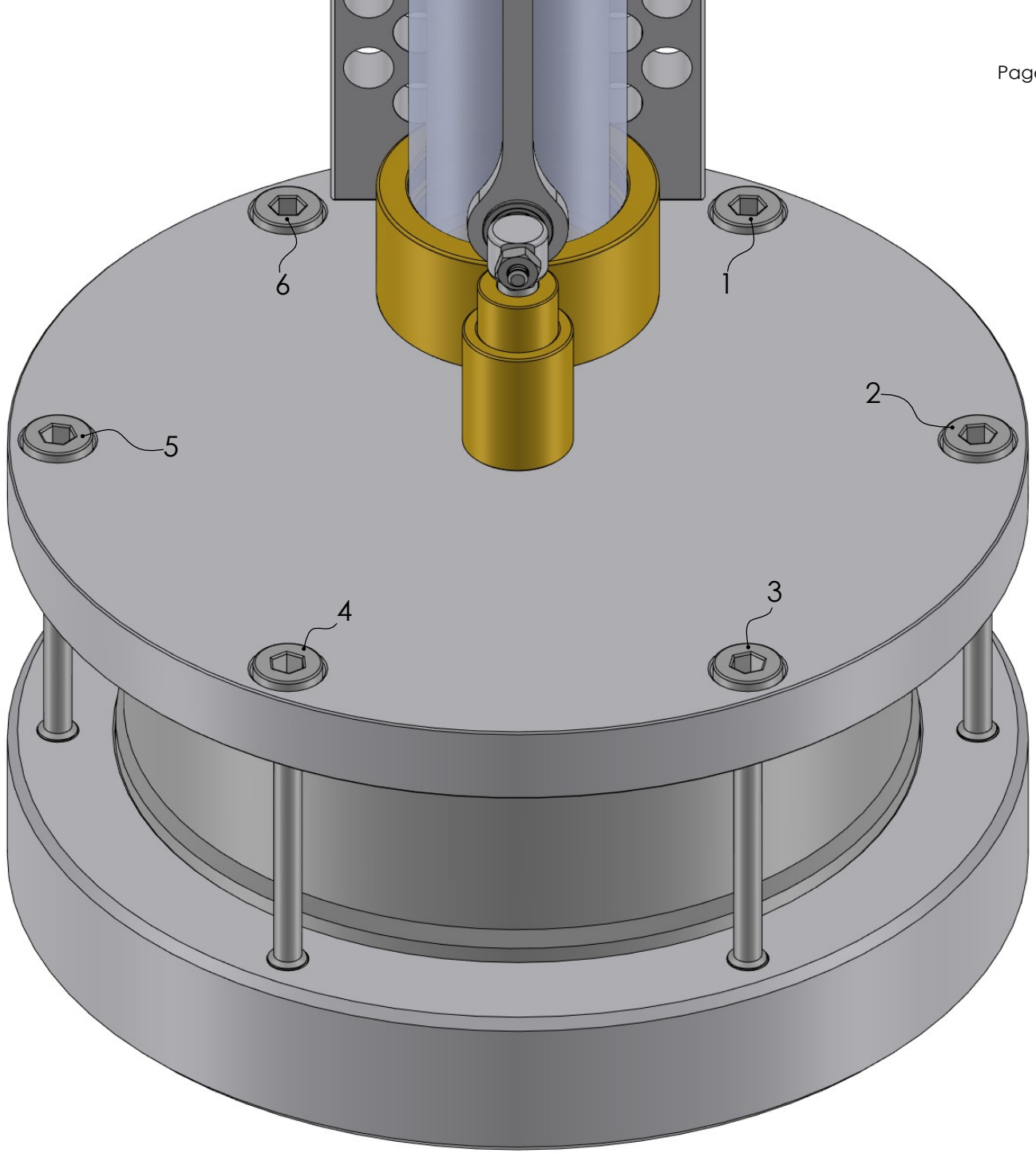
Do not attempt to tighten yet, final tightening will be done in the next stage.



When all the screws are touching the washers you can start to tighten them.

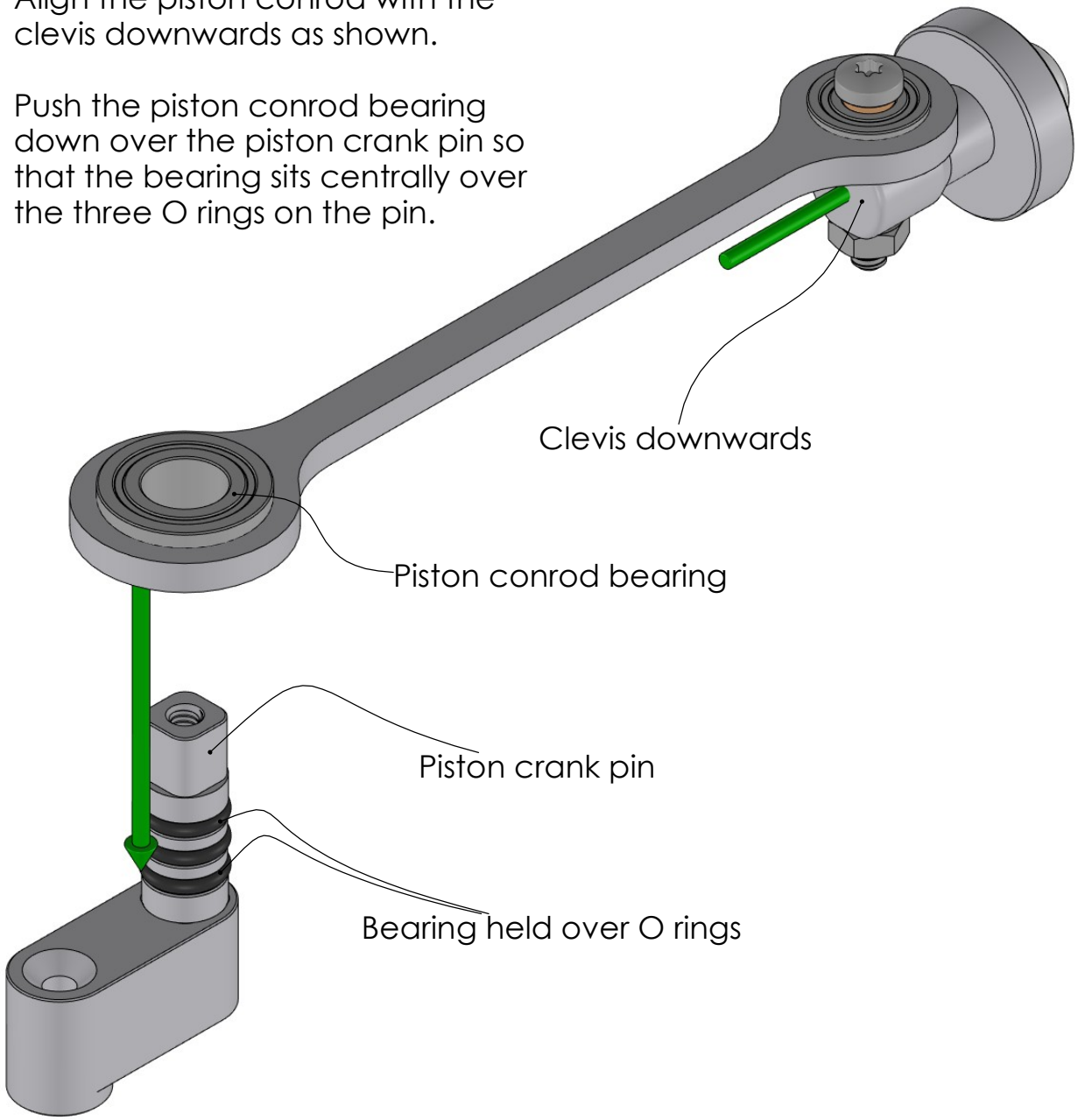
Work around the screws in the order 1, 4, 2, 5, 3, 6. Lightly screw each screw down to confirm it is still touching the washer and then tighten it a quarter of a turn ONLY.

After the first pass the process can be repeated in the same order, tightening each screw a quarter of a turn again, this should fully tighten all the screws to the required torque.

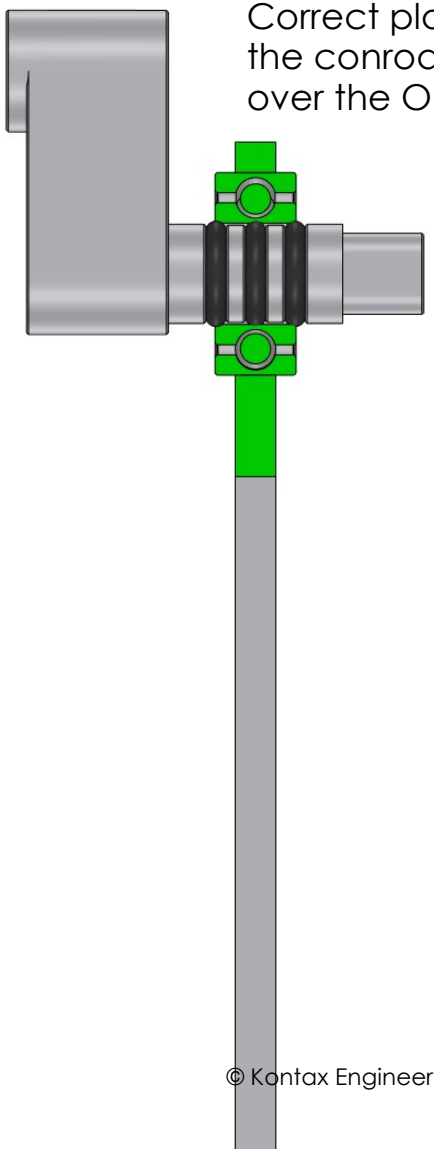


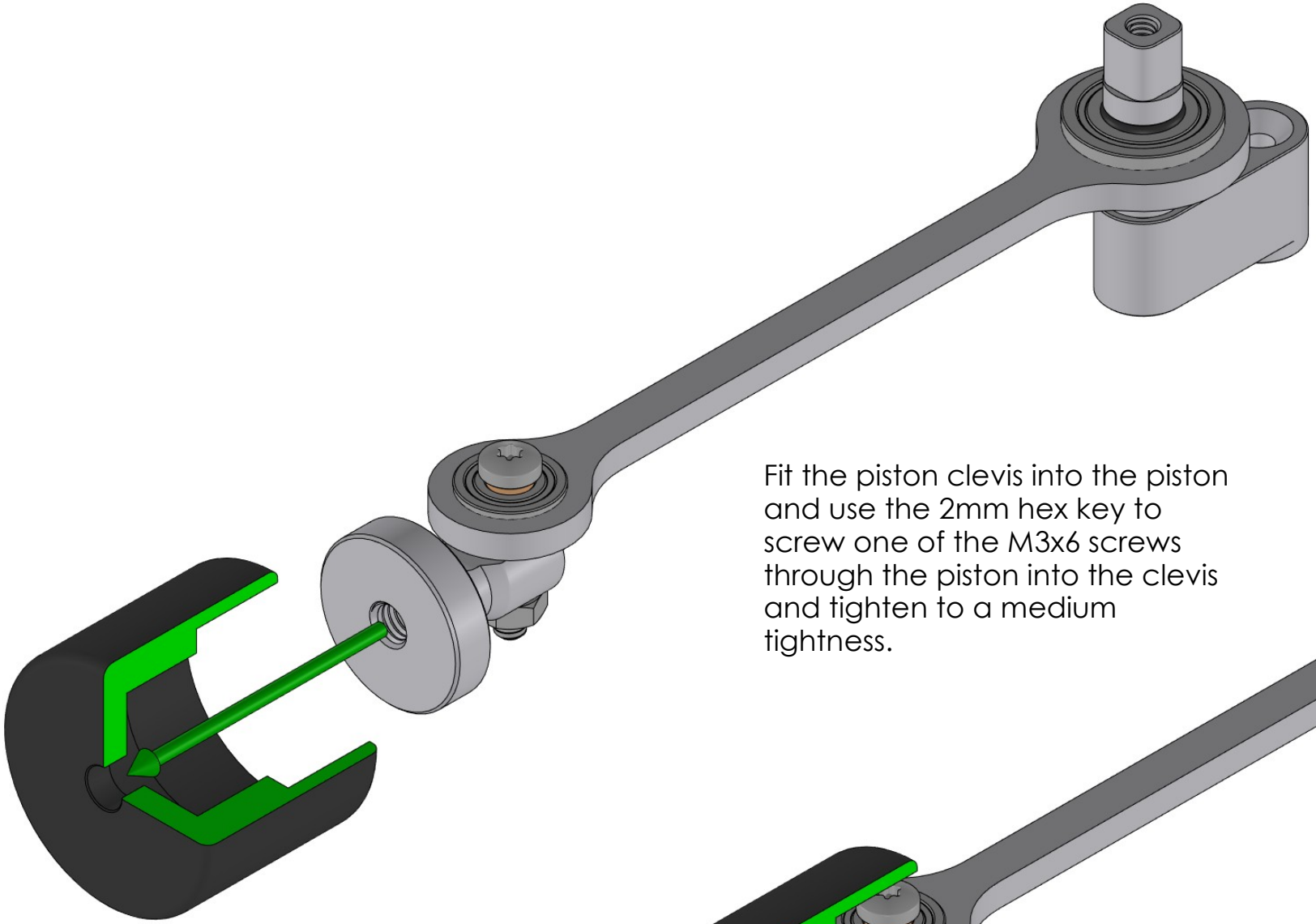
Align the piston conrod with the clevis downwards as shown.

Push the piston conrod bearing down over the piston crank pin so that the bearing sits centrally over the three O rings on the pin.

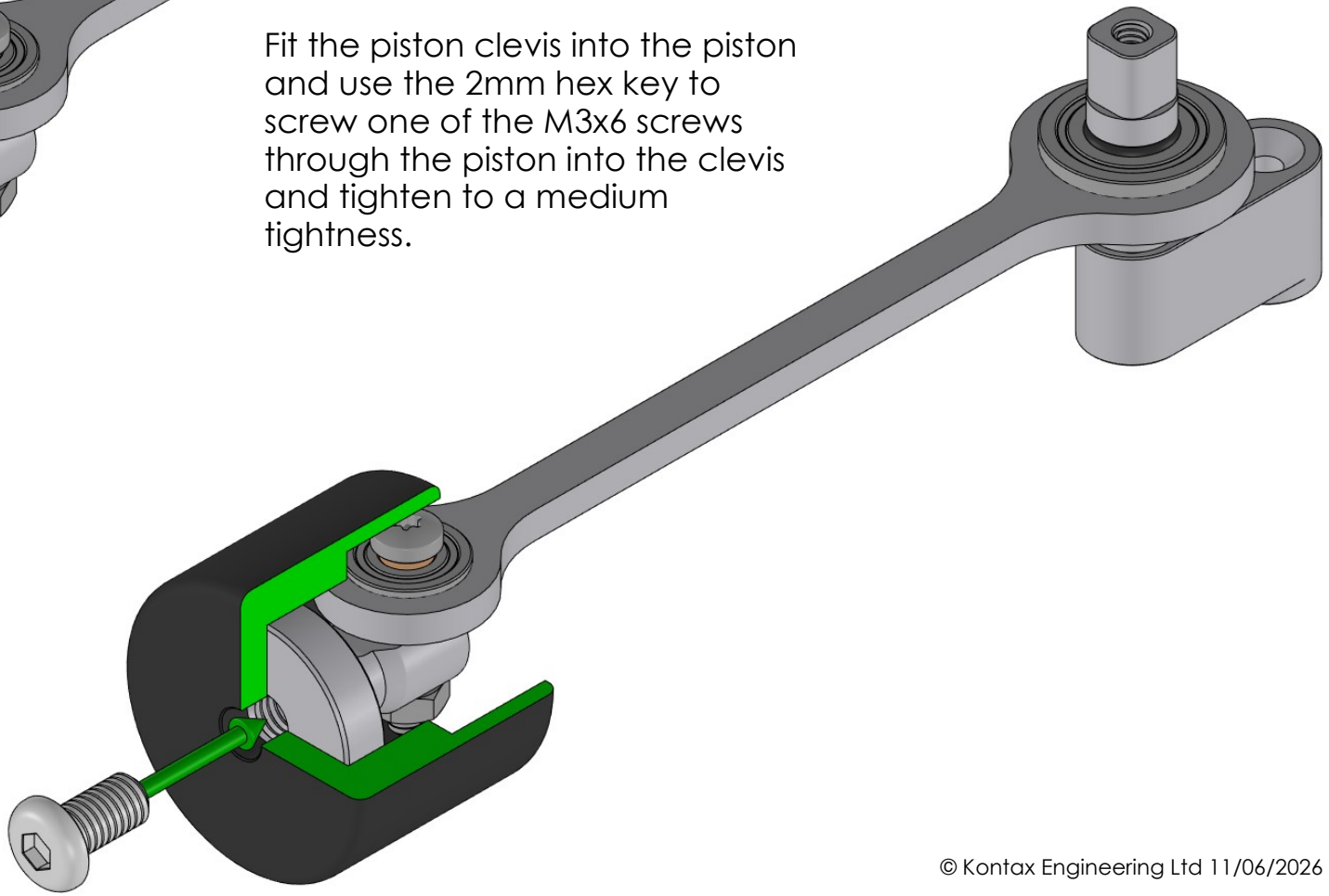


Correct placement of the conrod bearing over the O rings.



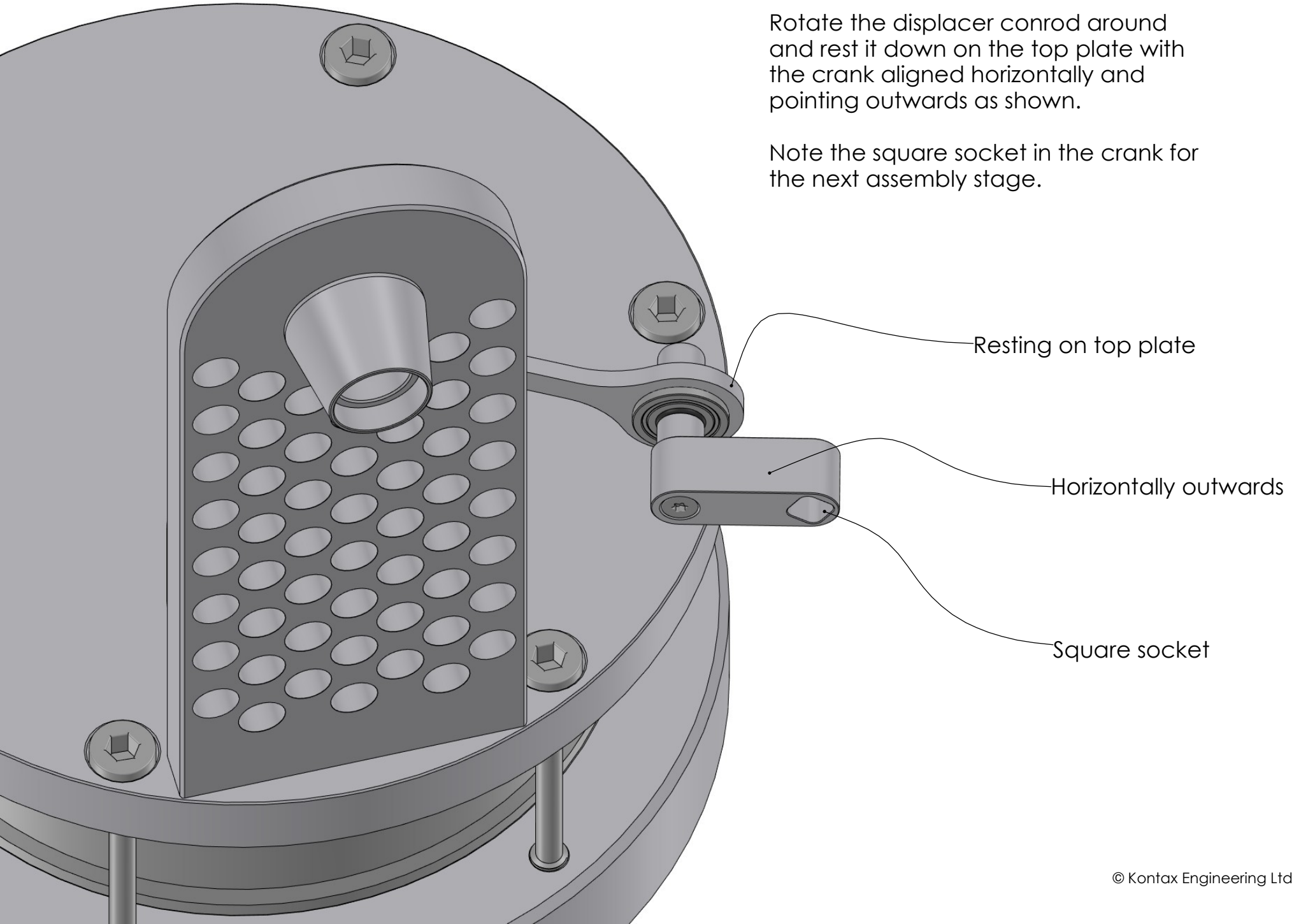


Fit the piston clevis into the piston and use the 2mm hex key to screw one of the M3x6 screws through the piston into the clevis and tighten to a medium tightness.



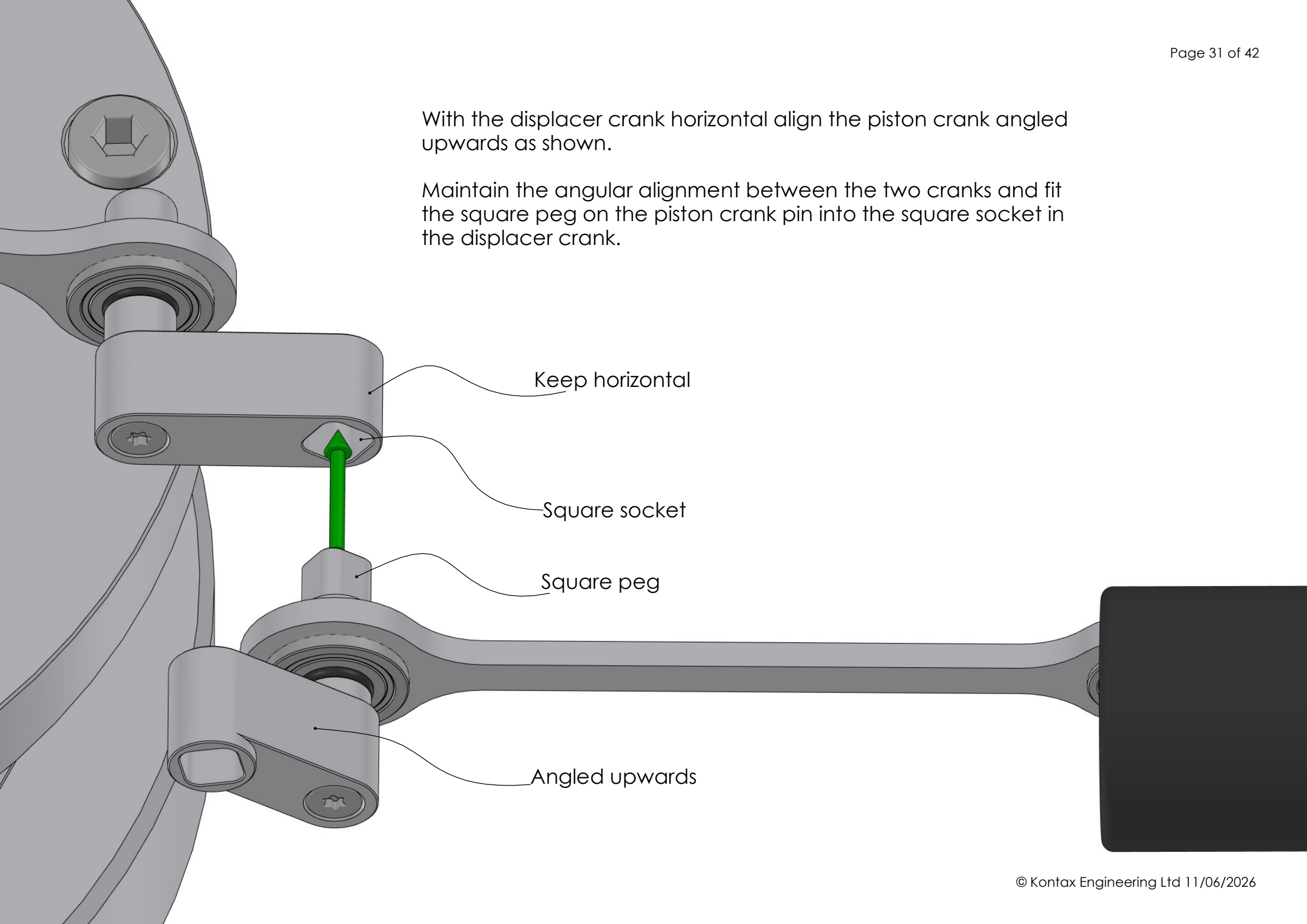
Rotate the displacer conrod around and rest it down on the top plate with the crank aligned horizontally and pointing outwards as shown.

Note the square socket in the crank for the next assembly stage.

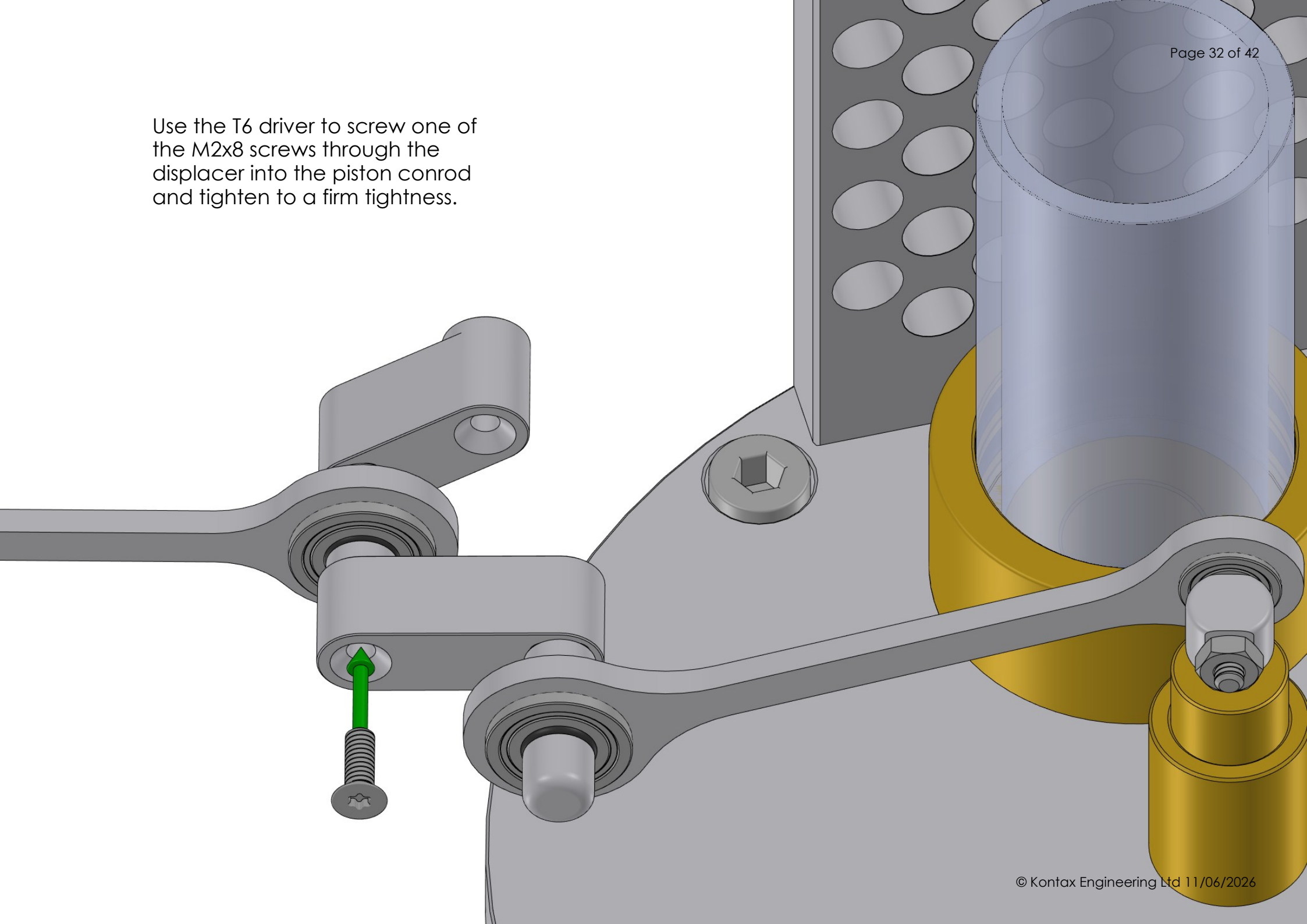


With the displacer crank horizontal align the piston crank angled upwards as shown.

Maintain the angular alignment between the two cranks and fit the square peg on the piston crank pin into the square socket in the displacer crank.

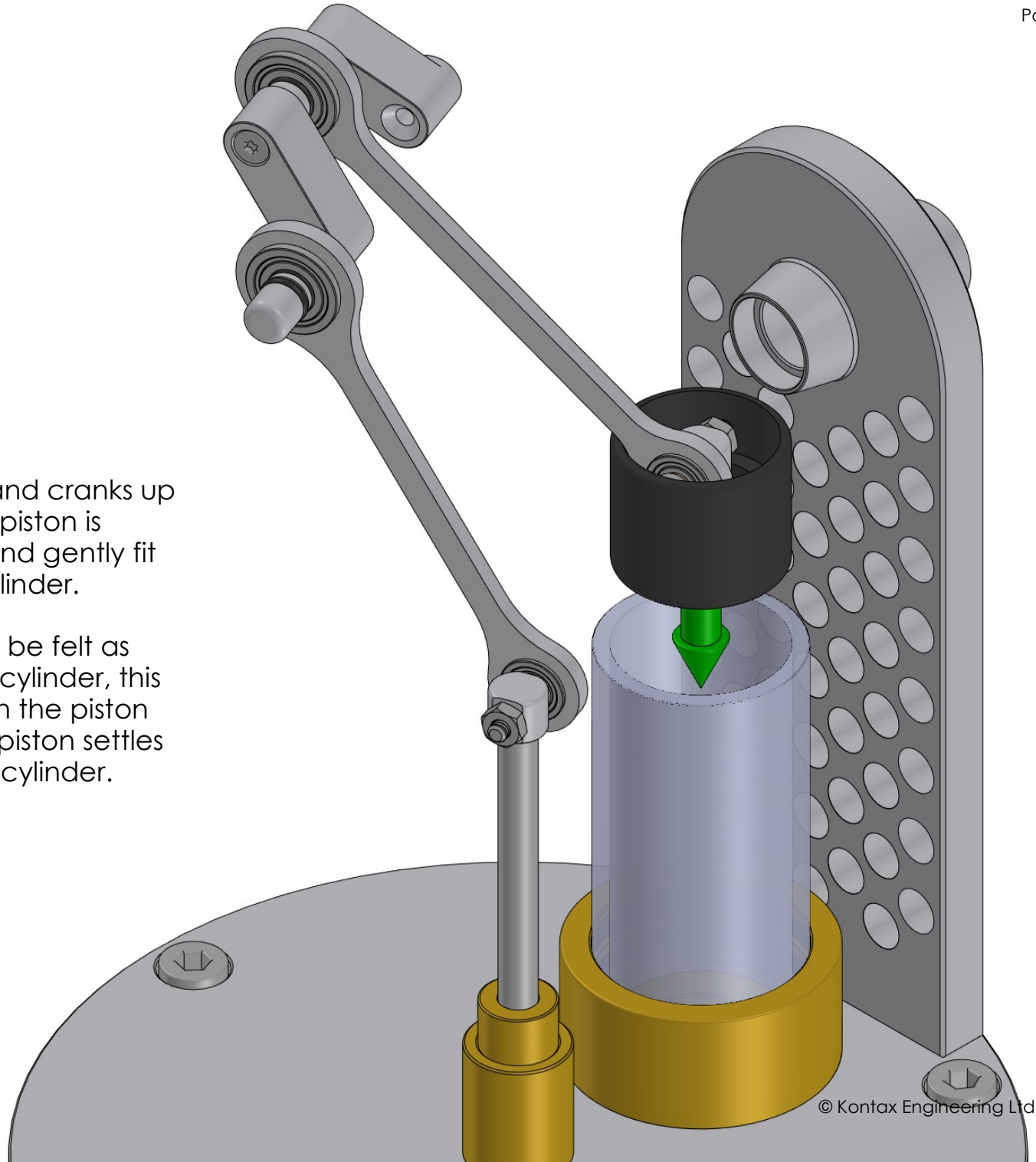


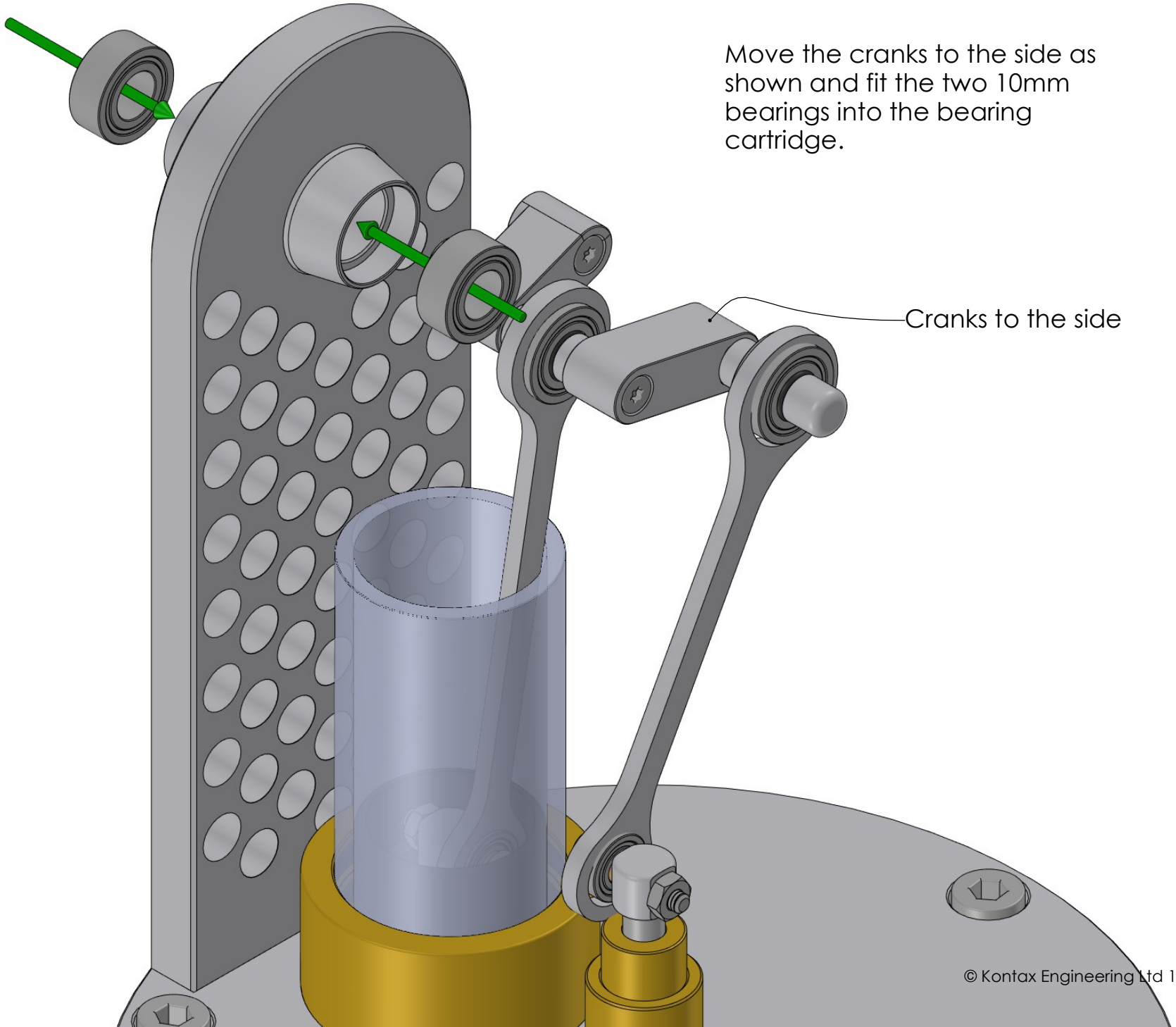
Use the T6 driver to screw one of the M2x8 screws through the displacer into the piston conrod and tighten to a firm tightness.



Rotate the conrods and cranks up and over so that the piston is above the cylinder and gently fit the piston into the cylinder.

Some air pressure will be felt as the piston enters the cylinder, this is normal. Genlty push the piston downwards until the piston settles at the bottom of the cylinder.

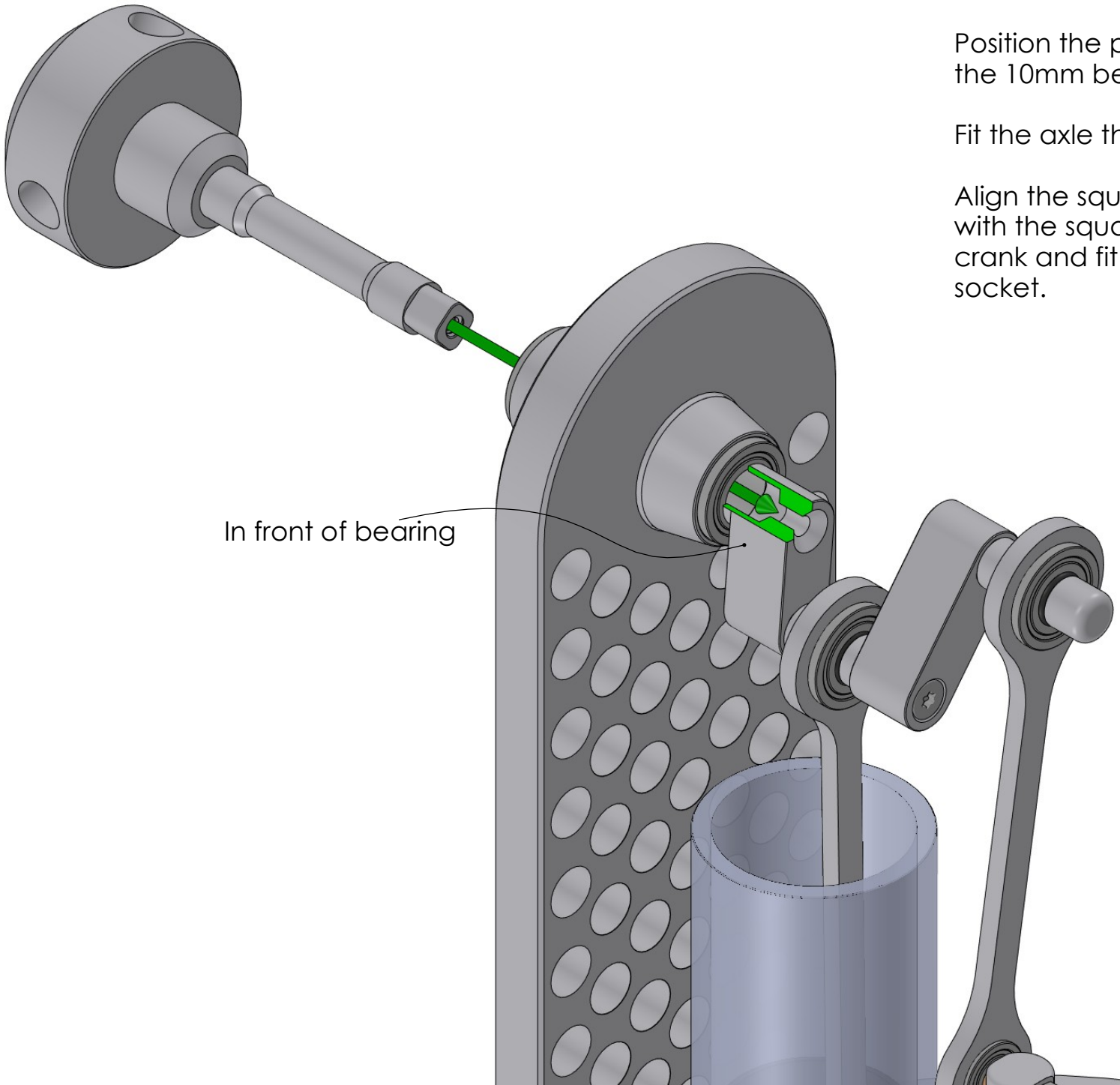


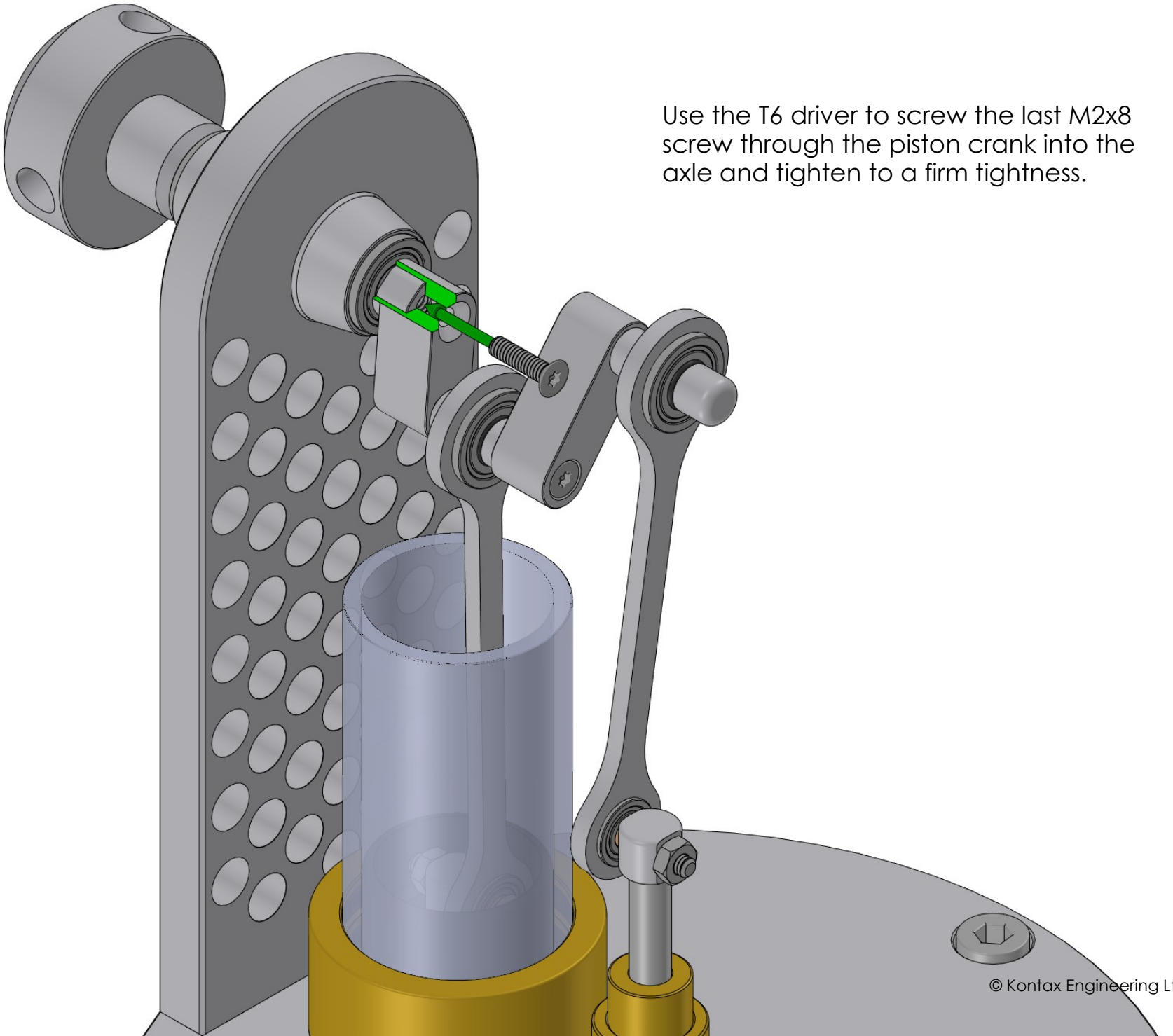


Position the piston crank in front of the 10mm bearing.

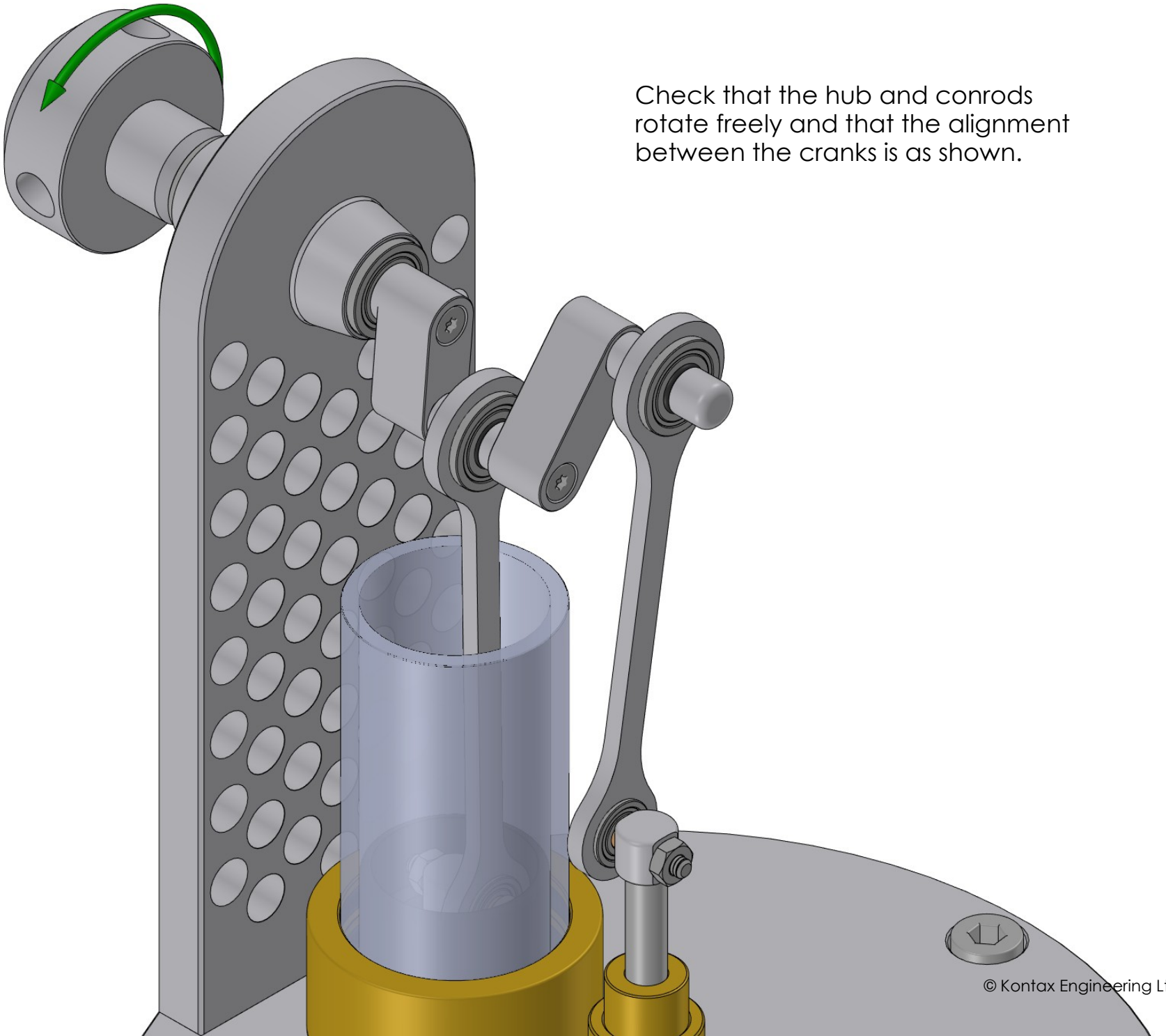
Fit the axle through both bearings.

Align the square peg on the axle with the square socket in the crank and fit the peg into the socket.





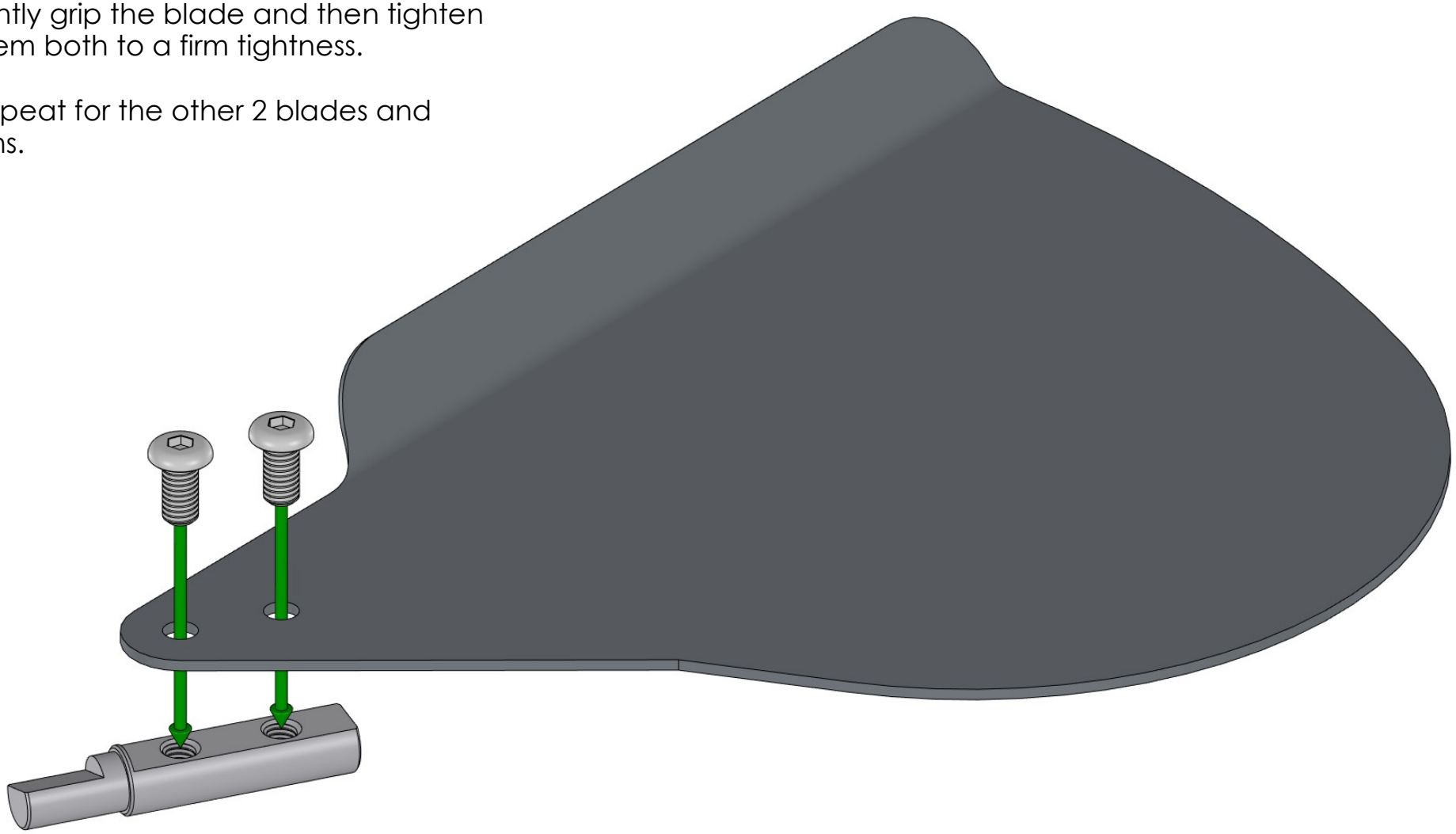
Use the T6 driver to screw the last M2x8 screw through the piston crank into the axle and tighten to a firm tightness.



Check that the hub and conrods rotate freely and that the alignment between the cranks is as shown.

Use the 2mm hex key to screw two M3x6 screws through the first blade into the first blade pin until they both lightly grip the blade and then tighten them both to a firm tightness.

Repeat for the other 2 blades and pins.

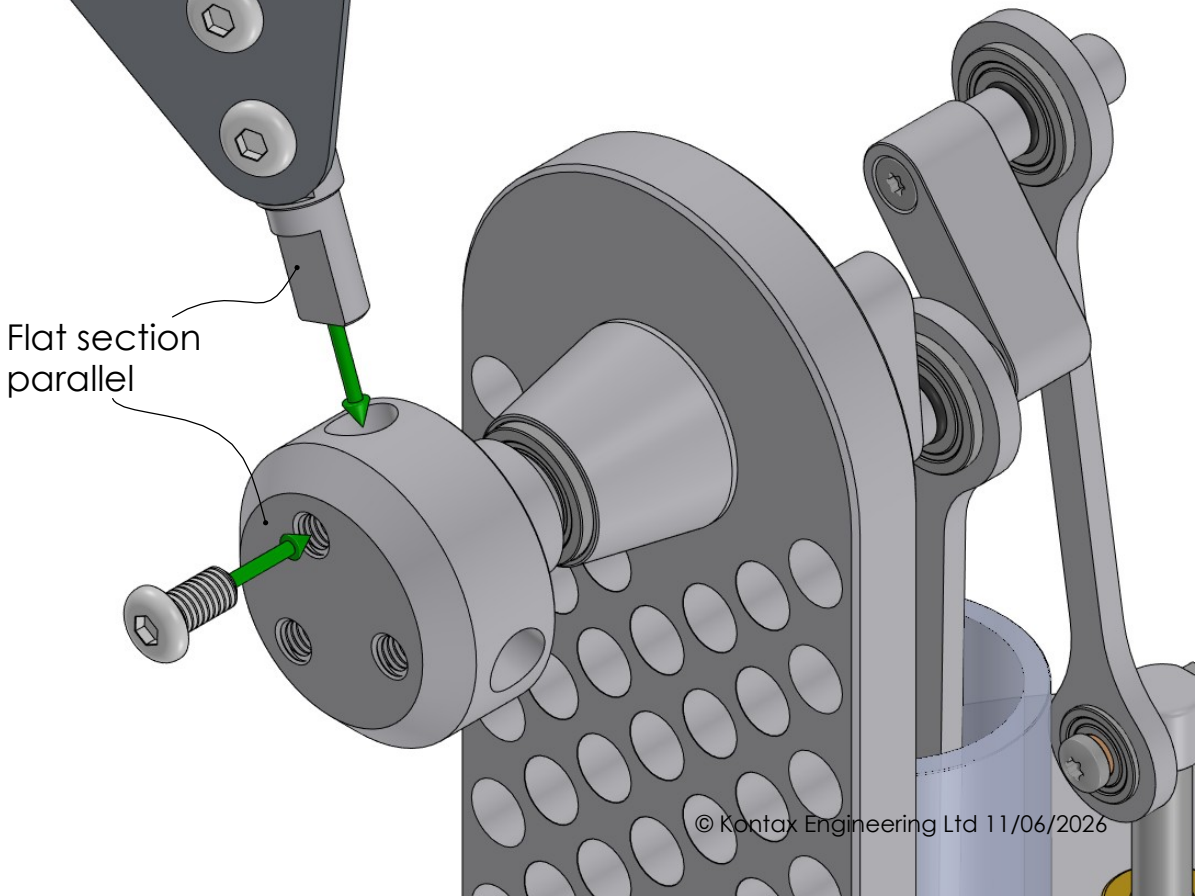


Align the flat section on the blade pin parallel to the front of the hub and fit the pin into any one of the pin sockets on the hub.

Use the 2mm hex key to screw an M3x6 screw into the front of the hub and tighten onto the flat on the pin to a firm tightness.

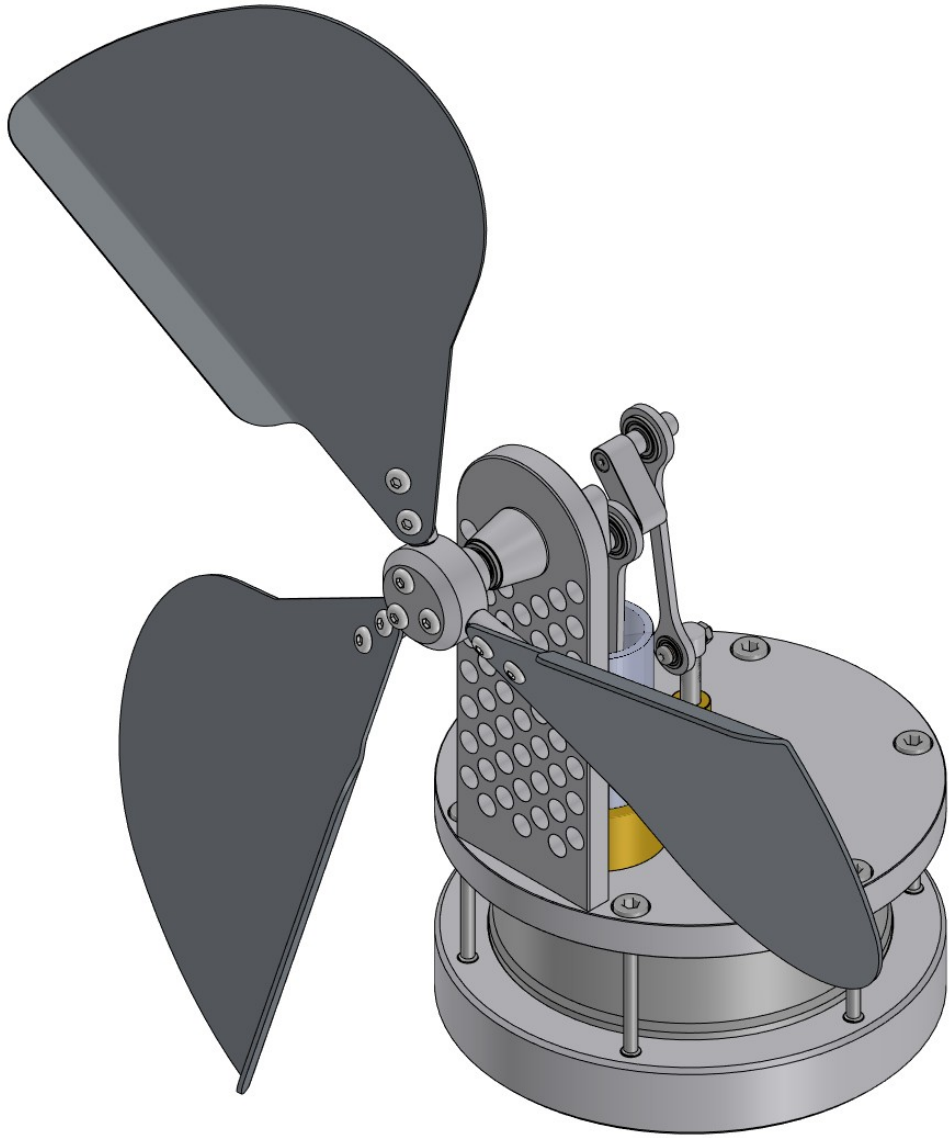
Make sure the flat on the pin stays parallel to hub face when tightening.

Repeat for the other two blades.

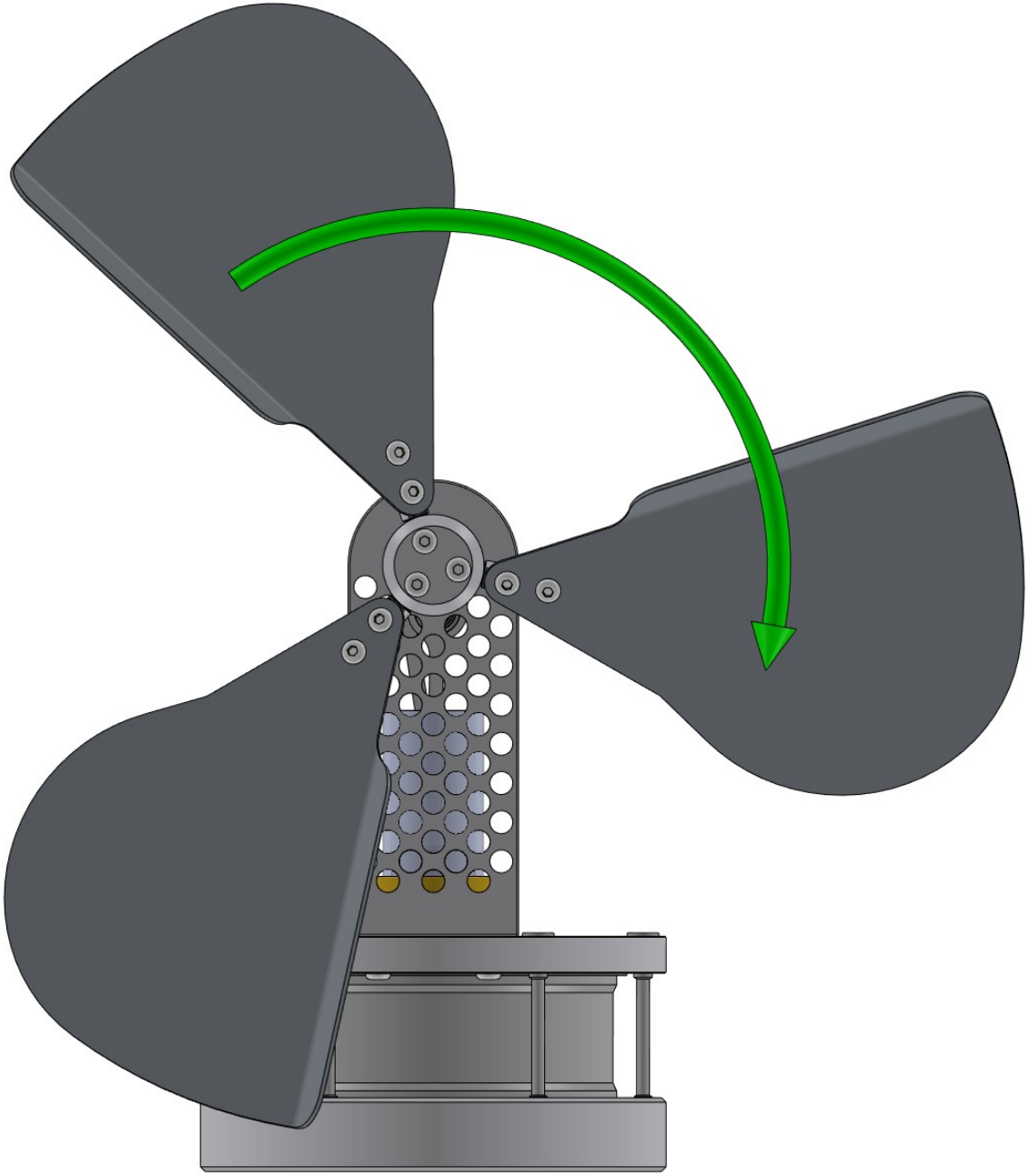


Your Vulcan Ultra is now fully assembled.

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



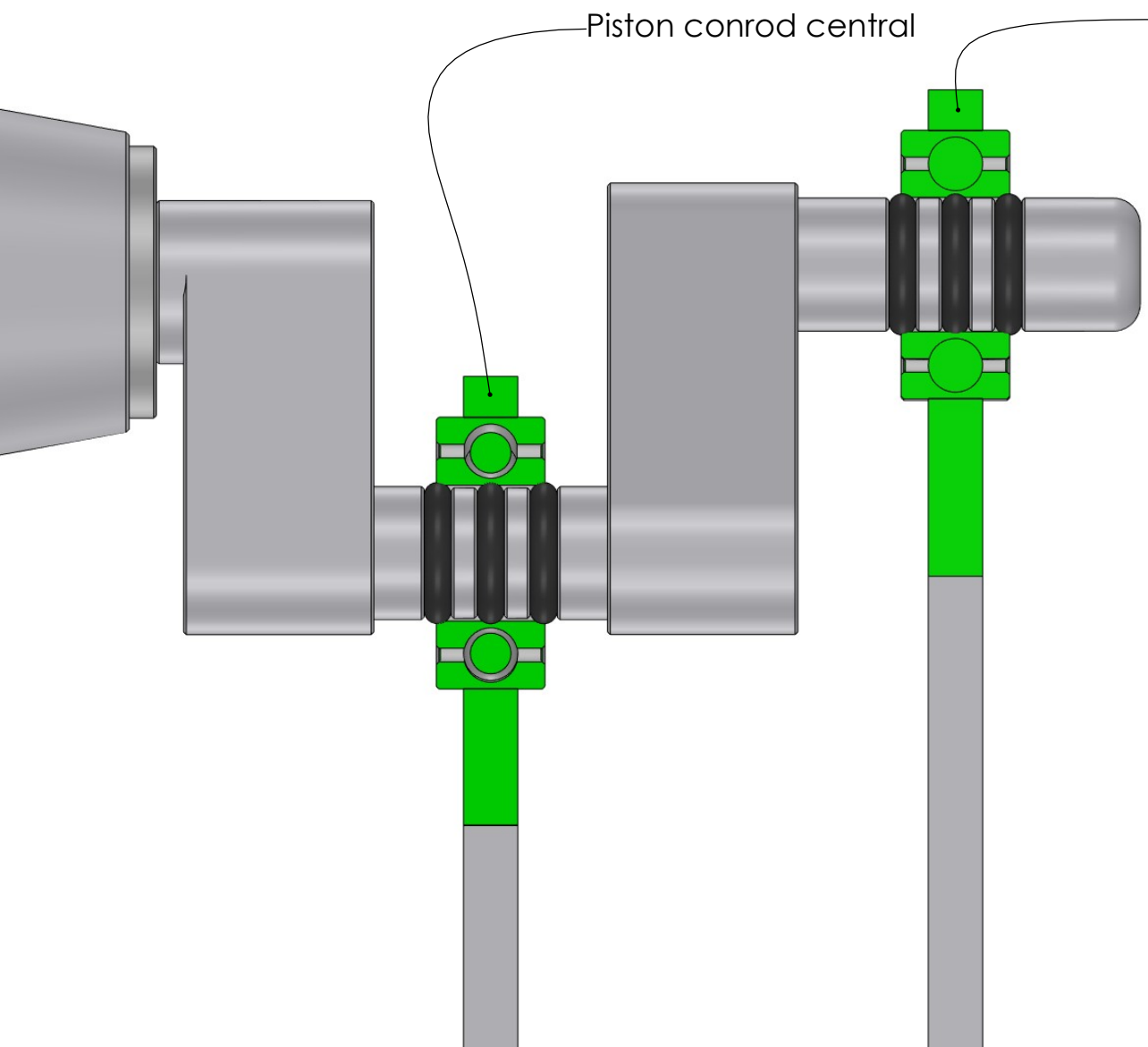
Operation



Note: This fan requires a stove top surface temperature of 100°c for efficient operation. It may run with the temperature as low as 75°c but this is not guaranteed.

Place the fan on the hot stove top and wait a few minutes for it to heat up. Gently spin the fan clockwise with enough force to take the blades through a couple of revolutions, the fan will start to rotate slowly at first but will gain speed quite quickly. The higher the temperature of the stove, the faster the fan will operate.

Improving performance



The positions of the conrods on the crank pins is adjustable left or right.

The theoretical best postion is perfectly central over the three O rings as shown but in some cases slight alignment differences during assembly may mean the best postion is slightly to the left or right.