



Turbogenerator Construction

Final Assembly

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We are now ready for final assembly, fitting, and alignment of the turbine.

The turbine must be assembled from the center-out to maintain proper alignment of the inlet nozzle and hot rotor.

Open *3D Photos, Assemblies, Case Assembly*. We see how the case should look fully assembled. Click on *Exploded Views, Case Assembly* to see the individual parts.

Bearing Case, Stator Plate & Lower Hot Rotor Plate

We'll begin by assembling the bearing case, stator plate, lower hot rotor plate and case spacers.

Press a bearing into each end of the bearing case.

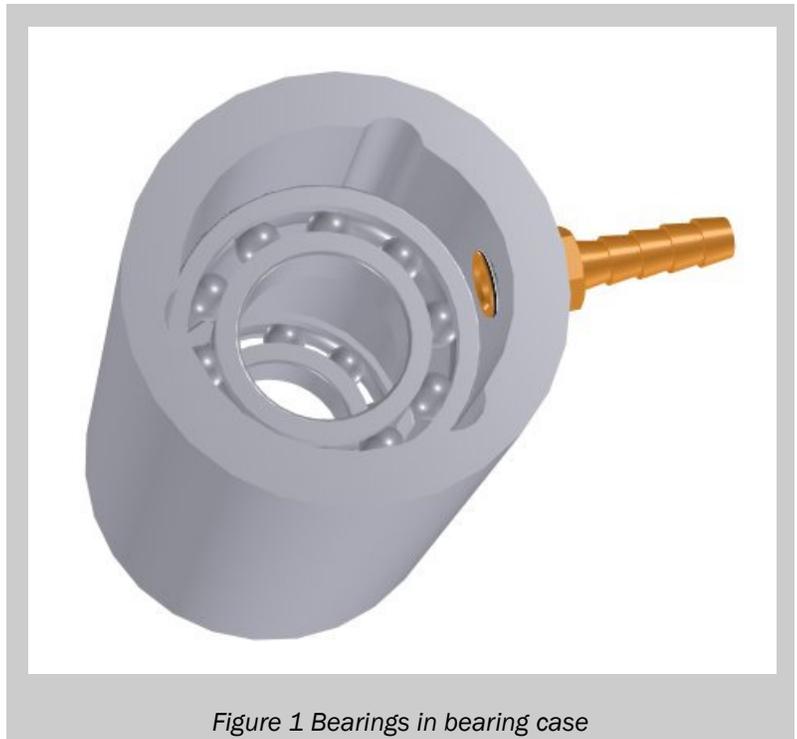


Figure 1 Bearings in bearing case

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Materials you will need:

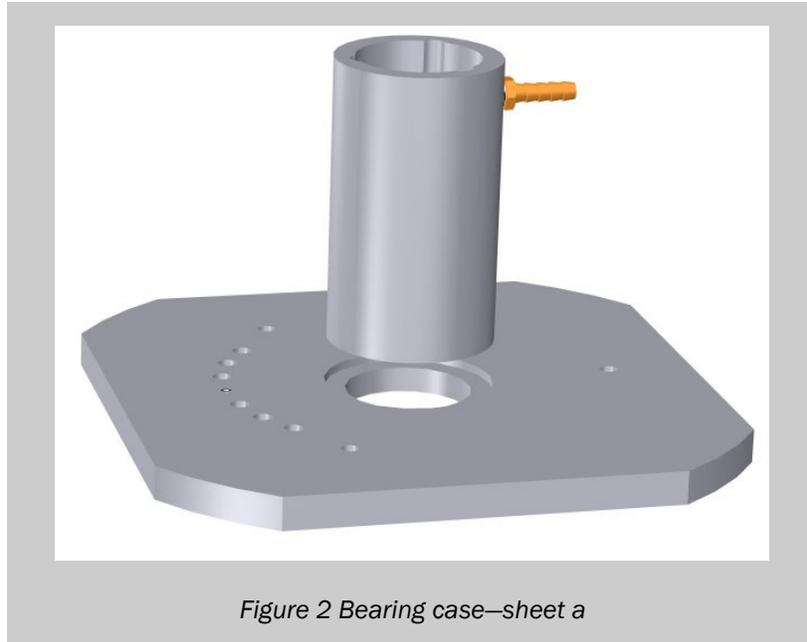
Bearing case & bearings	Stator plate
Lower hot rotor plate assembly	Case spacers
Compression rod sets	Shaft, spacers, washers, spring
Rotor assemblies	Stator
Inlet case assembly	Top plate
Light weight spindle oil	Silicone sealer

Assembly Step-by-step:

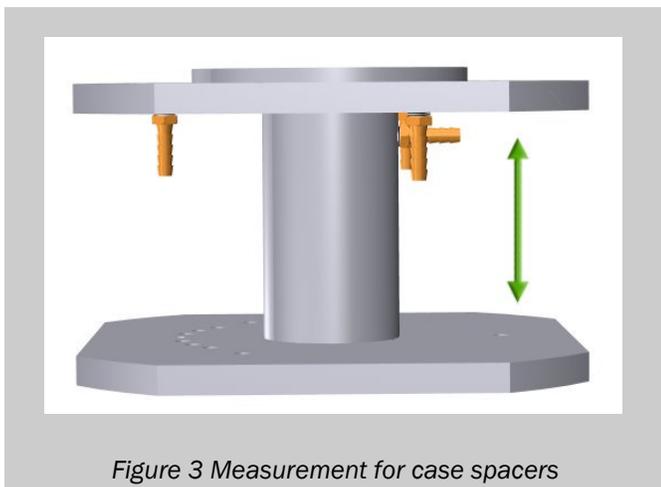
- Bearing case, stator plate, lower hot rotor plate, spacers
- Shaft & rotors
- Stator alignment
- Lower case ring, oil tubing
- Inlet case ring, top plate
- lubrication

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Place the bearing case (oil fitting up) into the stator plate bearing case slot.



Align the lower hot rotor plate bearing case slot with the bearing case, and measure the distance between the two plates.



Subtract 0.032” from this figure and trim all (4) case spacers for this value.

Remove the bearing case from between these (2) plates, coat the (2) bearing case slots with silicone sealer, and reassemble the bearing case between the plates.

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Case Spacers

Place the case spacers between the corner through holes, and fit the (4) case compression rods through this assembly. Washers and nuts are screwed onto both ends of each threaded rod and adjusted so that 9” of all (4) rods protrudes past the stator plates.

Tighten all 4 rods, compressing the bearing case between the plates; the case spacers ensure overall alignment.

Shaft & Rotors

It’s time now to install the shaft and rotors. Open the shaft & bearing assembly. Here we see all of the individual shaft-related parts - except for the (2) rotors.



Figure 5 Case compression rods

The (2) parts we have to pay particular attention to are the upper and lower shaft spacers (parts 67 & 69).

These (2) spacers set the alignment for the inlet nozzle and the alternator.

Open the shaft rotor system assembly photo to see all of the shaft-related parts - including the rotors.

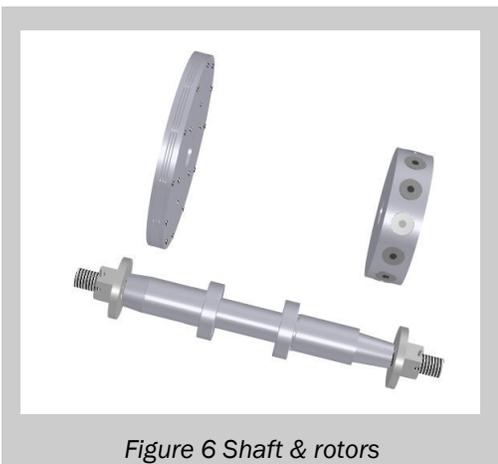
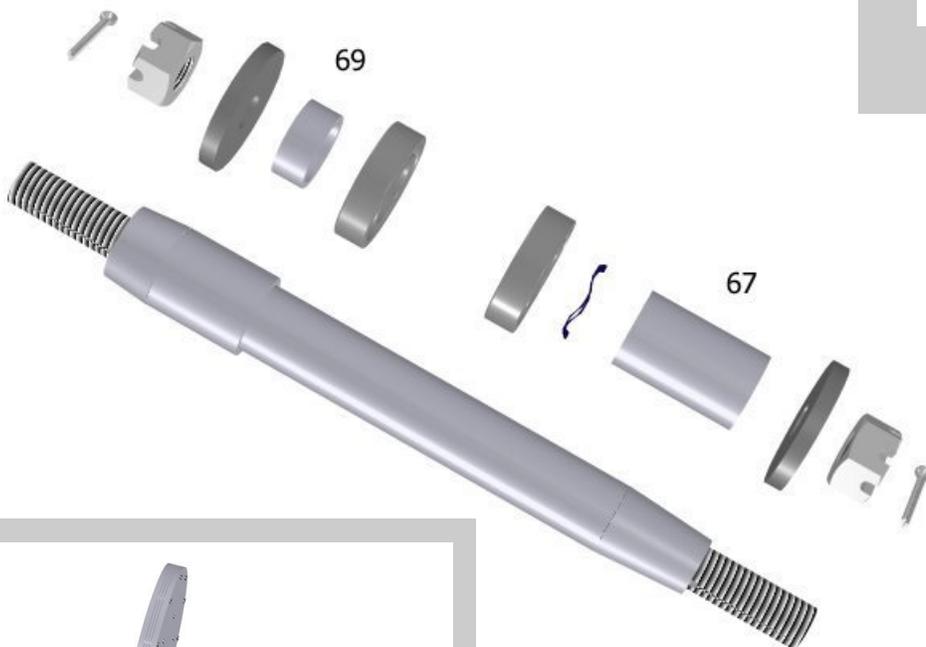


Figure 6 Shaft & rotors

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Hot Rotor & Upper Shaft Spacer

Begin this assembly by fitting the hot rotor to the shaft, then thread the upper shaft washer and nut onto the shaft and torque the nut to about 50-60 foot-pounds.

Insert the cotter pin into the upper pin hole and bend the pin legs outward.

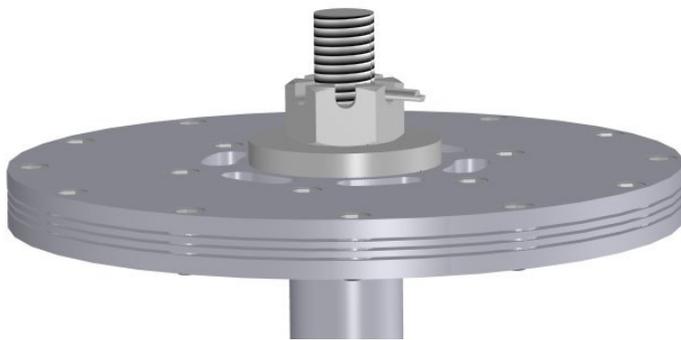


Figure 8 Cotter pin



Figure 7 Hot rotor on shaft

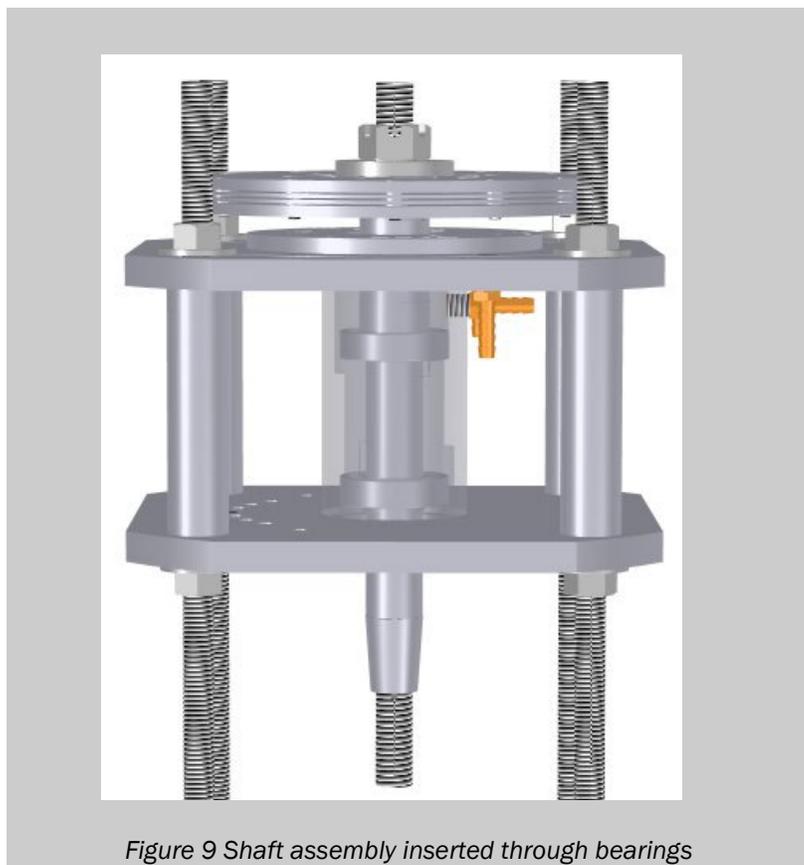


Figure 9 Shaft assembly inserted through bearings

The shaft assembly may now be spun on the lathe to true up the hot rotor.

Next slip the upper shaft spacer onto the shaft and insert the shaft assembly through the bearings.

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Temporarily mount the inlet ring onto the lower hot rotor plate and check the nozzle hole-to-hot rotor alignment.

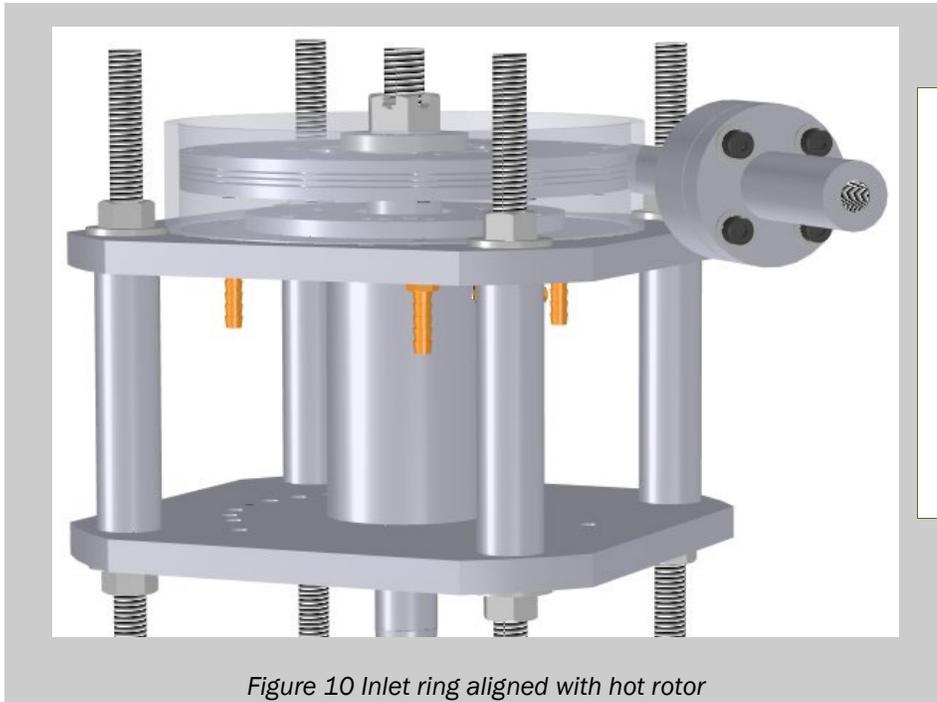


Figure 10 Inlet ring aligned with hot rotor

NOTE:

The nozzle hole must be exactly in line with the center of the hot rotor (edge center). If it is not lined up, trim the upper shaft spacer for proper alignment, or add spacers as necessary.

Magnet Rotor & Lower Shaft Spacer

With the hot rotor properly aligned, fit the lower shaft spacer and magnet rotor to the shaft and check for clearance between the spacer and the magnet rotor.

NOTE:

There must be a clearance of **(0.0625"-0.09375")** between the two parts. If not, trim the lower shaft spacer for proper clearance.

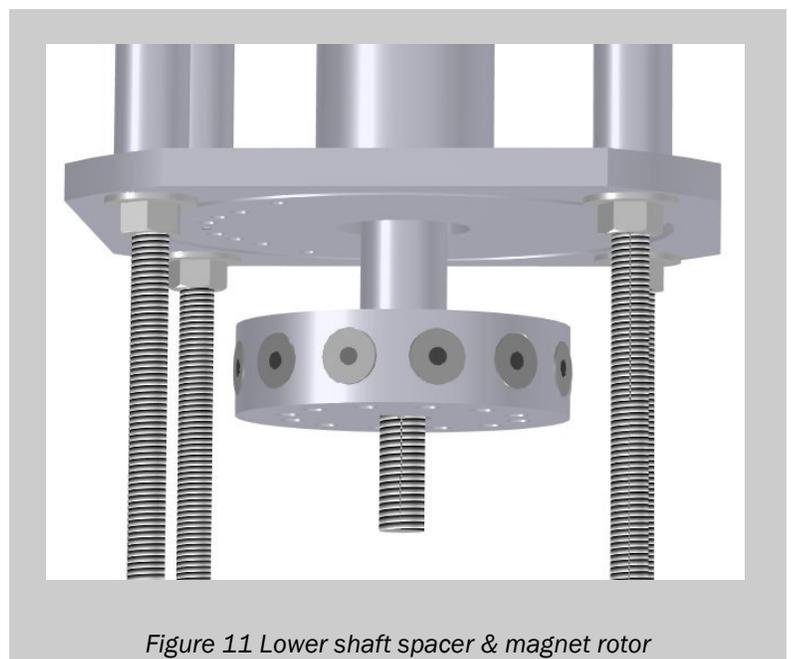


Figure 11 Lower shaft spacer & magnet rotor

Remove the magnet rotor and lower shaft spacer.

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Install the wave spring against the bearing and re-install the lower shaft spacer & magnet rotor, then the lower shaft washer and nut, torque to 60 ft./lb., insert and bend the cotter pin.

The shaft assembly is now complete.

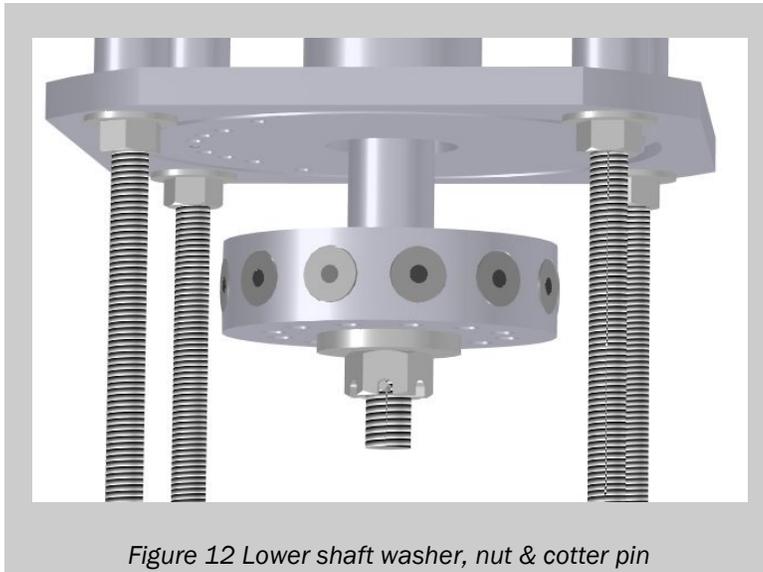


Figure 12 Lower shaft washer, nut & cotter pin

Now check the alignment of the magnet rotor to the stator.

If the magnets are relatively close to being aligned with the center of the stator, that's close enough - otherwise insert washers between the stator and stand-offs.

Also, check the gap between the magnet rotor and stator while spinning the shaft - there should be absolutely no interference between these two parts.

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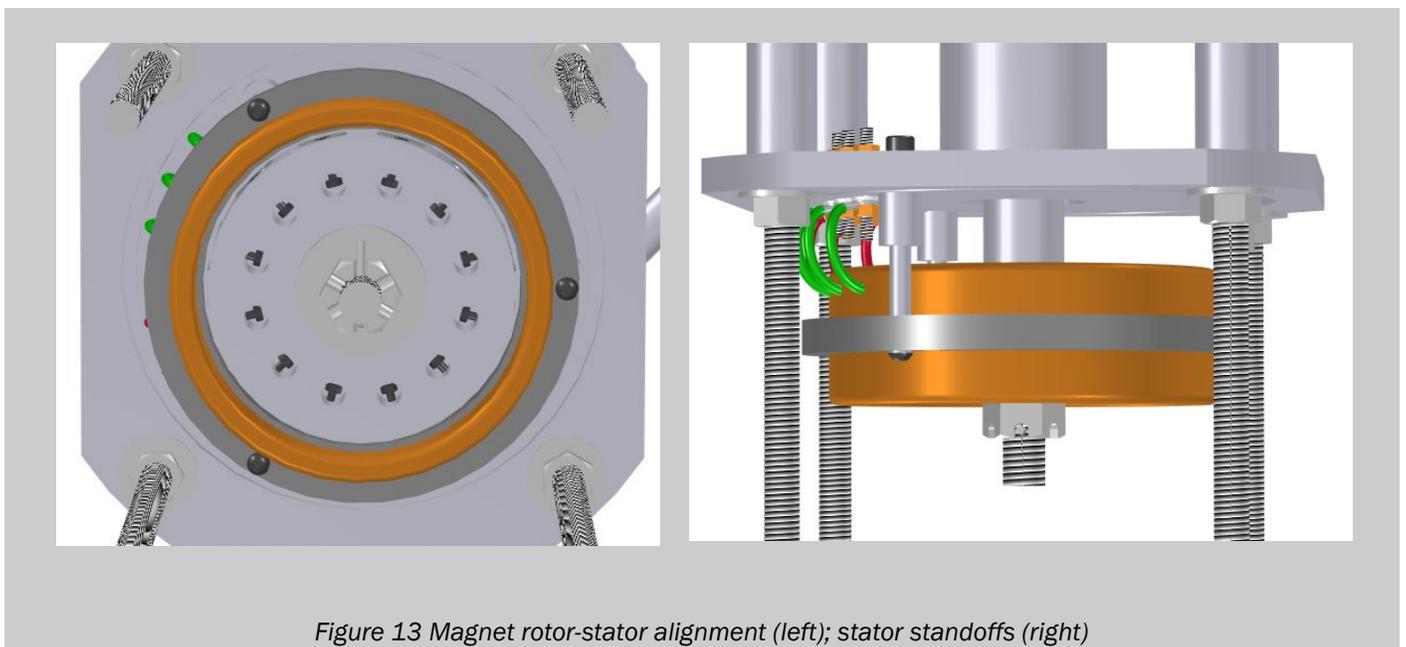
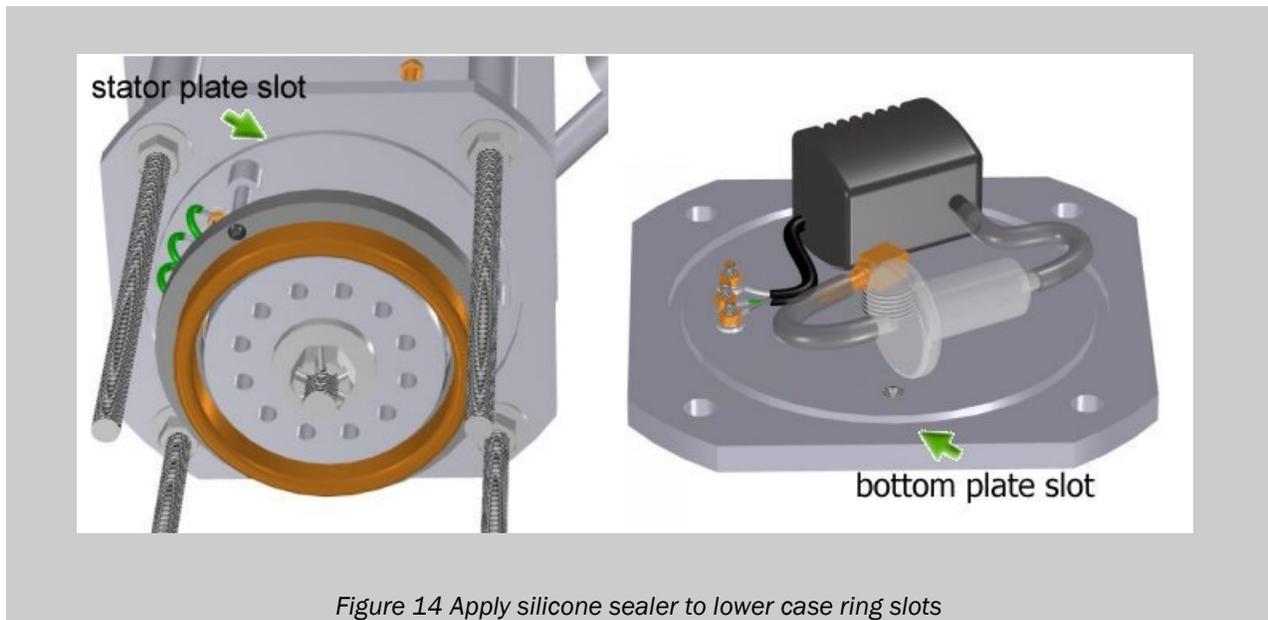


Figure 13 Magnet rotor-stator alignment (left); stator standoffs (right)

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Lower Case

All that's left now is to complete the bottom and top case assemblies. Apply a generous amount of silicone sealer to the lower case ring slots on both the stator plate and bottom plate.

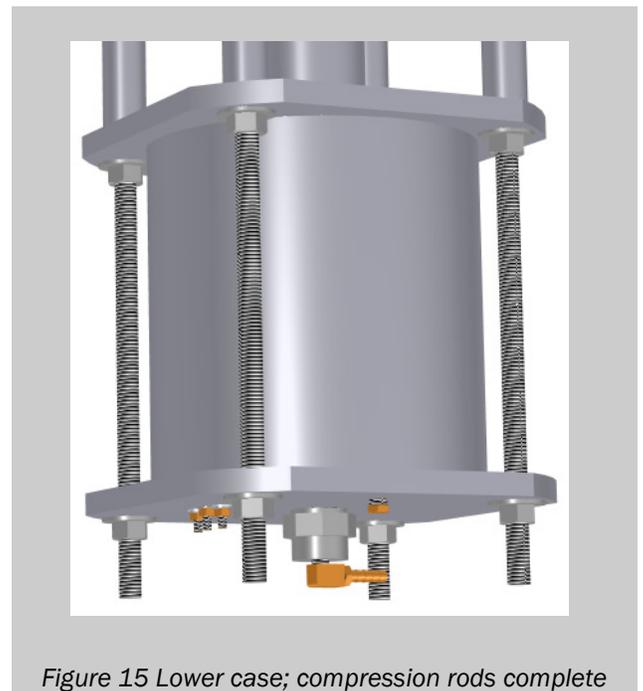


Insert the lower case ring between the (2) plates, and thread washers and nuts onto the ends of the case compression rods to clamp everything together.

Torque these nuts to about 25 foot-pounds.

Attach a length of either high-pressure flexible hose, or copper tubing from the bottom plate oil outlet to the bearing case upper oil inlet. Secure with the appropriate clamps or nuts.

The bottom section is complete. Now let's move on to the top section.



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Upper Case

Again, apply a generous amount of silicone sealer to the inlet case ring slots in both the upper and lower hot rotor plates.

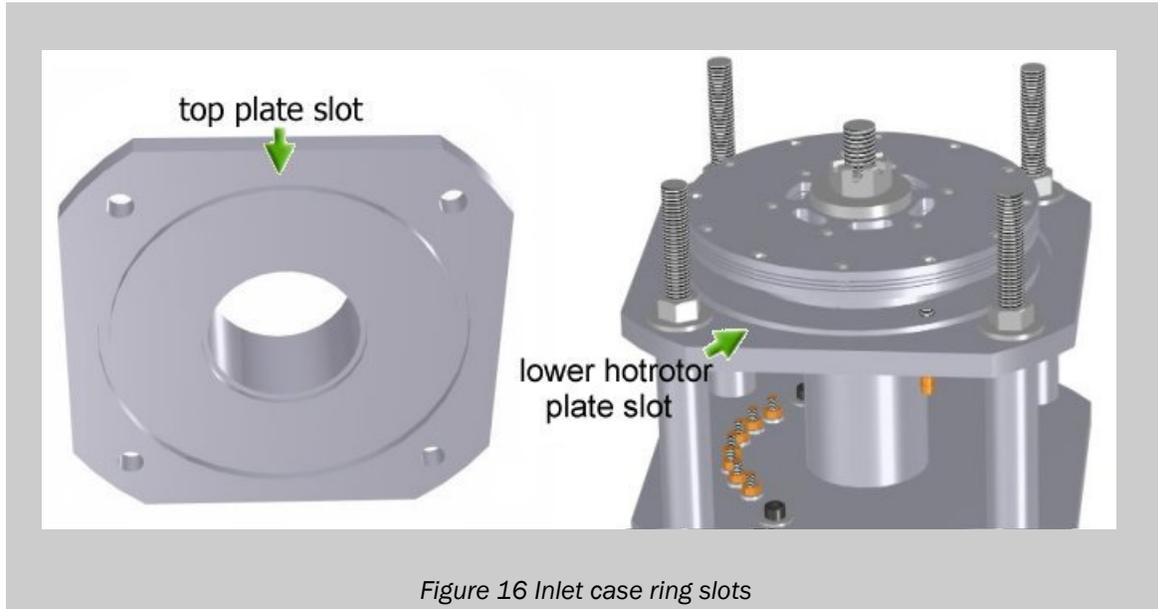


Figure 16 Inlet case ring slots

Set the inlet case ring into the lower hot rotor plate. Orient the inlet in the direction you choose, mount the upper plate on top of the inlet ring, and spin the last (4) washers and nuts onto the top ends of the case compression rods.

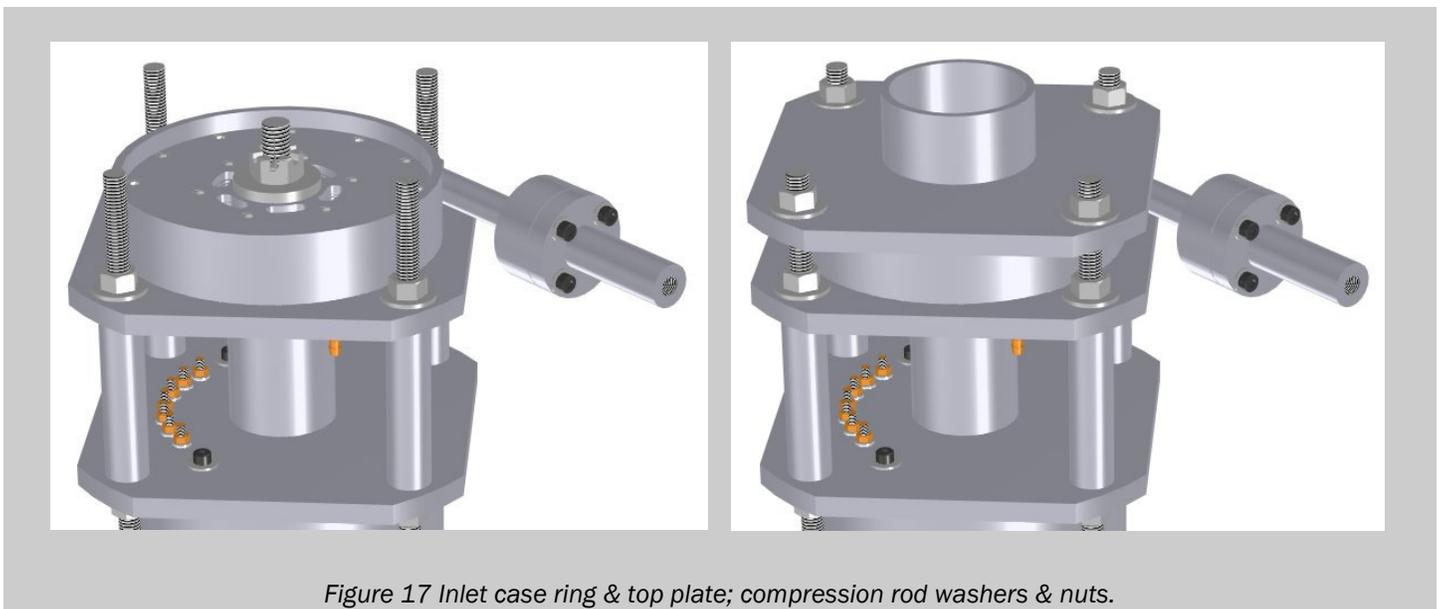


Figure 17 Inlet case ring & top plate; compression rod washers & nuts.

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Lubrication

Allow the silicone glue to cure for at least 24 hours, then fill the lower case with very light weight spindle oil or similar oil - to the half-way mark.

Be careful not to fill the case with oil, as this will put too much drag on the magnet rotor. The total amount of oil is approximately 2.2 liters or 2.3 quarts (US), or 2 quarts (Imperial).

First Fire!

After securely bolting this machine to your workbench, you are now ready to fire up your turbogenerator!

Note: It's always a good idea to run the oil pump for 30 seconds before powering the turbine. This saves on bearing wear.

Caution!

Do not touch the power terminals while the turbogenerator is running.

As soon as it begins to spins, power comes out of the terminals.

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Questions?

Discuss this class on the NTW Forum!

Ken Rieli, expert disc turbine designer/builder & multi-physicist, has developed a hands-on approach to learning about 21st century turbomachinery & how to harness eternal energy sources—Sun, Wind & Biofuels.

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