



Optical Illusion wind wheel - EOS_01 (approx. 45cm / 17,7") - NO-GLUE version available



PanicCarefully

[VIEW IN BROWSER](#)

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Summary

a large optical illusion wind wheel - design based on the EOS wind wheel platform. New NO-GLUE version available!

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Tags: [pinwheel](#) [opticalillusion](#) [kinetic](#) [kineticart](#)
[kineticsculpture](#) [windwheel](#)

2023-11-03:

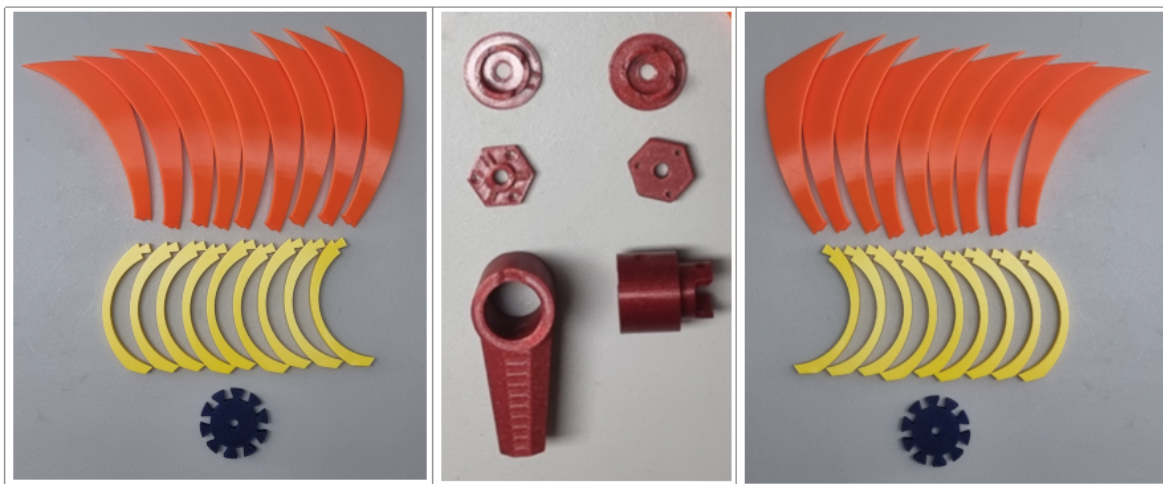
Finally the no-glue design - now it's possible to exchange every part of this model by itself without the need to print other, glued-attached neighbor parts!

For this, I've redesigned the arms and the wings, so they can be plugged together - no more glue necessary.

2023-10-26:

Thanks to my neighbor [Charly 1345771](#) I was able to make a major leap into an easier to build spinning mechanism (the so called OR-core). I've updated the whole instruction - Wish you all the BEST!

First of all, this is a massive project. Many parts have to be printed, glued and screwed together - do I think it's worth - **HELL YES!!!** It's so deeply satisfying and relaxing to see wheel spinning around in the wind. So let's begin!



To get an rough idea, here a picture of all needed print-parts for a EOS windwheel with the EOS_01 rotor design (without the measure and the press aid). NOTE: the hubs had been changed since tacking the photo

Overview:

The EOS wind wheel platform consists of 4 main parts:

1. the EOS-Core (spinning mechanism)

There are two spinning mechanisms available, the inner race (aka IR) and the outer race (aka OC) spinning mechanism. Both designs allow to exchange the rotor at will - with one house/core unit you are able to easily switch between different rotor designs, you only have to screw on the rotor to the core and you are done.

The following table gives you an overview of the pros and cons of those two solutions and supports you which EOS core you want to build.

	Inner race spinning (IR spinning)	Outer ring spinning (OR-Spinning)
Description	The outer ring of the bearing is immobilized, spinning is done via the inner ring	The inner ring of the bearing is immobilized, spinning is done via the outer ring
Location of bearing	inside the housing --> weather protected	outside the housing, integrated in rotor --> no weather protection
Bearing changeable	Not for itself whole assembly of shell/bearing/axis/connector has to be exchanged	Yes, Bearing itself changeable
Rotor exchangeable	Yes rotor consists only of printed parts	Yes Rotor consists of printed part and the bearing
Core	Definitely more assembly steps Axis has to be manufactured by yourself and pressed into bearing and connector plate. 'Special' DIY tools needed.	Easy assembly, only printed and sourced parts needed. Only wrench needed.
Parts	More printed (aids, connector plate) and sourced parts for bearing pressing tools needed	Lesser printed and sourced parts needed
My personal opinion	I like the weather protected bearing and that the rotor only consists of printed parts. The initial work to build the core is more and requires some crafty capabilities. In the end I hope the bearing will last way longer and if I want to change the rotor design I do not need additional bearings.	If I want a fast success and if I do not want to bother with additional work this is clearly my favorite. One downside is, that there is no weather protection for the bearing. I do not have any experience how this will work out in the long time, but at least it is very easy to exchange the bearing itself.

1. The two rotors

- One rotor consists out of several wing/arm-combination (depends on the design) and on hub, where all the arms are connected to.
- There are two different sorts of wings - the closed ones and the open ones. The different orientations of blades (open or closed) forces the two rotors to spin counter wise to each other. This maximizes the wanted moiré effect. You surely can build both rotors with one rotor orientation and it will work to, but the spinning will be less agile. I personally prefer to build the two rotors in different rotor orientations.
- The closed wings needed to be glued or plugged into the closed-wing arms, the open wings needed to be glued or plugged into the open-wing arms - so there are two types of arms.
- There are two types of hubs, one for the IR-Core and one for the OR-Core. The IR core is single printed part, whereas the OR-core consist out of two half shells of the rotor, where the bearing will be integrated to
- The wing/arm-combination is pressure fitted into hub (in German we call this a Schwalbenschwanz) - no glue necessary



open wing rotor (EOS_01 rotor design, IR hub)

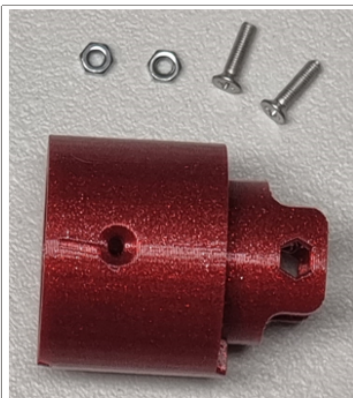


closed wing rotor (EOS_01 rotor design, OR hub)

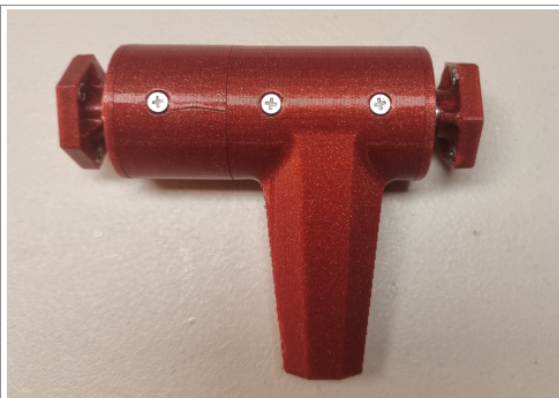
1. The housing

- There is only one housing for both core option - that's the easy part
- There is an option booster available - why?

I've ran the different EVO rotor designs quite a while on my balcony in different weather conditions and they performed fine, until... until we had a very heavy thunderstorm some time ago and wings of the open rotors broke. It looks like, that sudden gusts of wind bends the open wings of the rotor in the direction to post. The open wings with their spikey end tend to hook onto the post and break. To avoid this happening again, I introduced the booster. The booster mounted on the side of the open rotor increases the distance between the spikey ends and post and I hope this will solve this, at least it will make it more unlikely.



optional booster



optional booster assembled to the EOS IR-core housing

Let's start

I suggest to follow these 7 basic steps:

1. **Choose which EOS core (IR or OR) you want to build**
2. Print and source all needed parts according to your choice
3. Build two cores
4. Build two rotors
5. Assembling the housing and the two cores
6. Install the rotors to the core
7. Put everything on a stand and you are good to go

Building THE EOS IR-CORE (inner-race core)

Total bill of material for EOS IR-core:

Printable

Housing
2x shell
2x connector plate
Optional: booster
 booster

Sourced at a hardware store

2x 608 ball bearing (I prefer APEX7 or higher, choose a sealed one)
10x nut M3 DIN 934
4x flathead screw M3x12 DIN 965H
2x pieces of aluminum rod diameter 8mm (1mm wall) by 24mm length
Optional: booster
 2x nut M3 DIN 934
 2x flathead screw M3x12 DIN 965H



Bearing press tool

Printable

Pressing aid
Measure aid

Sourced at a hardware store

Assembly of the EOS IR-core

I suggest to follow these 8 steps:

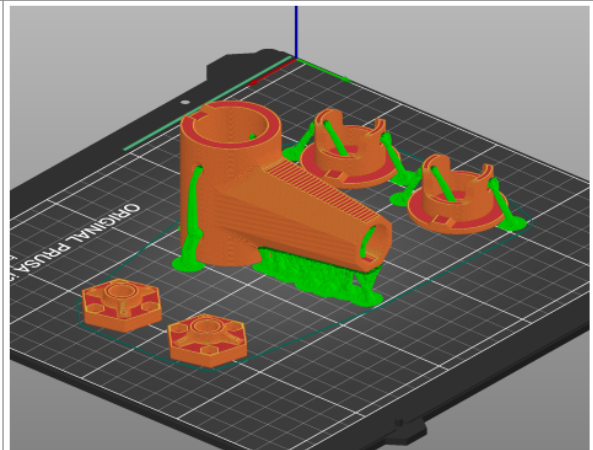
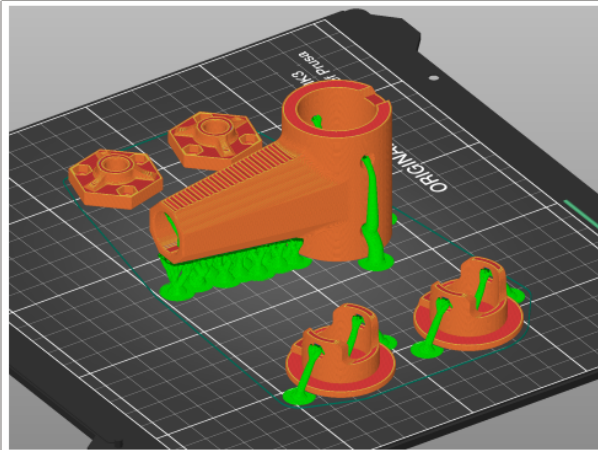
1. Print and source all needed parts
2. Prepare the axis
3. Prepare the shell
4. Prepare the connector plate
5. Press the axis into the bearing
6. Insert(press) the bearing/axis into the shell
7. Press the connector plate onto the axis
8. Assembling the housing and the two cores

Step 1: Print and source all needed parts for the IR-core

Print parameters:

filament	PETG (why? --> I felt better doing the core PETG than in PLA)
Layer	0,2mm or 0,3mm
Support	For support enforces only (refer to picture below)
Support type	Organic
Infill	40%
Perimeters	3

My support enforces:



Step 2: Prepare the axis

The axis of the rotor is made out of 24mm long piece of a 8mm (1mm wall) aluminum rod. You can get a 1m or 2m long piece in a hardware store and you have to cut it to the desired length. For a consistent measurement I have added measure aid. You can slip the longest hole over your aluminum rod and mark it.

After cutting the rod with a saw, you have to sand down all unwanted edge. After this reduce the diameter of the rod with a file (I insert the rod into a drill-machine) a little bit and sand it to get a smooth surface.



A unprocessed rotor axis (aluminum rod diameter 8mm (1mm wall) by 24mm length)



Processed rotor axis (remove the burs, scrubbed down the diameter little bit, chamfer the edges)



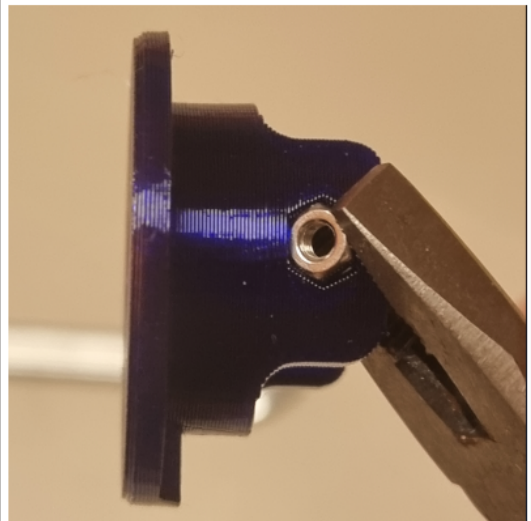
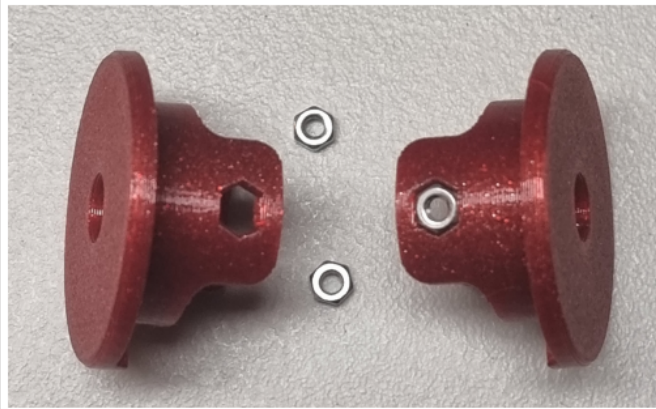
Mark the ball bearing pressure depth (approx. 8mm) with the measure aid



Mark the rotor pressure depth (approx. 10mm) with the measure aid

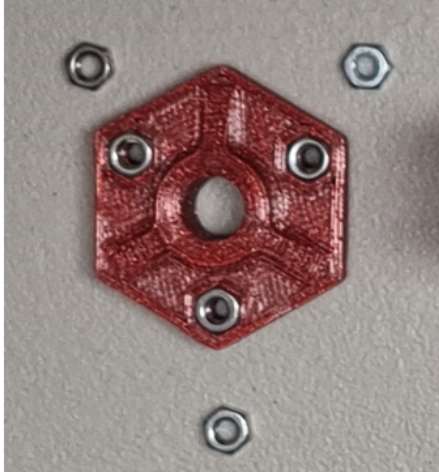
Step 3: Prepare the IR-shell

Insert two screw nuts as shown into the shell - the nuts should sit plain with the outer surface of the shell



Step 4: Prepare the connector plate

Insert three screw nuts as shown into the shell



Step 5: Press the axis into the bearing

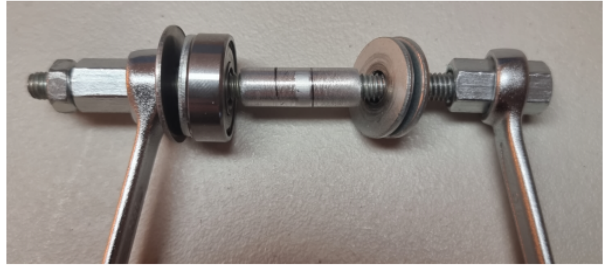
It took me quite a while to find an easy solution to press the axis into the 608 ball bearing. As my final solution I use a threaded rod, where the ball bearing and the axis is put on. By applying an axial force with the screw nuts at each end, while turning them counter wise, the axis will slip inside the hole of the ball bearing and that's it.



Here you see all parts and needed tools to press the axis into the 608 ball bearing.

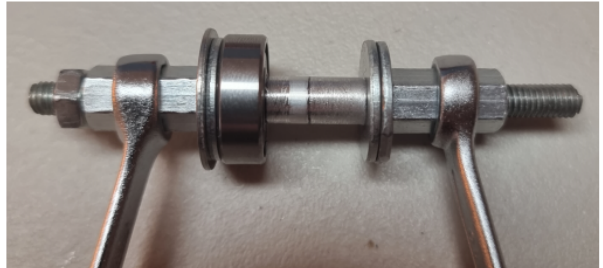
I use some washers to protect the surfaces of the ball bearing and the axis and to distribute the axial forces more equally.

Before pressing:

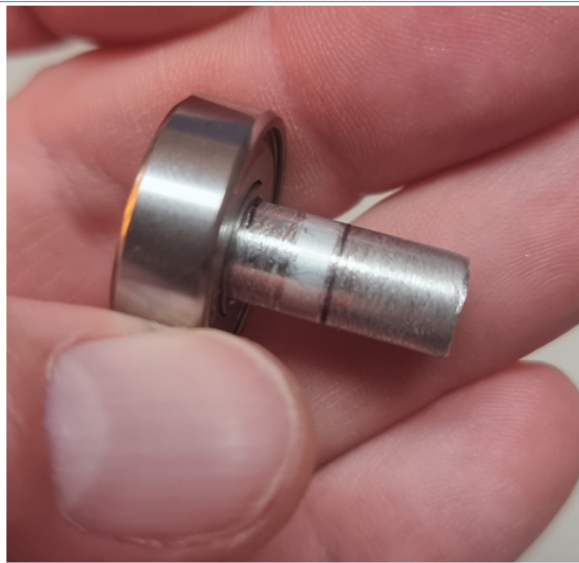


I use some washers to protect the surfaces of the ball bearing and the axis and to distribute the axial forces more equally. Be sure you put axis in the right direction - the smaller marking should face the bearing

After pressing: the small marking is barely seeable



The axis is correctly pressed into the bearing



After pressing: the small marking is barely seeable

Step 6: Insert(press) the bearing/axis into the IR-shell



Insert the bearing/axis assembly into the shell



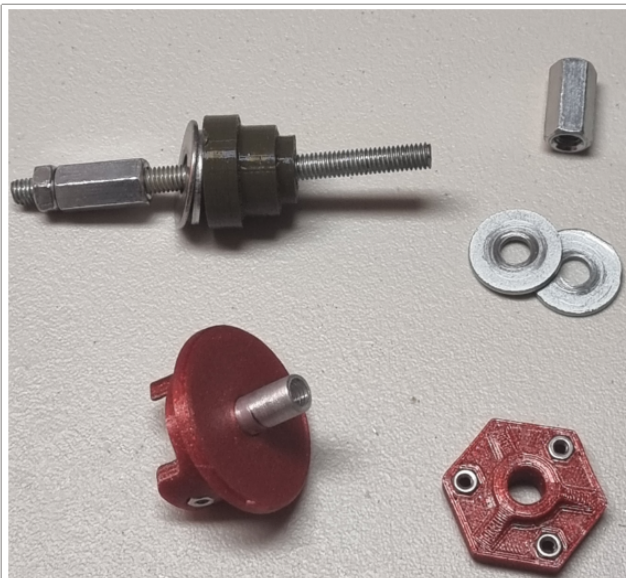
Push the bearing/axis into the shell - it needs force, don't be shy but do not bend the bearing cage



Correctly inserted the bearing fits into the shell, the axis should be easy going

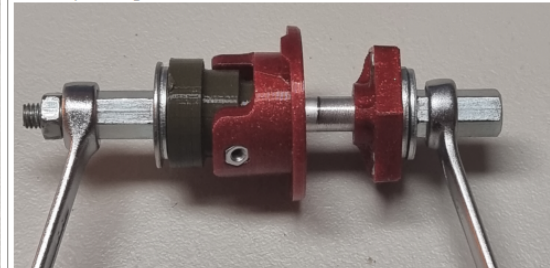


Step 7: Press the connector plate onto the axis

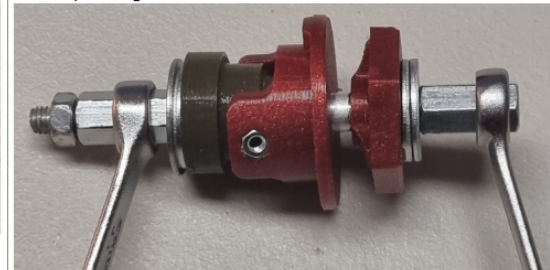


For this pressing I recommend to use the pressing aid in order to keep the bearing safe

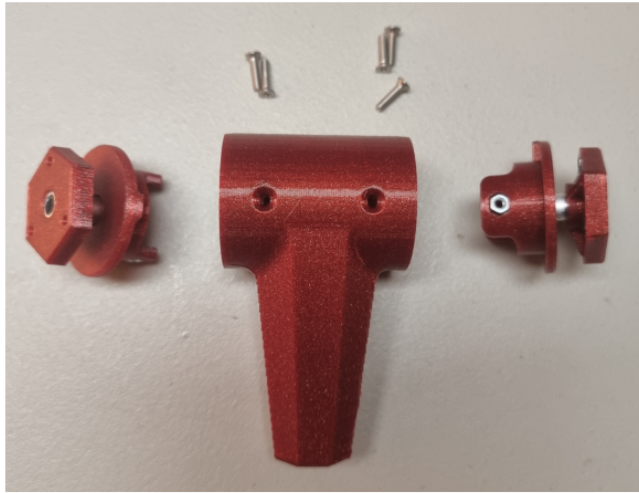
Before pressing:



Before pressing:

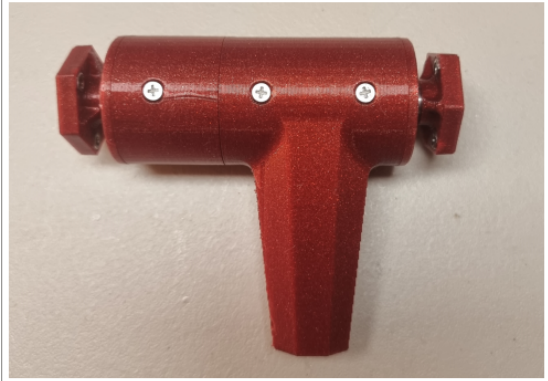


Step 8: Assembling the IR-core



Fit the two spinning mechanics into the housing - there is a nose on the shell and nose hole on the shell for a proper alignment. Secure the mechanics with two screws each.

Here you see a the EOS-core units without the additional booster.



Here you see a fully assembled EOS-core unit (with the optional booster installed). This core unit can be mounted on a 16mm aluminum pipe and you are ready to mount any rotor onto it, which fits to the connector plate.

Building THE EOS OR-CORE (outer-race core)

Total bill of material:

Printable

Housing

2x shell

Optional: booster

booster

Sourced at a hardware store

core

2x M8x30 screw

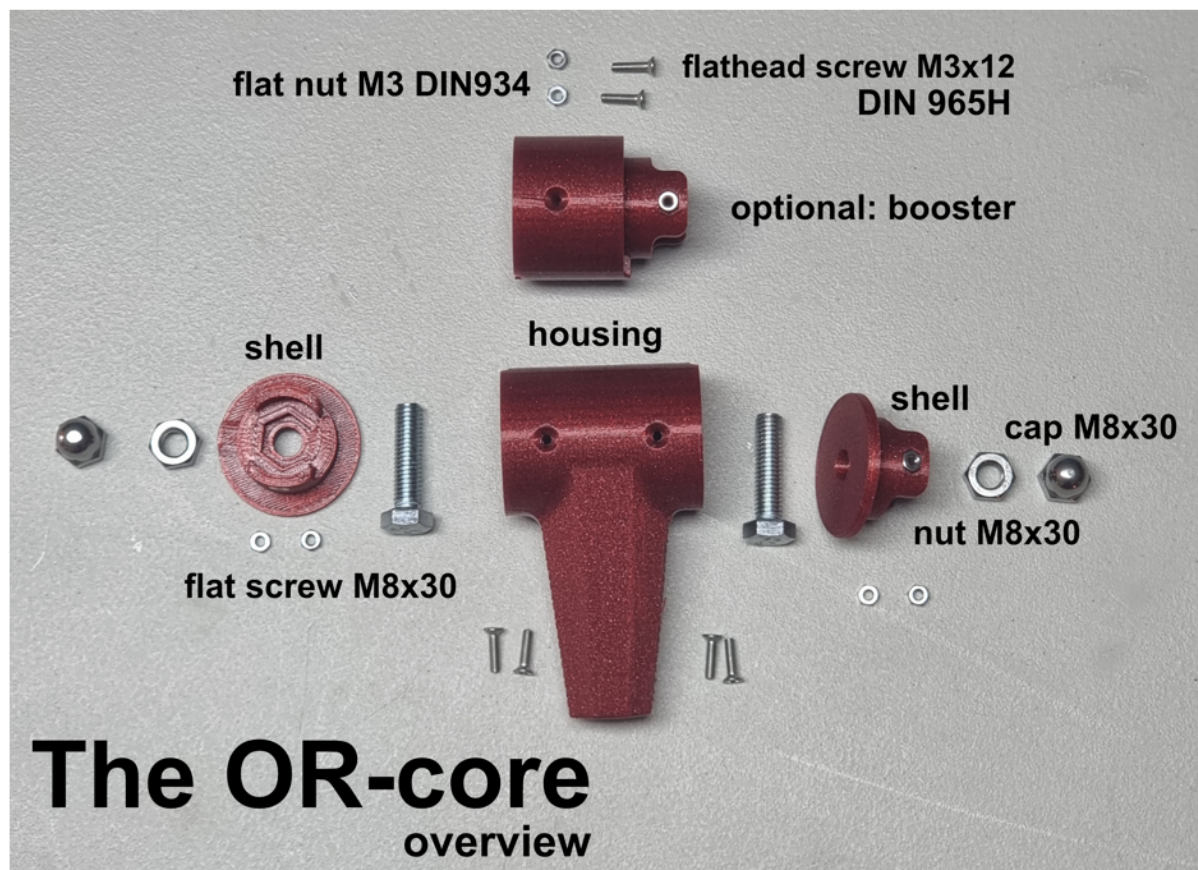
2x M8 nut

2x M8 cap nut

Assembly of the EOS IR-core

I suggest to follow these 8 steps:

1. Print and source all needed parts
2. Prepare the shell
3. Install the screw
4. Assembling the housing and the two cores

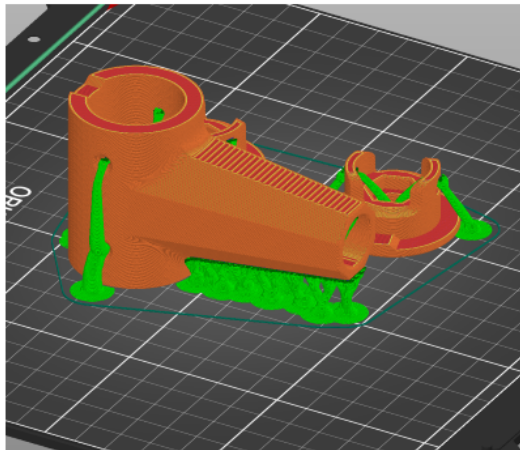
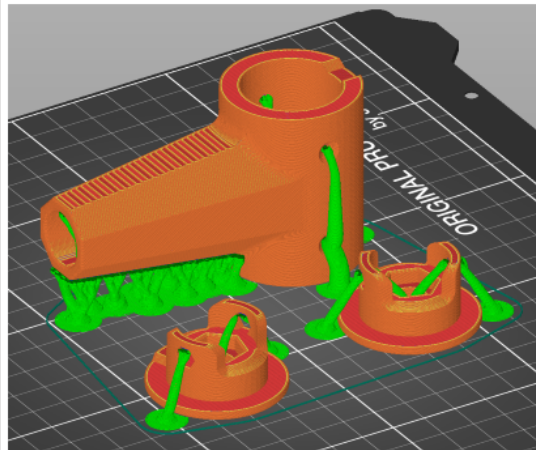


Step 1: Print and source all needed parts for OR-core

Print parameters:

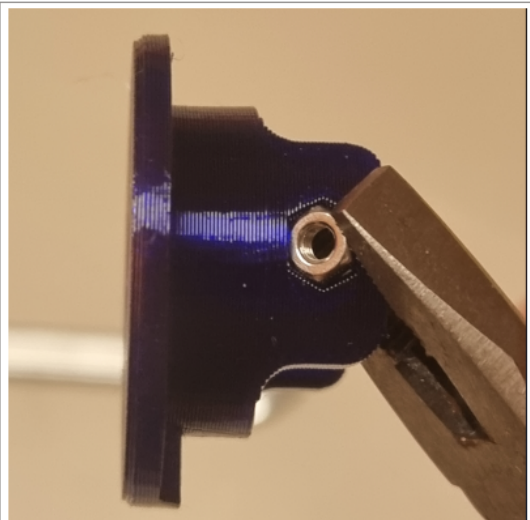
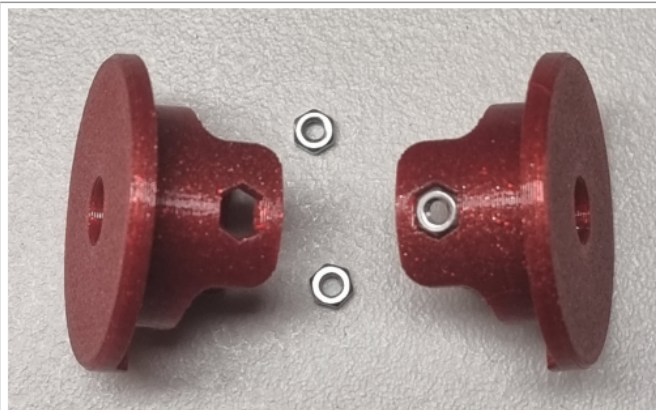
filament	PETG (why? --> I felt better doing the core PETG than in PLA)
Layer	0,2mm or 0,3mm
Support	For support enforces only (refer to picture below)
Support type	Organic
Infill	40%
Perimeters	3

My support enforces:

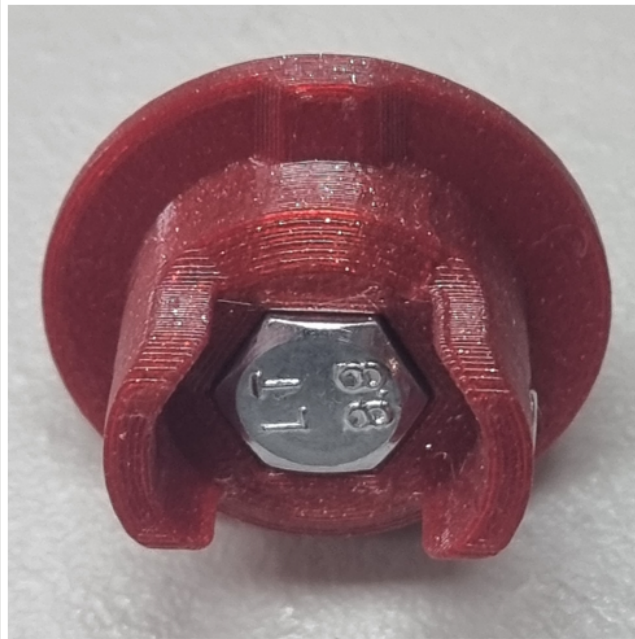


Step 2: Prepare the OR-shell

Insert two screw nuts as shown into the shell - the nuts should sit plain with the outer surface of the shell



Step 3: Install the screw

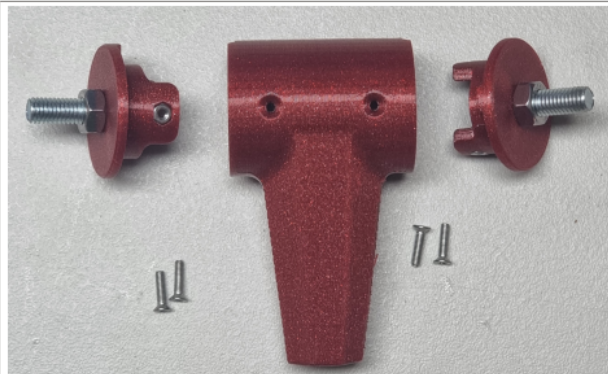


Insert the M8X30 into the shell

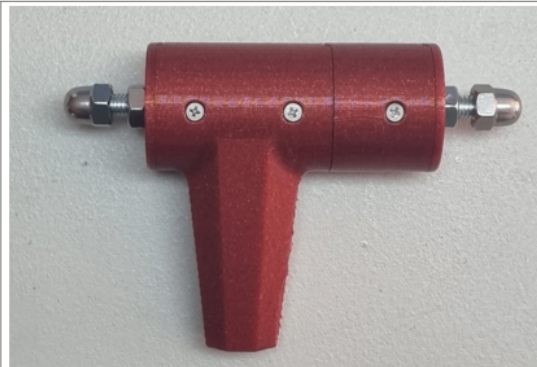


Counterscrew the nut onto and that's it

Step 5: Assemble the OR-core



Fit the two spinning mechanics into the housing - there is a nose on the shell and nose hole on the shell for a proper alignment. Secure the mechanics with two screws each.



Fully assembled EOS OR-core unit with the optional booster unit, and the threaded end and the nuts visible

THE EOS-ROTOR

There are several rotor designs for the EOS wind wheel platform available (see list at end of this post). They may differ in the amount and form of the wings arms and the form of the rotor, but they rooted on a similar assembly principle.

So if you follow one EOS design assembly description you can built all the other EOS design as well. By releasing different EOS rotor designs I will only upgrade the bill of material for this released design, the assembly description could be from a different design as a guidance - hope this will work out.

Total bill of material for the EOS_01 rotor design:

Printable

- 10x open rotor wings
- 10x closed rotor wings
- 10x open rotor arms
- 10x closed rotor arms
- 2x IR-hub or 2x OR-hub for EOS_01 design

Sourced at a hardware store

- Glue
- For IR-hub: 6x flathead screw M3x12 DIN 965
- For OR-hub: 2x M8 cap nut

There is no single rotor design for this wind wheel platform - the rotor come and will come in many different design. The assembly is very similar but the amount of parts differ from design to design, here I will describe the assembly of the **EOS_02** rotor design as an example.



EOS_02: open wing with IR-hub



EOS_02: closed wing with IR-hub

Assembly of EOS-rotor

I suggest to follow these three steps:

1. Print and source all needed parts
2. Connect/glue the arm and the wing (all of them)
3. ONLY FOR OR-core: Assembling the OR-hub
4. Insert the wing/arm into central

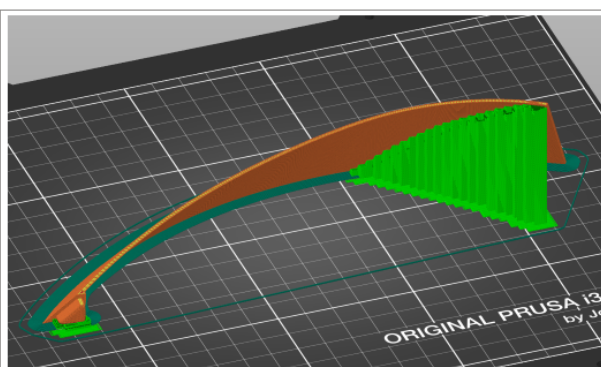
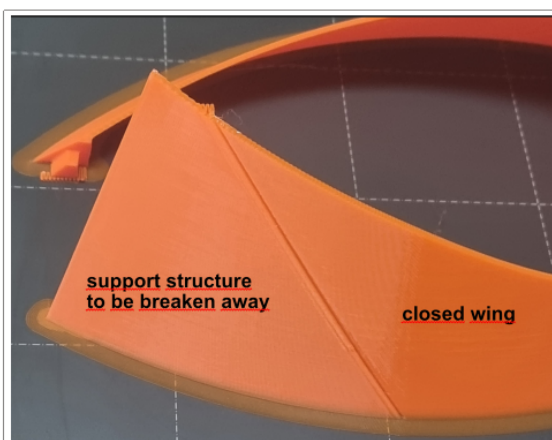
Step 1: Print and source all needed parts

The wing/arm combination should be as light as possible but on the same time sturdy enough to withstand the wind pressure. I came up with this parameters

Closed wings

The closed wings are a bit tricky to print. Because of their large overhanging tip, the tip has to be supported while printing. I've added predetermined breaking line so you can easily snap of the support of the wing.

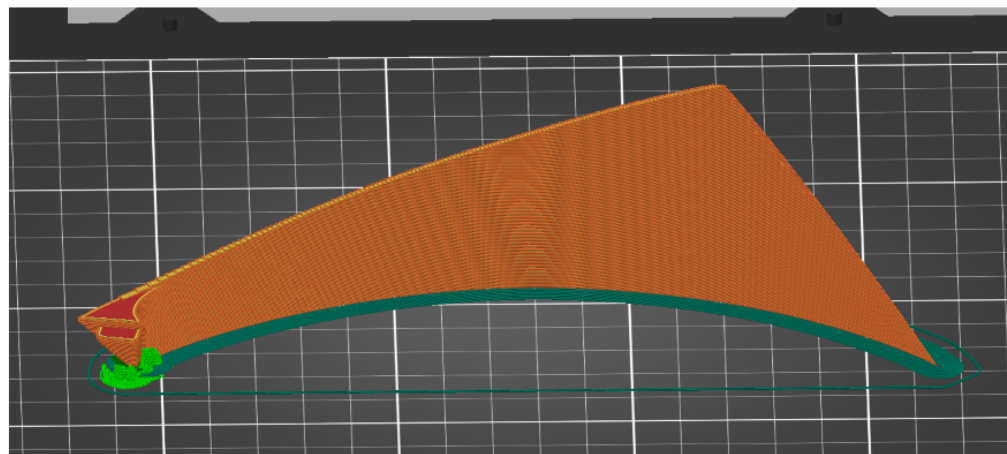
filament	PLA (why? --> had more colors and it proofed stable enough)
Layer	0,2mm or 0,3mm
Support	For support enforces only (refer to picture below)
Support type	grid
Infill	5%
Perimeters	1 or 2
Brim	yes



My choosen support enforcers

Open wings

filament	PLA (why? --> had more colors and it proofed stable enough)
Layer	0,2mm or 0,3mm
Support	For support enforces only (refer to picture below)
Support typ	organic
Infil	5%
Perimeters	1 or 2
Brim	yes



Closed wing arms / Open wing arms

filament	PLA (why? --> had more colors and it proofed stable enough)
Layer	0,2mm or 0,3mm
Support	Everywhere (Prusa slicer)
Support type	Organic

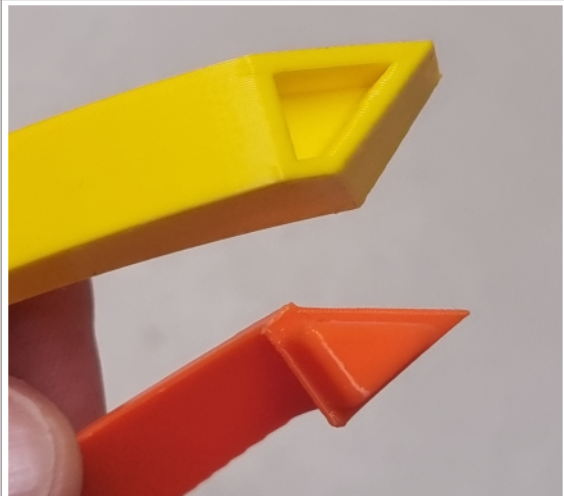
Step 2: Connect the arm and the wing (all of them)

Note!: Basically there are two connection types available. One which needs to be glued together, and one which can be plugged together (tight fit, no-glue) - you can choose. Personally I prefer the plugin-version, because then you can exchange a potential broken wing without the need to print a new arm.

Gluing the arm and the wing together:



Pair of an arm to a corresponding wing (e.g. an open arm to an open wing)



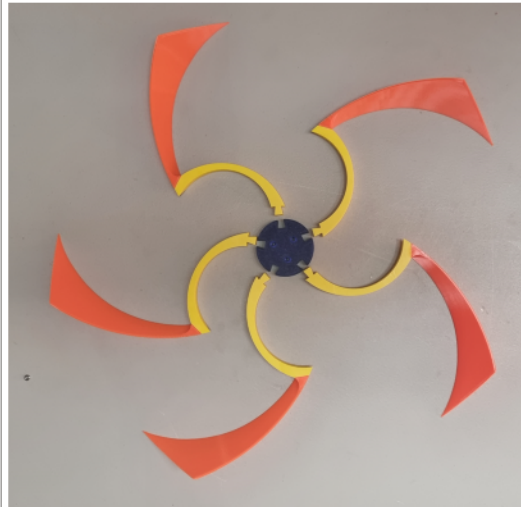
The arm and the wing can be press fit together - I strongly recommend to glue them together if the arm and the wing do not fit together, then check first if you have a not corresponding wing/arm pair (e.g. an open arm and a closed wing) - mixed pairs don't fit together



An assembled wing/arm combination - repeat the two previous steps as often as needed.

Note: A wing does have a plane edge and a curved edge. I recommend to glue and mount the wings facing their plane edge on a table

EOS_02 open rotor with IR-hub



EOS_02 closed rotor with IR-hub



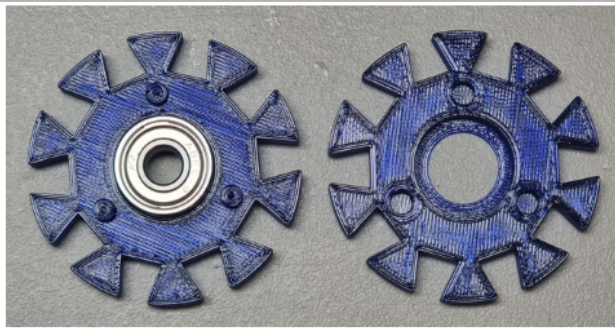
No-glue version - plugin the arm and the wing together:

Step 3: **ONLY FOR OR-core** Assembling the OR-hub

If you have chosen to build a OR-core based wind wheel, the hub consists of two halves with the bearing in between



Two halves of the hub and the bearing



Push the bearing into one half and put the other half on top of it - Caution: The teeth of both sides have to line up!



Fully assembled OR-hub

Step 3: Insert the wing/arm into central hub



Place the wing/arm combi with the plane edge on the table and press fit it into the central hub. The arm should align plain with the hub

FOR IR-hubs:

Be sure, that the central hub is in the right orientation - the side with three screw holes must be visible.

For OR-Hubs:



IR-hub: Correct assembled **EOS_02** rotor (closed wing)



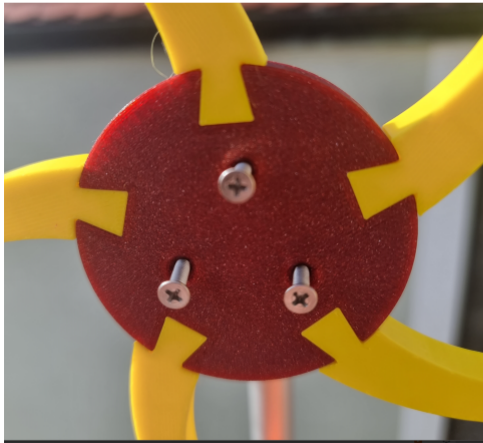
Assembling the IR-Core with the IR-rotor



Put the EOS-Core onto a shaft (16mm diameter)



Place the rotor onto the connector plate (align the screws with the screw hole on the plate)



Fasten the screws



Ready rotor one!



Turn the core



Screw the second rotor onto the core --> YOU HAVE DONE IT!

Assembling the OR-Core with the OR-rotor



Put the EOS-Core onto a shaft (16mm diameter)



Slide the OR-Rotor onto the threaded end



Screw the cap nut onto and fasten it slightly



YOU HAVE DONE IT!

List of released EOS rotor designs (subject to be actualized frequently)

EOS_01 rotor design → this post (https://www.printables.com/model/608274-45cm-optical-illusion-wind-wheel-eos_01-approx-177)

updated on 03.nov.2023

updated on 15.oct.2023



EOS_02 rotor design → https://www.printables.com/model/606745-45cm-optical-illusion-wind-wheel-eos_02-approx-17

updated on 03.nov.2023

updated on 15.oct.2023



EOS_03 rotor design → https://www.printables.com/model/610898-45cm-optical-illusion-wind-wheel-eos_03-approx-177

updated on 03.nov.2023



Model files



OR_EOS_housing and Core

3 files



eos_core_housing_v142.3mf



eos_or-shell_-v151.3mf



eos_or-core_total_v151_prusa-slicer.3mf



OR_EOS-01_hub

2 files



eos_or-hub_v57.3mf

☐ you will need 2



or_eos-01_hub_v57_prusa-slicer.3mf



IR_EOS_housing and core

4 files



eos_core_housing_v142.3mf



eos_core_shell_v142.3mf

☐ you will need 2 of them



eos_core_connector_v50.3mf

☐ you will need 2 of them



eos_core_total_v142_prusa-slicer.3mf



IR_EOS-01_hub

2 files



eos_01_hub_v50.3mf

☐ you will need 2 of them



eos_01_hub_v50_prusa-slicer.3mf



IR_Tools for core

2 files



eos_tool_press-aid_v142.3mf



eos_tool_measure-aid_v142.3mf



NO GLUE__IR and OR_EOS01-to-03 rotor

8 files



eos1to3_closed_wing_no-glue.3mf



eos1to3_closed_arm_no-glue.3mf



eos1to3_open_arm_no-glue.3mf



eos1to3_open_wing_no-glue.3mf



eos1to3_closed_arm_no-glue_prusa-slicer.3mf



eos1to3_open_arm_no-glue_prusa-slicer.3mf



eos1to3_closed_wing_no-glue_prusa-slicer.3mf



eos1to3_open_wing_no-glue_prusa-slicer.3mf



GLUE_IR and OR_EOS01-to-03 rotor

8 files



eos_01_closed-wing_v50_glue.3mf



eos_01_open-wing-arm_v50_glue.3mf



eos_01_open-wing-arm_v50_glue_prusa-slicer.3mf



eos_01_open-wing_v50_glue_prusa-slicer.3mf



eos_01_closed-wing-arm_v50_glue.3mf



eos_01_closed-wing_v50_glue_prusa-slicer.3mf



eos_01_closed-wing-arm_v50_glueprusa-slicer.3mf



eos_01_open-wing_v50_glue.3mf



IR and OR_Optional (for housing)

1 file



eos_core_enlargement_v142.3mf

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