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Umikot (54mm Version) - Planetary Gear Spirograph Espresso WDT Tool

redfoxdude

VIEW IN BROWSER

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Summary

Easy and consistent WDT for your espresso! 54mm version.

Household > Kitchen

Tags: espresso coffee wdt wdttool espressoaccessories coffeeaccessories

WDT is an art. Its chaotic nature takes skill to master consistently.

Umikot is a Tagalog word which means: to spin; to turn around; to revolve; to rotate; to circle; to go around; to swirl; to gyrate.

In that spirit, this 3D printable tool utilizes a print-in-place planetary gear mechanism to create spirographic needle motion. **This is the 54mm version. Looking for the 58mm version? See here.**

This design is provided to you for free under a Creative Commons CC-BY-NC-SA license. Make and enjoy, but do not sell.

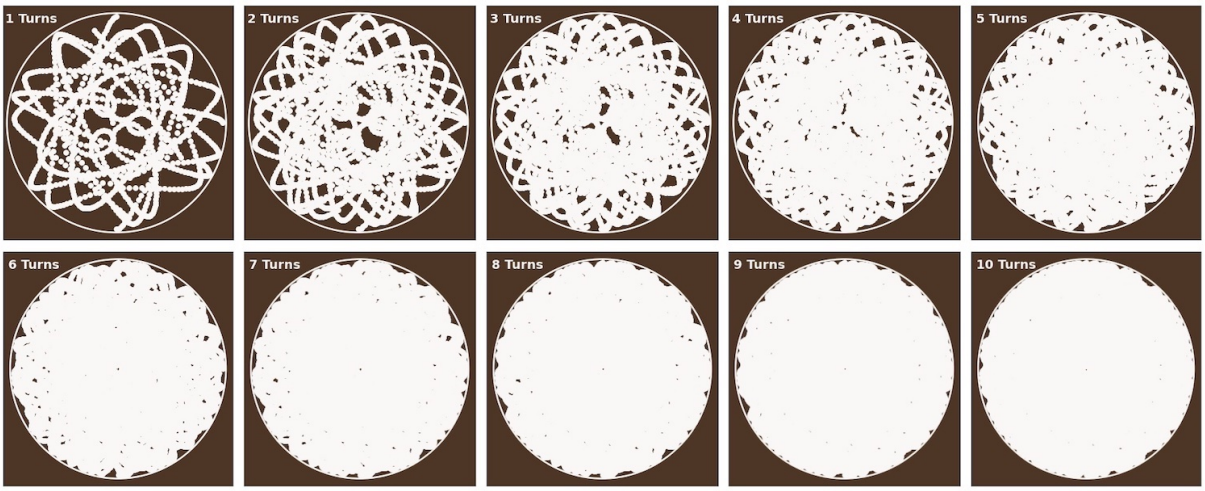
Like what I'm doing and want to share the love? Buy me a coffee – any donation is much appreciated (paypal.me/vjapolitzer) ☺

OnShape Sources

Make it your own! Custom needle depth, tweak tolerances, or remix! Easily export STLs and STEPs. Check out the open source design on OnShape. (Note: when exporting STLs, make sure you select Units→Millimeter and Resolution→Fine.)
54mm workspace

A common problem with many commercially available WDT tools is that they utilize concentric motion, which creates trenches in the coffee. The spirographic pattern avoids needles crossing the same path, with the goal of a more homogeneous particle distribution.

I have optimized the needle pattern for even coverage, and no more than 8 rotations of the handle should be necessary. Two different needle lengths provide deep and top of the bed distribution.



The needles are inserted from the top and are replaceable, and the base is swappable, allowing for configurable needle depth for different baskets, without needing to change out the needles. Optionally, you can print versions of the base that can house eight magnets and/or include a flange to interface with the portafilter lugs. A little de-bossed label to indicate a given base's depth is included for easier identification.

Instructions

Gather your parts and materials.

For the non-printed things, you will need:

- 5x M3 x 12mm flathead/countersunk screws (if you have non-flathead/countersunk screws you would like to use, check out these alternative parts)
- 10x 0.35mm acupuncture needles with a 30mm handle (I used the same as the popular 9-prong tool, 0.35x75mm from aliexpress)
- Cheap flush-cutters you don't mind dedicating to needle cutting, or even better, a hardened cable cutter
- Screw-driver/Allen-key for the M3 screws
- A 3D printer

Print your parts!

I printed mine with PLA. You may want to print the Base part with PETG.

Personally, the contact time with the hot basket/portafilter has been short enough that I have not had issues with PLA - however, PETG, with its higher glass transition temperature, would certainly have reduced risk of softening.

Settings:

- 0.2mm layers
- 4 top/bottom layers
- 2 walls are sufficient
- 11% gyroid minimum (consider higher for more heft!)
- No supports
- Random z-seam for Upper Mech can help with snagging and improve smoothness [Thanks to zumicroom in EAF]

The gears and needle holes require a good calibration (0.2mm XY print-in-place tolerance) and good quality filament!

Printed Parts:

- 1x Upper Mech
- 1x Spin Ring
- 1x Handle (see Handle Options below)
- 1x Base (see Base Options below)
- 1x Stand (see Stand Options below)

Handle Options

The Handle is available in Small and Large. Which to use comes down to preference.

The pictured Umikot is fitted with a Small, which is good for small hands or those that want a delicate-operation feel (that is my personal preference, but go with what feels good for you!)

Base Options

The Base part is available in different versions for:

- Various needle depths
- With or without a flange that interfaces with the portafilter lugs (Lug/NoLug)

Pick the needle depth that fits your basket. The filenames include the depth (i.e. Umikot54 - Base **25mm** Lug.stl). This is how deep the needles extend below the lip of the basket. See below for some common needle depths.

Common 54mm basket needle depths are:

- Stock Breville/Sage 2-cup single wall basket
    - 24mm

- IMS 18-22g basket
    - 26mm

Note: For the very best fit, measure the internal depth of your basket. The above are based on specifications and have not all been tested. Please let me know if these recommendations need adjustments!

Stand Options

Print the corresponding stand, either Lug or NoLug, depending on the base you choose.

Cut the needles to size.

The designed needle depth for the various base files assumes the needle length to be cut precisely. If anything, favor slightly short. You only need to cut to the lengths described below. The base you choose is what adjusts the effective needle depth.

The needles are likely harder than the cutting edges of most cheap flush cutters, so be prepared to dedicate them to the cause. I used a very inexpensive one from a multi-pack I got off of Amazon. Even better, use a proper, hardened cable cutter.

Be very careful to safely dispose of the cut ends of these needles!

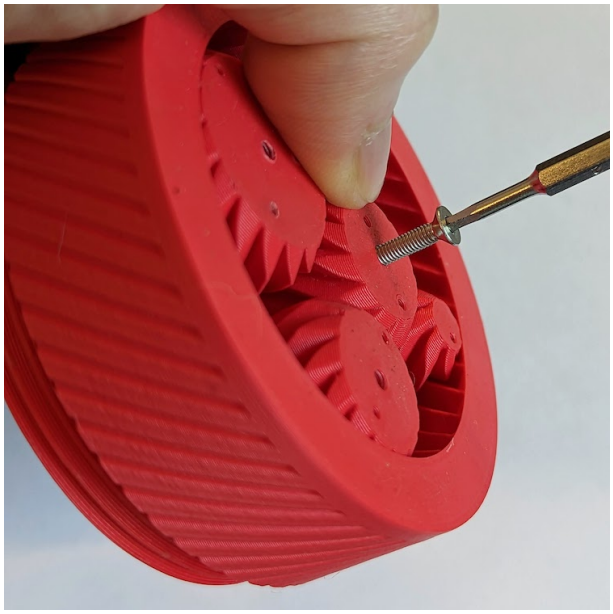
First, cut 5 of your 10 needles to a total length of 65mm (35mm needle + 30mm handle):

Cut the remaining 5 needles to a total length of 55mm (25mm needle + 30mm handle):

To secure the needles in their places in the gears, give them a little bend, like in the above photo. This way they won't rattle around, but can still be removed if they ever need to be replaced.

[Optional] “Tap” the gears' screw-holes

This step is optional, particularly if your screw holes are quite tight. To make our lives a bit easier later, “tap” the holes with one of your M3 screws. Carefully screw them into each of the gears' holes, stopping when you feel the resistance noticeably increase (you've hit the bottom) and then remove the screw. Repeat for each of the 4 larger gears. You will need to hold the gears carefully to keep them from rotating while you do this. Be careful you do not get pinched!



Attach your base

Screw on your chosen base. You can change bases at any time, but be very careful when doing so when the needles are installed!

Insert the needles!

Be careful during this step - the trimmed needles are still thin and sharp! Place the assembly onto its stand at this point to keep the tips in a safe place. Gently insert each needle until it sits flush with the top of the gear. Do not force them! Give them a little jiggle if they are not quite lining up with the hole in the bottom.

See below for the needle pattern with respect to the different needle lengths:

Attach the spin ring and handle

Gently screw in 4 of the M3 screws to attach the spin ring. Fully tighten until they stop (the mechanism should be locked). Then back out 1 turn, which will align the gears vertically to the outer ring gear.

Then, do the same for the handle, but only back out ~1⁄4 turn:

Distribute some coffee!

And that is it! If you chose the NoMagnet NoLug base or the Magnet NoLug base but your basket isn't very magnetic, you will need to hold Umikot down while turning the mechanism. Gently give it several rotations. At least 8 gives the pattern nearly full coverage, but I like to do as many as 12 - whatever gives you the best results!

The distribution must be done with the basket in a level position - otherwise, the grounds will tend towards whichever direction the basket is tilted.

Finally, remove Umikot, give the portafilter a tap to settle the grounds, tamp, pull, and enjoy your espresso!

Disclaimer: not all filaments, nor the 3D-printing process, are certified food safe. Use of this tool is at your own discretion.
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This remix is based on

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by redfoxdude

Model files

Umikot 54mm - Upper and Stand 6 files

umikot-handle-large.stl

umikot54-upper-mech-v17.stl

umikot54-stand-lug.stl

umikot54-stand-nolug.stl

umikot54-spin-ring-v171.stl

umikot-handle-small.stl

Umikot 54mm - Base 24mm 2 files

umikot54-base-24mm-nolug.stl

umikot54-base-24mm-lug.stl

Umikot 54mm - Base 26mm 2 files

umikot54-base-26mm-lug.stl

umikot54-base-26mm-nolug.stl

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