



Mechanical "Electromagnet" Pickup Tool



Phil Caruso

[VIEW IN BROWSER](#)

updated 5. 4. 2024 | published 5. 4. 2024

Summary

Compact mechanical pickup tool that "switches" on and off like a strong electromagnet - without any electricity!



1.66 hrs



10 pcs



0.20 mm



0.40 mm



PLA



21 g



Prusa MK4

[Hobby & Makers](#) > [Tools](#)

Tags: [prusa](#) [tool](#) [screws](#) [workshop](#) [magnetic](#) [pickup](#)
[parts](#) [electromagnet](#) [contest](#) [ergonomic](#) [mk4](#) [nails](#)

Update April 5, 2024: I just published **two holders** for this tool. Either holder can be used on the Honeycomb Storage Wall by [@RostaP](#) or on any flat surface. Check out **HSW Mechanical Electromagnet Holders** at <https://www.printables.com/model/833166-hsw-mechanical-electromagnet-holders>

This **Mechanical Electromagnet** simplifies the task of picking up collections of screws, nails, washers, or any other magnetic (steel, iron, nickel, cobalt, etc.) parts. No more struggling to pick up loose parts or grab

parts from a container, and no more cuts on your fingers from handling sharp metal objects!

Slide the lever forward, and the **pickup** magnets are engaged - ready to collect. Using the recommended magnets, this compact tool **lifts up to 327 grams** of parts (about 3/4 pound).

When you're ready to **release** the magnetic grip, simply **slide the lever backwards**! Couldn't be simpler!

Additional Latch magnets on the Barrel lock the internal Rod into the engaged or disengaged positions with a satisfying magnetic grip. And these Latch magnets also allow **convenient storage** of the tool **on any magnetic surface**. Or you can use the Pickup magnets to store it on any magnetic surface.

The provided STL files can be printed in PLA or PETG and do not require supports (except for the optional Shield).

PrusaSlicer 3MF files are provided for Prusament PLA.

G-code files have been provided for the Original Prusa MK4 using Input Shaper at 0.2mm STRUCTURAL layer height.

PARTS NEEDED

To make a Mechanical Electromagnet you need some **neodymium magnets** (described below) and the following **printed parts**:

1 - one **Barrel** - the outer shell (printed vertically with the flat side down - no brim needed on my Prusa MK4 with a Smooth PEI sheet, but your printer might require a brim).

Barrel



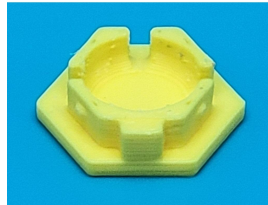
2 - one **Rod** - the internal sliding part with Pickup magnets on one end (where the work is done!) with Lever + Latch magnets on the other end.

Rod



3 - one **Cap** - this snaps on the open end of the Barrel after the Rod is inserted.

Cap



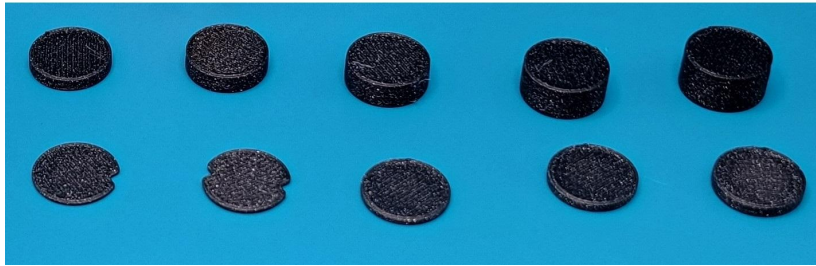
Shield is optional - slides over the Barrel to keep small parts from moving up the Barrel as the Pickup magnets are being released. The **Shield** **requires supports** (organic tree preferred).

Shield



Spacers and **Reducers** are only needed if you use fewer and/or smaller neodymium magnets than specified below:

Spacers



Reducers



1 - for the 12.2mm diameter by 12mm deep pocket on the **Pickup** side of the Rod, you will need **four 12mm by 3mm neodymium magnets** (or six 12mm by 2mm neodymium magnets).

Pickup magnets (12 x 3)



2 - for the 12.2mm diameter by 6mm deep pocket on the **Lever** side of the Rod, you will need **two 12mm by 3mm neodymium magnets** (or three 12mm by 2mm neodymium magnets).

**Lever magnets
(12 x 3)**



3 - for the two 8.2mm diameter by 1.2mm deep **Latch** pockets on the outside of the Barrel, you will need **two 8mm by 2mm neodymium magnets** (one per pocket); these magnets hold the mechanical electromagnet in the engaged or disengaged positions until you slide the Lever, and they allow you to store the tool on any magnetic surface when not in use. Be sure to follow the assembly instructions below to insert these magnets in the correct direction!

Latch magnets
(8 x 2)



At the expense of pickup and/or latch strength, you can use fewer magnets than specified above by using Spacers behind the magnets in the Pickup/Lever pockets to fill the pockets and/or you can use smaller magnets (6mm, 8mm, and/or 10mm) by using Reducers around the magnets in the Pickup/Lever pockets. The "**extras**" folder has various **Spacers** and **Reducers** for this purpose.

The "**mechanicalElectromagnet-2c***" files include all the printed parts that you may need - including the Barrel, Rod, Cover, optional Spacers, and optional Reducers.

If you prefer to mix up the colors or filament types, I've included separate versions of files for the **Barrel**

"**mechanicalElectromagnetBarrel-2c***" and the **Rod + Cap**

"**mechanicalElectromagnetRodCap-2c***". I printed my Barrel in Black and my Rod and Cap in Yellow, so I only needed these two files to make a complete Mechanical Electromagnet.

The "**mechanicalElectromagnetShield-2c***" files are for the optional **Shield**. I printed my Shield in Yellow.

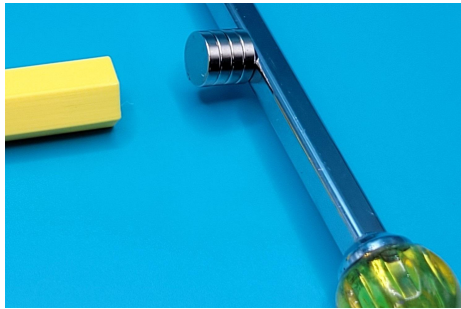
ASSEMBLY

Before you start assembling your Mechanical Electromagnet, **it's very important that you use SuperGlue** (or a similar adhesive) to secure all magnets, Spacers (if used), and Reducers (if used) to each other and to the places where they attach to the tool per the following instructions! Also be sure that the adhesive is completely hardened before continuing onto subsequent steps.

Once you've printed the necessary parts and gathered the required neodymium magnets (ideally: six 12mm by 3mm magnets and two 8mm

by 2mm magnets) and have your adhesive ready, complete the following steps:

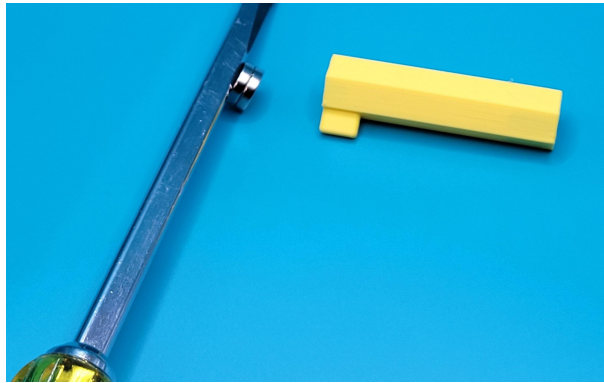
1 - **Test fit the Pickup magnets** by temporarily inserting magnets into the pocket on the Pickup side of the Rod. The magnets should reach close to the end of the Rod. Use Spacers (or more magnets) as needed to use up the entire 12mm depth. Remove the magnets and Spacers (if used) from the pocket; the shaft of a screwdriver can be used to help remove the magnets.



2 - **Glue** each Spacer (if needed) into the **Pickup** pocket; when the adhesive is dry, add more glue, and insert another Spacer or magnet into the pocket; when the adhesive is dry, repeat until the entire pocket is filled - preferably with all magnets. Everything in the pocket must be glued to keep the magnets in place after assembly!



3 - **Test fit the Lever magnets** by temporarily inserting magnets into the pocket on the Lever side of the Rod. The magnets should reach close to the end of the Rod. Use Spacers (or more magnets) as needed to use up the entire 6mm depth. Remove the magnets and Spacers (if used) from the pocket; the shaft of a screwdriver can be used to help remove the magnets.



4 - **Glue** each Spacer (if needed) into the **Lever** pocket; when the adhesive is dry, add more glue, and insert another Spacer or magnet into the pocket; when the adhesive is dry, repeat until the entire pocket is filled - preferably with all magnets. Everything in the pocket must be glued to keep the magnets in place after assembly!



5 - **Insert the Rod into the Barrel** with the Pickup end in first (Lever end goes in last). Slide the Rod back and forth a few times; if it doesn't slide easily (as it should), then repeat the sliding motion several more times; if the fit is still pretty tight, you can apply silicone grease on the sides of the Rod to reduce the friction.



6 - **Snap the Cap** on the open end of the Barrel. You can apply glue to the Cap if you'd like, but you shouldn't have to.



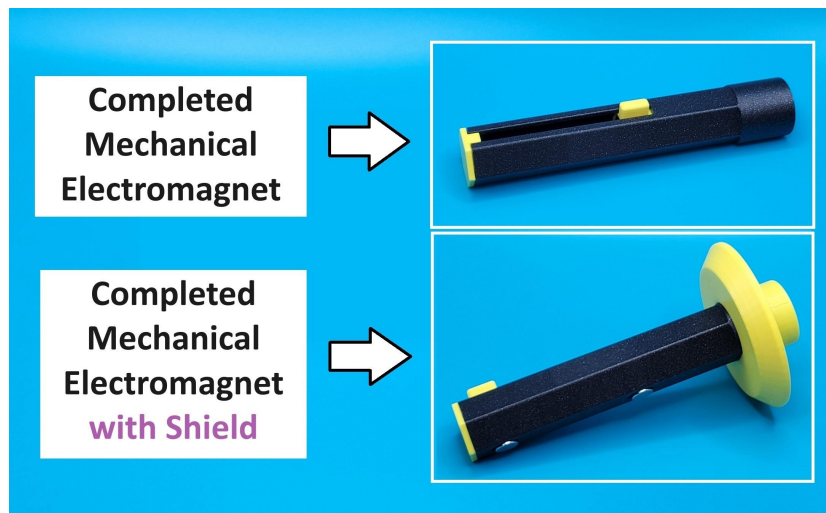
7 - Slide the Lever all the way forward (toward the Pickup end, away from the Cap end) and temporarily tape the Lever in position to keep it in place. Then, without using adhesive (yet), insert one of the 8mm by 2mm magnets into the Latch magnet pocket (towards the middle of the Barrel). The magnetic pole must align with the Lever magnets inside the Barrel, so allow the magnet to flip into the position where it's pulled into the Latch magnet pocket. Use a Sharpie or other marker to identify the side of the magnet that needs to face outward. Finally, remove the magnet, apply glue into the pocket, and insert the magnet in the pocket. Wait for the adhesive to dry before continuing.



8 - Slide the Lever all the way backward (toward the Cap end, away from the Pickup end) and temporarily tape the Lever in position to keep it in place. Then, without using adhesive (yet), insert the other 8mm by 2mm magnet into the Latch magnet pocket (towards the Cap end of the Barrel). The magnetic pole must align with the Lever magnets inside the Barrel, so allow the magnet to flip into the position where it's pulled into the Latch magnet pocket. Use a Sharpie or other marker to identify the side of the magnet that needs to face outward. Finally, remove the magnet, apply glue into the pocket, and insert the magnet in the pocket. Wait for the adhesive to dry before continuing.



9 - If you're using a Shield, slide it onto the Pickup end of the tool. You can apply glue to the Shield if you'd like, but you shouldn't have to. Great job! Time to start picking stuff up!



USAGE

Slide the Lever forward to pick up magnetic parts; **slide the Lever backward to release** the magnetic hold. The Latch magnets hold the tool in either the engaged position or in the disengaged position.

The optional **Shield can be slipped over the Pickup end to keep small parts from moving up the Barrel** as the Pickup magnets are being released.

When not in use, you can **store your Mechanical Electromagnet tool on any magnetic surface** using the Pickup magnets on the end of the tool.

If you aren't using the optional Shield, then you could alternatively store the tool by placing the side of the Barrel with the Latch magnets against any magnetic surface.

The Mechanical Electromagnet seen in the photos was printed on an Original Prusa MK4 with FilaCube Yellow PLA and Prusament Galaxy Black PLA using Input Shaper with a 0.4mm nozzle at 0.2mm STRUCTURAL layer height with a 15% gyroid infill.

Be sure to check out **my other designs** - including honeycomb storage wall (HSW) accessories, universal key covers, and a diverse collection of household accessories and 3D printing tools - on Printables at https://www.printables.com/@PhilCaruso_661446/models

Model files



extras

12 files



mechanicalelectromagnetwithshield-2c.stl

☐ complete mechanical electromagnet with shield



mechanicalelectromagnetwithshield-2c.3mf

☐ complete mechanical electromagnet with shield



mechanicalelectromagnetspacers-2c.stl

☐ various spacers



mechanicalelectromagnetspacers-2c.3mf

☐ various spacers



mechanicalelectromagnetreducers-2c.stl

☐ various reducers



mechanicalelectromagnetreducers-2c.3mf

☐ various reducers



mechanicalelectromagnet10mmreducers-2c.stl

☐ reducers for 10mm magnets



mechanicalelectromagnet10mmreducers-2c.3mf

☐ reducers for 10mm magnets



mechanicalelectromagnet8mmreducers-2c.stl

☐ reducers for 8mm magnets



mechanicalelectromagnet8mmreducers-2c.3mf

☐ reducers for 8mm magnets



mechanicalelectromagnet6mmreducers-2c.stl

☐ reducers for 6mm magnets



mechanicalelectromagnet6mmreducers-2c.3mf

☐ reducers for 6mm magnets



mechanicalelectromagnet-2c.stl

☐ basic parts required for single color tool - also includes spacers and reducers



mechanicalelectromagnet-2c.3mf

☐ basic parts required for single color tool - also includes spacers and reducers



mechanicalelectromagnetbarrel-2c.stl

☐ barrel only



mechanicalelectromagnetbarrel-2c.3mf

☐ barrel only



mechanicalelectromagnetrodcap-2c.stl

☐ rod and cap (use a different color than the barrel if you like!)



mechanicalelectromagnetrodcap-2c.3mf

📄 rod and cap (use a different color than the barrel if you like!)



mechanicalelectromagnetshield-2c.stl

📄 optional shield



mechanicalelectromagnetshield-2c.3mf

📄 optional shield

Print files



extras

6 files



mechanicalelectromagnetwithshield-2c_04n_02mm_pla_m... .gcode

🌀 PLA 📏 0.40 mm 📏 0.20 mm ⌚ 2.18 hrs ⚖️ 31 g 🖨️ Prusa MK4

📄 complete mechanical electromagnet with shield



mechanicalelectromagnetspacers-2c_04n_02mm_pla_mk4i... .gcode

🌀 PLA 📏 0.40 mm 📏 0.20 mm ⌚ 0.17 hrs ⚖️ 2 g 🖨️ Prusa MK4

📄 various spacers



mechanicalelectromagnetreducers-2c_04n_02mm_pla_mk4... .gcode

🌀 PLA 📏 0.40 mm 📏 0.20 mm ⌚ 0.07 hrs ⚖️ 1 g 🖨️ Prusa MK4

📄 various reducers



mechanicalelectromagnet10mmreducers-2c_04n_02mm_pla... .gcode

🌀 PLA 📏 0.40 mm 📏 0.20 mm ⌚ 0.03 hrs ⚖️ 1 g 🖨️ Prusa MK4

📄 reducers for 10mm magnets



mechanicalelectromagnet8mmreducers-2c_04n_02mm_pla_... .gcode

🌀 PLA 📏 0.40 mm 📏 0.20 mm ⌚ 0.04 hrs ⚖️ 1 g 🖨️ Prusa MK4

📄 reducers for 8mm magnets



mechanicalelectromagnet6mmreducers-2c_04n_02mm_pla_... .gcode

🌀 PLA 📏 0.40 mm 📏 0.20 mm ⌚ 0.04 hrs ⚖️ 1 g 🖨️ Prusa MK4

📄 reducers for 6mm magnets



mechanicalelectromagnet-2c_04n_02mm_pla_mk4is_1h49m.gcode

🌀 PLA 📏 0.40 mm 📏 0.20 mm ⌚ 1.81 hrs ⚖️ 24 g 🖨️ Prusa MK4

📄 basic parts required for single color tool - also includes spacers and reducers



mechanicalelectromagnetbarrel-2c_04n_02mm_pla_mk4is... .gcode

🌀 PLA 📏 0.40 mm 📏 0.20 mm ⌚ 1.29 hrs ⚖️ 15 g 🖨️ Prusa MK4

📄 barrel only



mechanicalelectromagnetrodcap-2c_04n_02mm_pla_mk4is... .gcode

🌀 PLA 📏 0.40 mm 📏 0.20 mm ⌚ 0.37 hrs ⚖️ 6 g 🖨️ Prusa MK4

📄 rod and cap (use a different color than the barrel if you like!)



mechanicalelectromagnetshield-2c_04n_02mm_pla_mk4is... .gcode

🌀 PLA 📏 0.40 mm 📏 0.20 mm ⌚ 0.58 hrs ⚖️ 10 g 🖨️ Prusa MK4

📄 optional shield

License ©

This work is licensed under a
Creative Commons (4.0 International License)



Attribution-NonCommercial

- ✗ | Sharing without ATTRIBUTION
- ✓ | Remix Culture allowed
- ✗ | Commercial Use

- ✖ | Free Cultural Works
- ✖ | Meets Open Definition