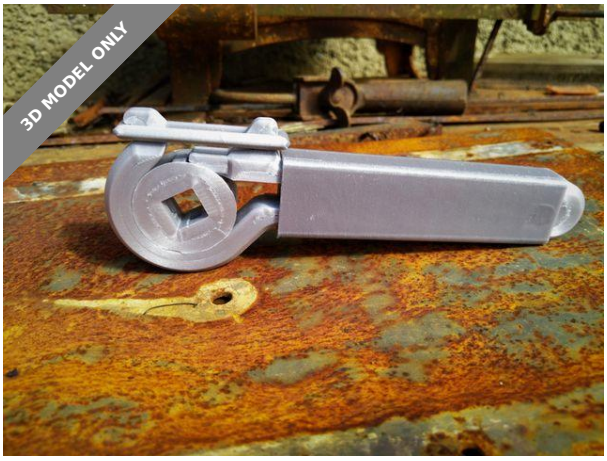


3D Printed Ratcheting Wrench with 30Nm max. torque

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VIEW IN BROWSER

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Summary

A 3D Printed ratcheting wrench that can achieve 30Nm when printed in plain (Prusament) PLA!

Hobby & Makers > Tools

Tags: halfinch nasa ratchet ratcheting ratchetingwrench ratchetwrench wrench

3D Printed Ratcheting Wrench with 30Nm max. torque

A couple of years ago NASA released a 3D Printable wrench that they sent to the ISS and printed there. I have seen this model quite a few times floating around the internets and got curious about it. After Downloading and testing it I was sorely disappointed, to say the least. The ratcheting teeth are tiny, you have to print a left and a right-handed one to loosen and tighten and the main load is ripping the layers apart in their weak orientation. After having a closer look at the ratchet I noticed that the designer seems to have known this and labeled the wrench with its max torque. 3In-lb or 0.3Nm in sensible units. For reference that is just barely enough to tighten an M2.2 8.8 Screw to its max torque or if that is easier to imagine, resting a bar of chocolate (100g) at about 30 cm from the

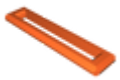
center of rotation of a lever. So in short it's not much use at all. Nevertheless, I got curious about the possibility of printing such a tool and set myself a design challenge:

Creating a 3D Printed Wrench that could tighten an M8 8.8 bolt to its full torque spec of 24Nm (or about 72 chocolate bars resting on that same 30cm lever from before).

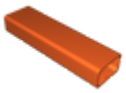
So I started researching ad thinking to find a way of doing this. While browsing the internet for inspiration I came across a design for a ratcheting wrench from 1909 that showed great promise. Its design was simple yet effective and well-suited for Filament 3D printing. After many hours of designing and breaking about 20 or so prototypes, I finally reached the current state of the prototype! It can reliably and repeatedly handle 30Nm of torque when printed in PLA! It has a minimum safety factor of 1.3 and if you print the nut in Prusament PC it even reaches a safety factor of 1.5- Btw here is where one can really tell the difference in Prusament and other filaments. Prusament PLA was the only one that produced any working results at all. Other Filaments just broke, splintered, yielded, and failed in many many different and interesting ways so I highly recommend using Prusament for this build.

Assembly is pretty easy. Once all the parts are printed just pop in the ratcheting wheel in the handle making sure that the teeth are facing the right way so it ratchets when you turn it. Then you slide on the handle cover until it clicks in place and secures it all with the retainer by first hooking it in on the top hook of the ratchet and then pushing it in on the bottom one. The retainer and the Handle are important! when under full load there will be a force of about 2000N or roughly 200 Kg trying to bend the main ratcheting "leg" of the mechanism pushing on the teeth. Under these sorts of loads, the plastic will try to deform. If it is not held in place by the Handle cover the ratchet would break. Don't worry about this deformation and some minor deformation of the teeth. Under such loads this is normal and I have tested my ratchet to full torque well over 100 times without failure.
Hope you have as much fun showing this project off to baffled friends and coworkers as I had. For best effect bring a big torque wrench and have them slowly work their way up to 30Nm. Trust me it's quite impressive.

Model files



retainer_v3.3mf



handle_cover.3mf



gear_half_inch_hardend.3mf



handle.3mf

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