Introducing pegBits

Motivated by connecting between bits and atoms pegBits is an exploration of ways we can craft the relationship between the physical world, made up of atoms and molecules, and the digital world, made up of bits and bytes. All too often we experience these worlds as we lift them off the consumer shelf and put them into our homes, our offices and onto our bodies as complex digital products.

pegBits is a standardised and scalable open source pegboard based system for prototyping open hardware technologies from component to artefact that is built up from the existing standardisation in vero board and whiteboard

Since the mid 19th century humans have been shaped by the two industrial revolutions; of steam (the one that heralded in the Victorian age), and the cloud (the current one born out of the digital age). We are increasingly defined and targeted as consumers rather than producers/makers, where the industrialised model is biased towards the very few people who have the power to control the markets that determine what is on offer to us.

Designed in California, made in China and consumed globally. A connected device in San Francisco will be the same as a device in Berlin, Bangalore or Berwick-upon-Tweed. The profits, power and control of which flow back into the single place of origin — Silicon Valley.

To grasp the scale of this, imagine if the only bread we could eat was a white-sliced plastic wrapped loaf that was only made by a handful of corporations all in a single place in the world. There would be no sourdough, ragi dosa, berliner brot or stottie. There would be no local bakeries and no way for people to build livelihoods around localised making.

This has had dire and far-reaching consequences that are affecting the health of society and the planet. For example, we can see that the Meta and X dominated social media platforms using ultra processed digital are eroding democratic processes through AI fuelled misinformation. Just as ultra processed food undermines biological health, ultra processed digital is eroding democratic process. The AI in turn requires massive centralised cloud-based data and processing centres that consume enormous amounts of fossil fuels. The data and processing centres are walled digital fortresses that lock people into entire digital ecosystems (which can be more accurately considered as mono-cultures) that continue the cycle of profit, power and control.

Open hardware technologies, such as Raspberry Pi, Arduino and BBC Microbit, offer an alternative digital offering. These systems are interoperable, community supported, financially accessible and operate outside of the big tech ecosystem. pegBits is a standardised physical pegboard system for use with these technologies.

hiCraft

pegBits

Open source pegboard for prototyping
— from component to artefact

https://github.com/pegBits

PUBLIC DOMAIN

Open hardware technologies collectively offer an opportunity for large scale, global, but at the same time localised and community-based computing and production. However, open hardware technologies are not easy to use and are often highly technical. They require multiple skills in coding and electronics, but also physical making and product design in order to deliver on quite simple computing processes that are able to be placed in peoples' hands. It is akin to the world of home cooking and local bakeries requiring a five year training in french pâtisserie in order to master the basics of a simple loaf to feed the family.

Our motivation for pegBits is to make the transition from the physical world to the digital world as simple as possible. We are not the first to do this, by far. There is a long history of hobbyist electronic kits, platforms and learning environments — from *Lego-Technic*, *Science Fair 200 in 1 Heathkits* that span the development of electronics and mechatronics throughout the latter half of the twentieth century; to the explosion of kit based delivery of open hardware in the last decade — *Adafruit*, *Seeed Studio*, *littleBits*, *Maki Maki*.

However, one surprising feature that all of these kits share is that while they all follow electronics standards, they either create their own physical proprietary systems — for example *Lego* or *Meccano* (which do not play nicely together) — or they provide bespoke specific construction parts (e.g. the sides of a radio that you screw together). There is no system that takes a single interoperable standard that fosters open play and making.

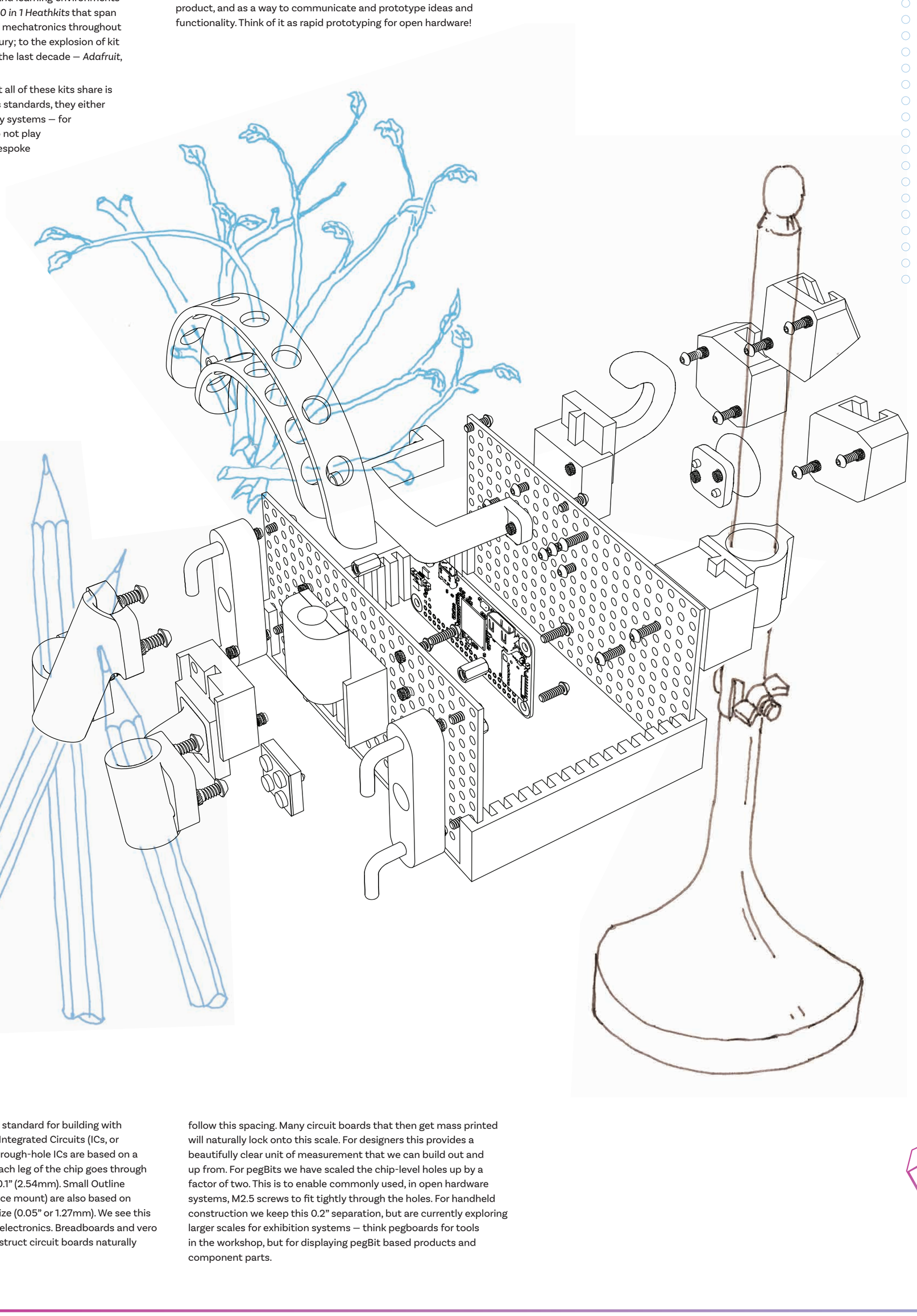
pegBits and their inspiration

pegBits is a standardised and scalable open source pegboard based system for prototyping open hardware technologies from component to artefact that is built up from the existing standardisation in vero board and whiteboard.

In response to the affordances of construction systems like *Lego*, *Meccano* and *K'Nex* to address the complexities of joining open hardware systems of *Arduino*, *Raspberry Pi* and basic electronics to the world of physical product design, we are proposing ***pegBits***.

Our intention is for pegBits to enable makers to go beyond the limitations of a 'project box' without having to create bespoke design solutions tailored to a single concept. We see it function as a physical 3D sketching tool that can work both as a way to create a final physical product, and as a way to communicate and prototype ideas and functionality. Think of it as rapid prototyping for open hardware!

We are centring the system on the most commonly available existing standards in electronic and mechanical system design. Namely on circuit boards, screws, spacers and inserts — all things that are low-priced, scalable and non-proprietary components that fit within the open source community. In other words, things you would buy from a local hardware, electronics shop or online equivalent. Taking this standardised configurability further into a product design space, pegBits is also a system that allows for a broad range of practical and/or playful external extensions to be created, e.g. fittings that allow you to integrate your designs into existing modular systems such as IKEA pegboards, or hooks to hang devices from the nearest tree … this peg*Bit* is entirely up to you.



PegBits at work! — holding a Pi5 and screen with bespoke standoff converters and tripod attachment

The detailed Bit

pegBits works on the international standard for building with electronics based on though-hole Integrated Circuits (ICs, or computer chips to you and me). Through-hole ICs are based on a standard hole separation (where each leg of the chip goes through to be soldered onto the board) of 0.1" (2.54mm). Small Outline Integrated Circuits (a form of surface mount) are also based on this separation — except half the size (0.05" or 1.27mm). We see this magic number appear throughout electronics. Breadboards and vero boards used to prototype and construct circuit boards naturally follow this spacing. Many circuit boards that then get mass printed will naturally lock onto this scale. For designers this provides a beautifully clear unit of measurement that we can build out and up from. For pegBits we have scaled the chip-level holes up by a factor of two. This is to enable commonly used, in open hardware systems, M2.5 screws to fit tightly through the holes. For handheld construction we keep this 0.2" separation, but are currently exploring larger scales for exhibition systems — think pegboards for tools in the workshop, but for displaying pegBit based products and component parts.

hiCraft is a research project, based at Northumbria and Newcastle Universities in the North East of the England, exploring healthier ways to live with IoT using craft as a methodological and practical lens. hiCraft speaks to concerns about trust, bias and the lack of transparency around the way we currently digitally connect. Our investigation seeks to define and foster a healthy relationship between people, the internet and things using craft-oriented thinking and making.

For more visit www.hicraftnorthumbria.org

Attachment edition

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Open source pegboard for prototyping

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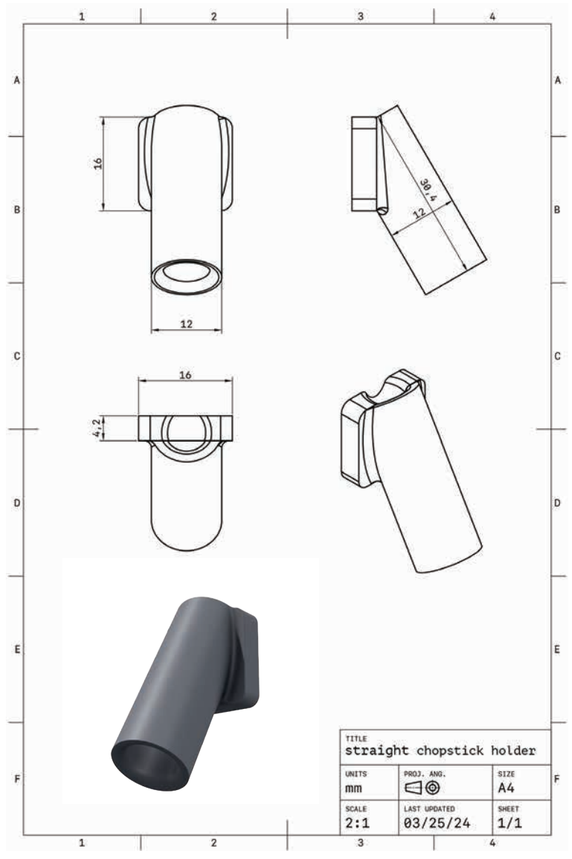

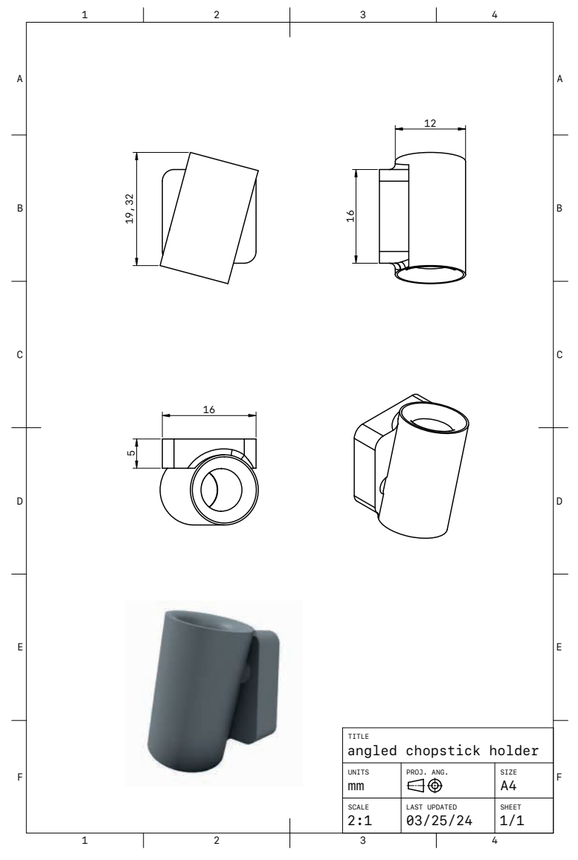

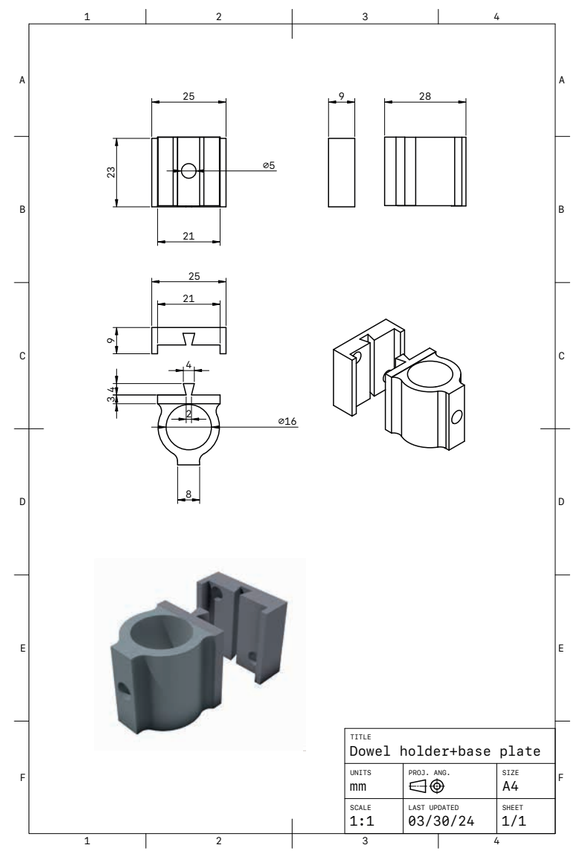

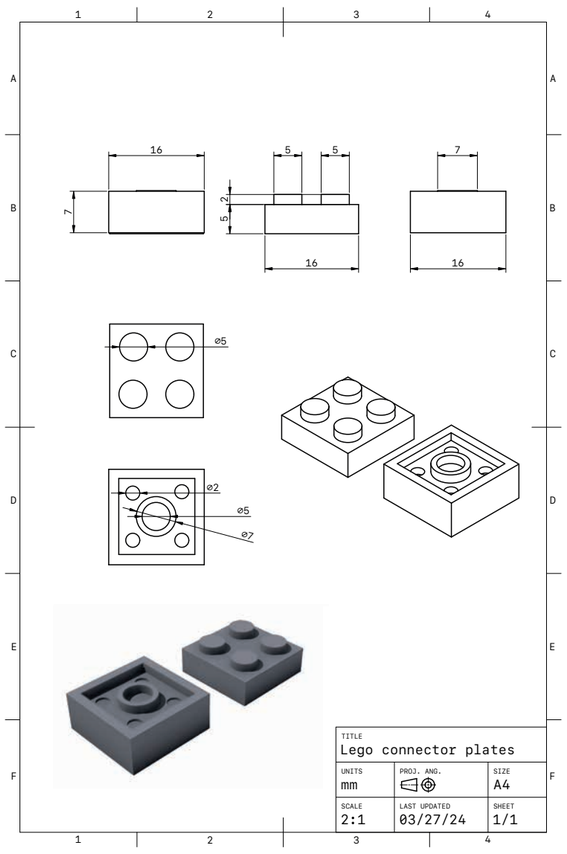

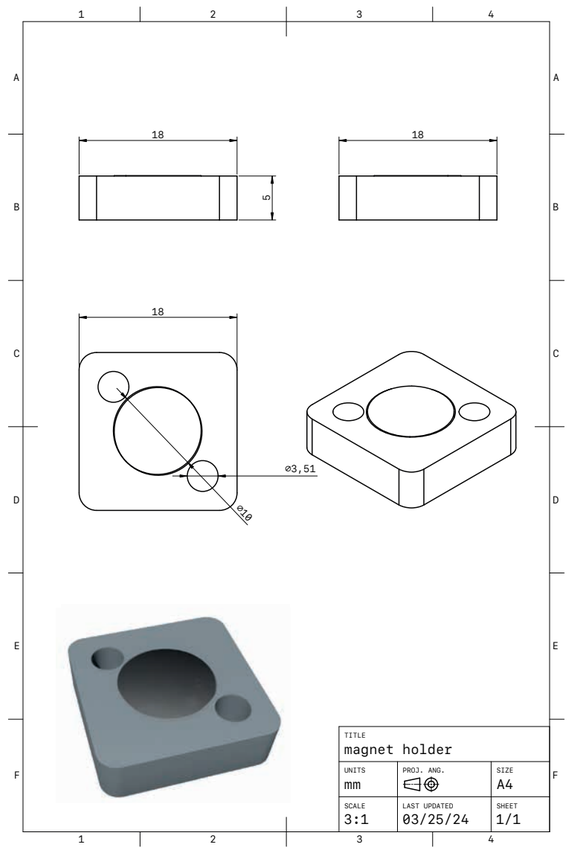

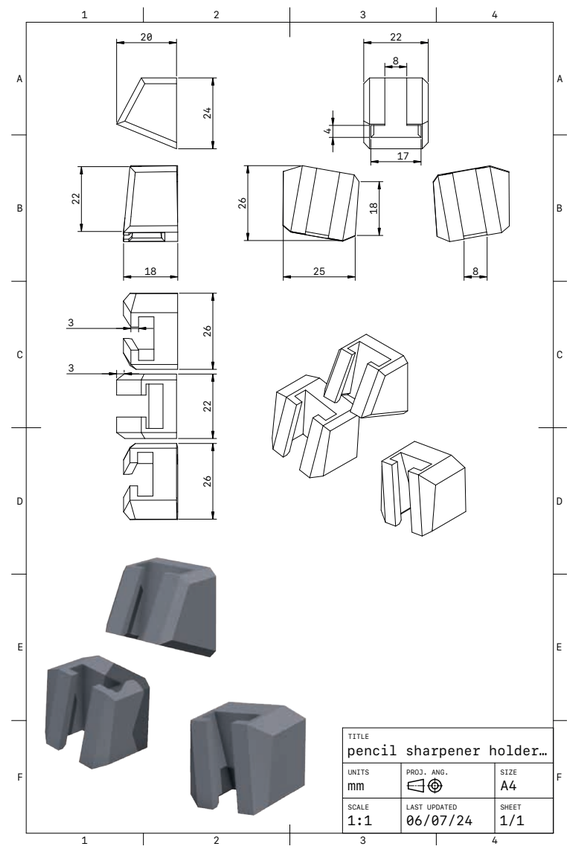

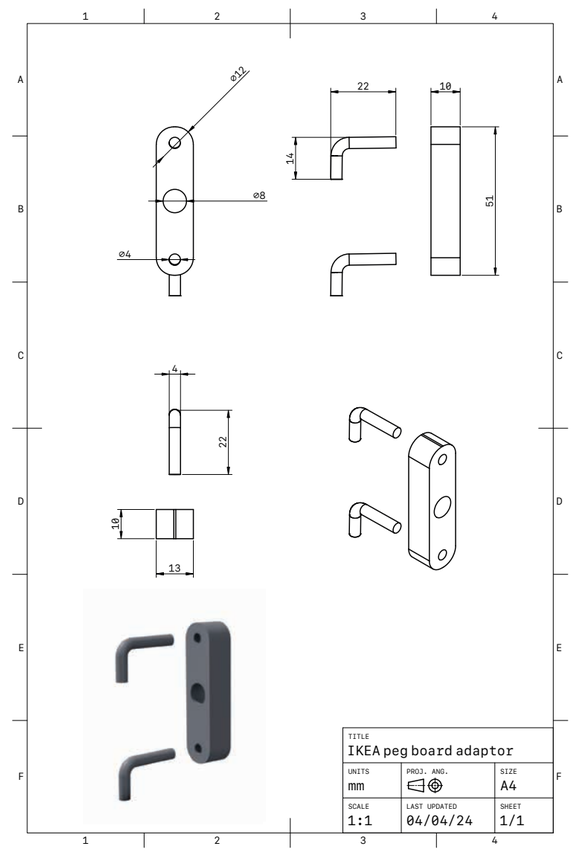

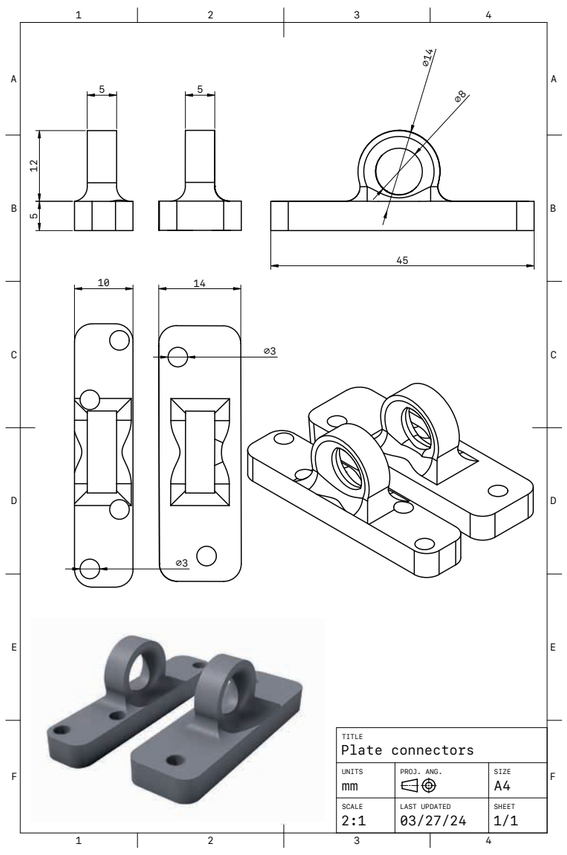

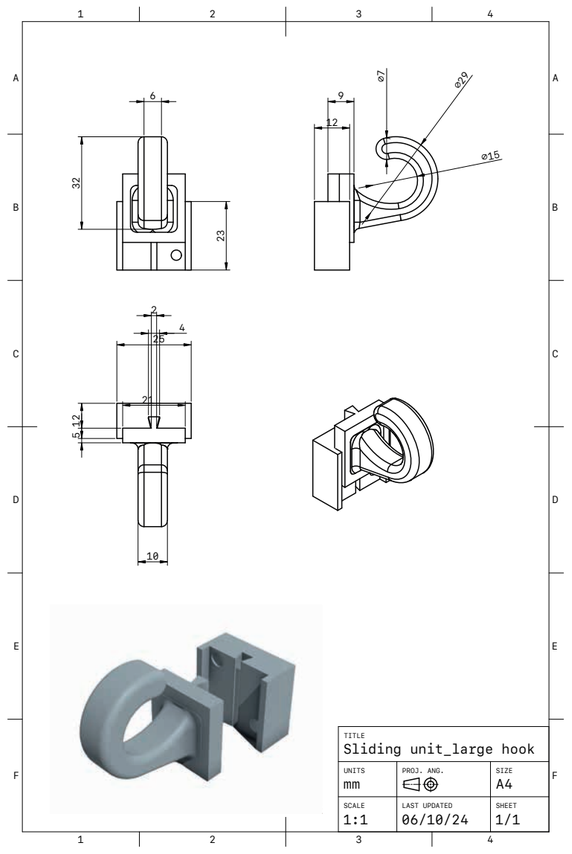

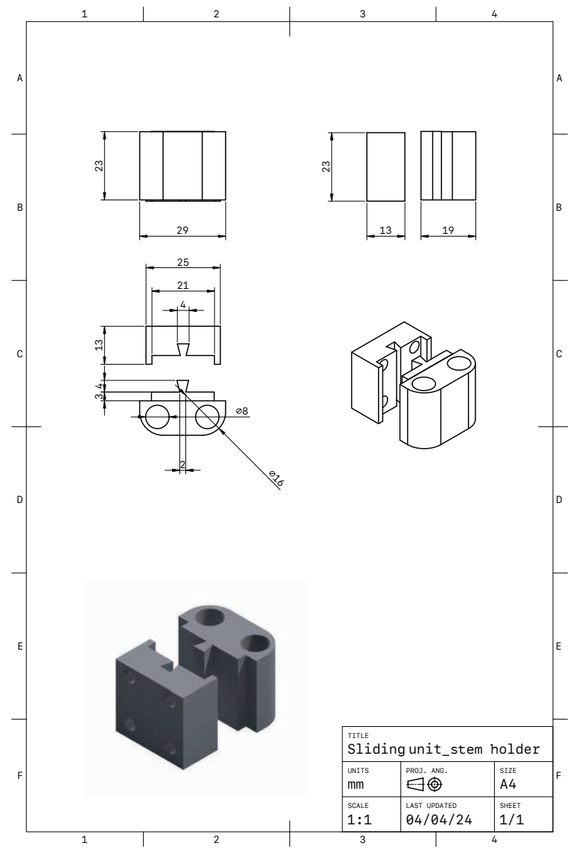

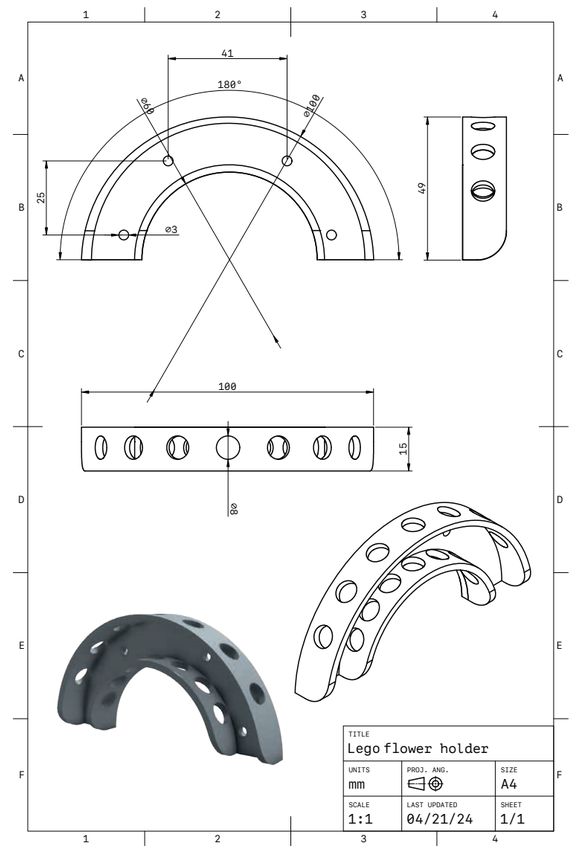

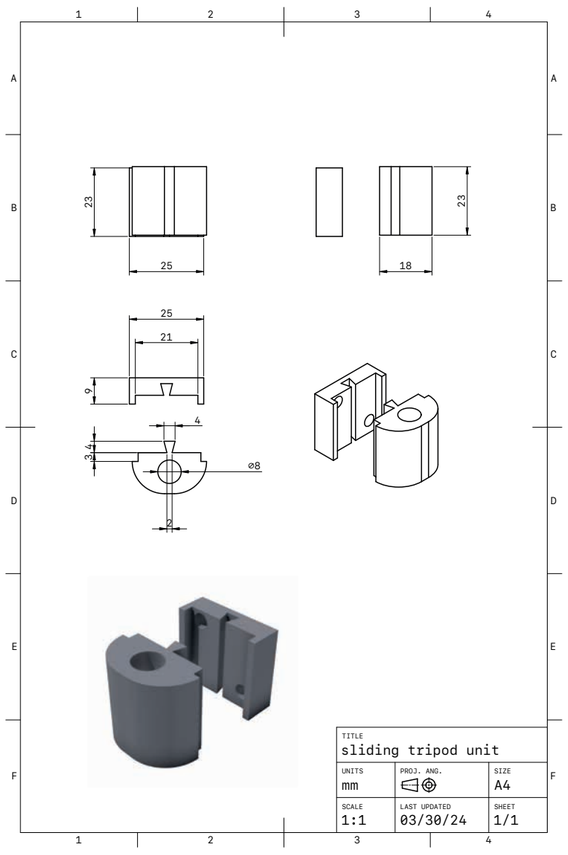

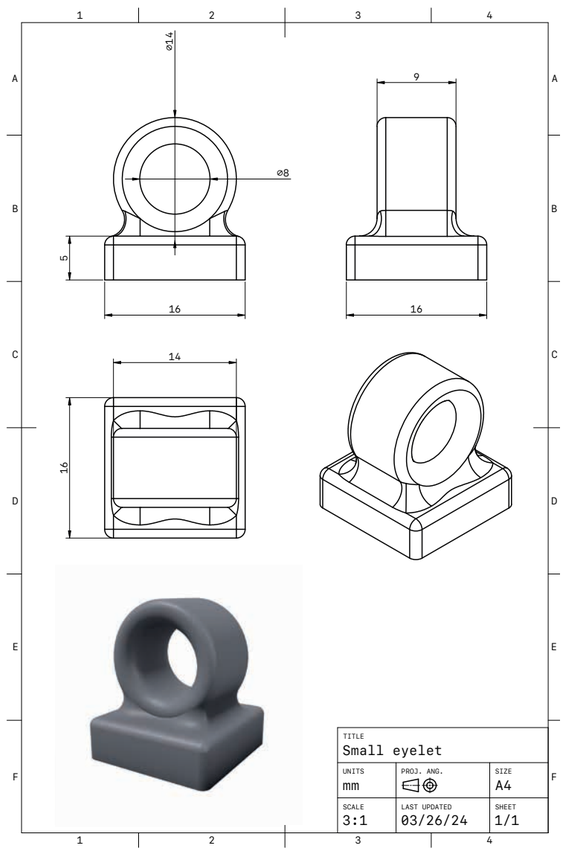

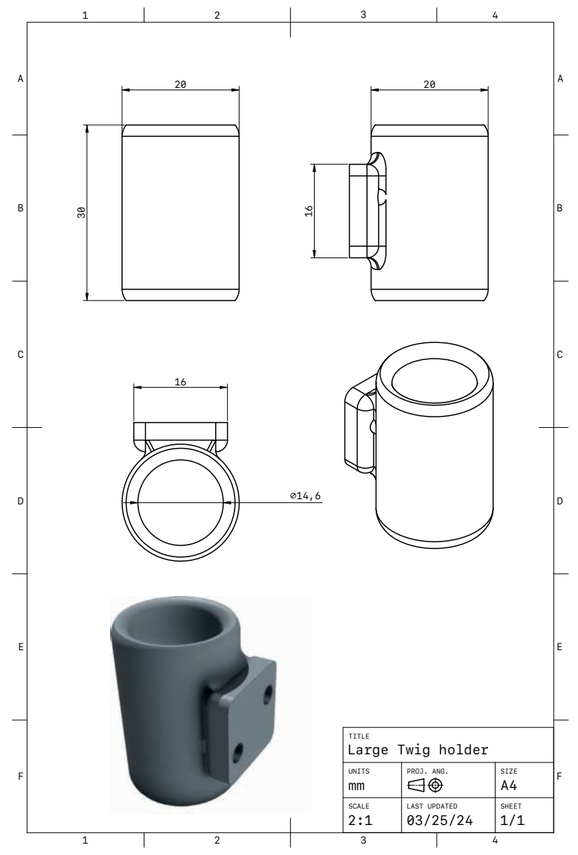

hiCraft

Investigating how we can define and foster a healthy relationship between people, the internet and things through the ethos of craft

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