

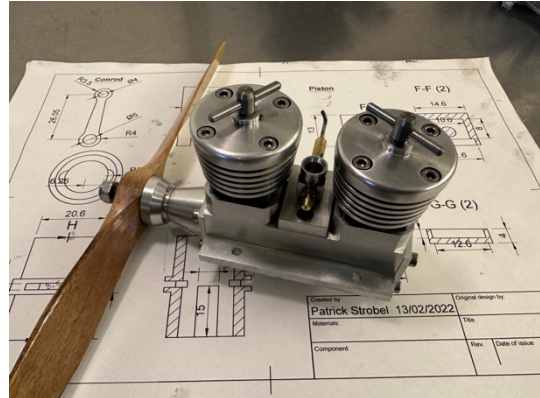
# Holly Buddy Twin

By Patrick Strobel and Ed Holly

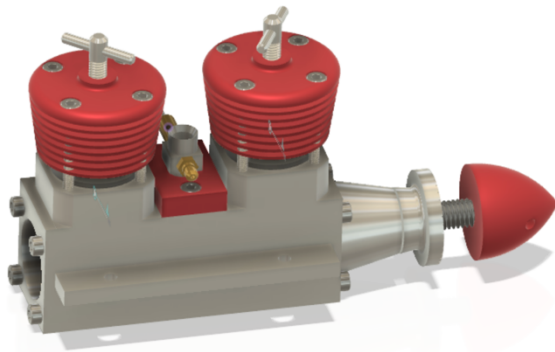
## Introduction

After completing Ed's excellent Holly Buddy Diesel engine, I really wanted to build a twin. After looking around for a long time I soon realised there wasn't that much out there in terms of plans or build logs. I came across the Twin from Fig Tree Pocket in the Motor Boys plan book and a Sparey Twin on Model Engine News, but nothing quite ticked the box for me.

I wanted to keep the engine small and that ruled out anything with split conrods and one-piece cranks. That said, the Fig Tree is probably still on my build list at some point in the future! I got chatting to Ed and he suggested I had a go at building a twin Holly Buddy which he had successfully done in the past and still had some paper sketches lying around. From there, a plan was hatched.



We started working from his original drawings and I modelled out/tweaked in CAD. The design philosophy was KISS: Keep it Stupid Simple (or Keep it Simple, Stupid!) and building within reach of mere mortals with typical model engineering workshop setups. This was very much in line with the original Holly Buddy which was key to its success. Simplicity aside, like the original Holly Buddy, the engine starts well and absolutely screams! This is one of the first engines I've run outside and been truly worried about disturbing neighbours all the way down the street.



When, after what seemed like an eternity in CAD modelling, I finally got round to making some parts in the workshop, the engine was a delight to build with nothing really that tricky apart from the centre crankshaft and bearing.

We both really hope you have fun making this engine. Please share your story with us on HMEM or YouTube etc. We would love to see another one come to life.

This is also my first-time doing CAD work. As a self-taught amateur (mainly learned for 3d printing), people with an engineering/fabrication background will frown at my adherence to conventions (or my lack thereof). I'm happy to take feedback to continue making the plans better.

Enjoy the build!

Thanks,

**Ed and Patrick**

## Materials

With regards to Aluminium, the engine casing, cylinder muffs, prop driver and venturi are all made from HE30 aluminium (or whatever I found in the scrap box). For the conrods and centre bearing I used HE15 which is much stronger but equally doesn't machine as well.

I used EN24 high tensile steel for the crankshafts. These were left in un-hardened state as I don't have a tool post grinder and the distortion caused by the heat treatment would have caused issues. I have multiple times used high-tensile bolts to make crankshafts that work fine. I just really hate the job of turning the bolts down and removing the threads. That interrupted cut seems to give my flimsy old lathe a hard time.

The cylinder liners are made from bog standard EN1A (pb I think) mild steel. This is a delight to machine and, with a bit of care a, reasonable surface finish is achievable straight from the lathe which makes the task of lapping later on a bit easier.

The pistons are made from cast iron. I have always used this piston/cylinder combo and have never had an issue.

Wrist pin is made from ground 4mm drill rod.



## Building tips

There isn't really that much to catch you out on this build if you have built a single Diesel before. That said, the centre bearing setup is unique to this engine and requires a bit of care.

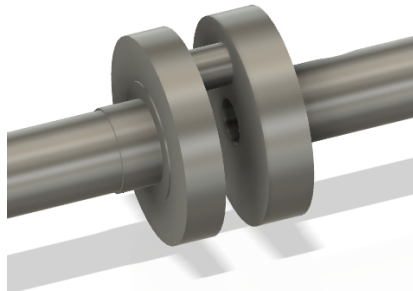
There is a build log on Home Model Engine Machinist site if you want any more detail than the quick tips below.

<https://www.homemodelenginemachinist.com/threads/holly-buddy-inline-twin.33976/#post-390338>

**TIP 1:** Take your time and make sure the crank case is straight. Every lathe/boring bar has flex in it so you need to take light cuts and then finishing cuts with the thickest boring bar you can get your hands on, a sharp tip and 100s of finishing cuts. Line boring would be an alternative but I haven't used this technique before so didn't want to invest the time to make the fixtures etc.



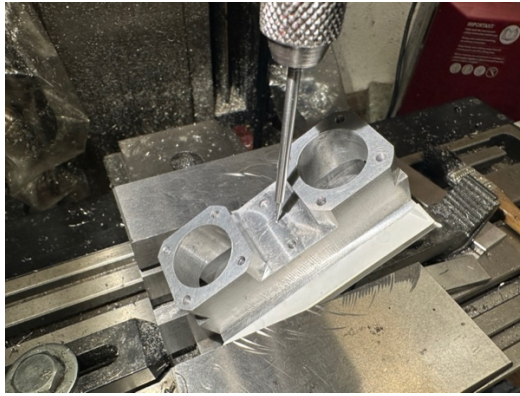
**TIP 2:** Be as accurate as you can aligning the crankpin on the crank web! The pin from the front crankshaft must accurately locate in the hole in the crank web of the centre crankshaft. There is no room for error here as shown below.



I used a dead centre held in another dead centre on the lathe although a 'wiggler' setup may have been more accurate. Total disclosure here, the first time I tried assembling the engine, the pin and the hole didn't mate and I had to bin and re-make the centre bearing. I wish I'd had someone to give me this tip before I started making mine 😊.



**TIP 3:** Drill the induction holes at 30 degrees through the crank case with the centre bearing already in place. This is a super nerve-racking operation given the amount of work already gone into these parts but take a deep breath, relax your shoulders and get on with it. You've drilled stuff plenty of times before! First mark out the location of the port, then put the crankcase on an angle plate, then align using a centre-finder.

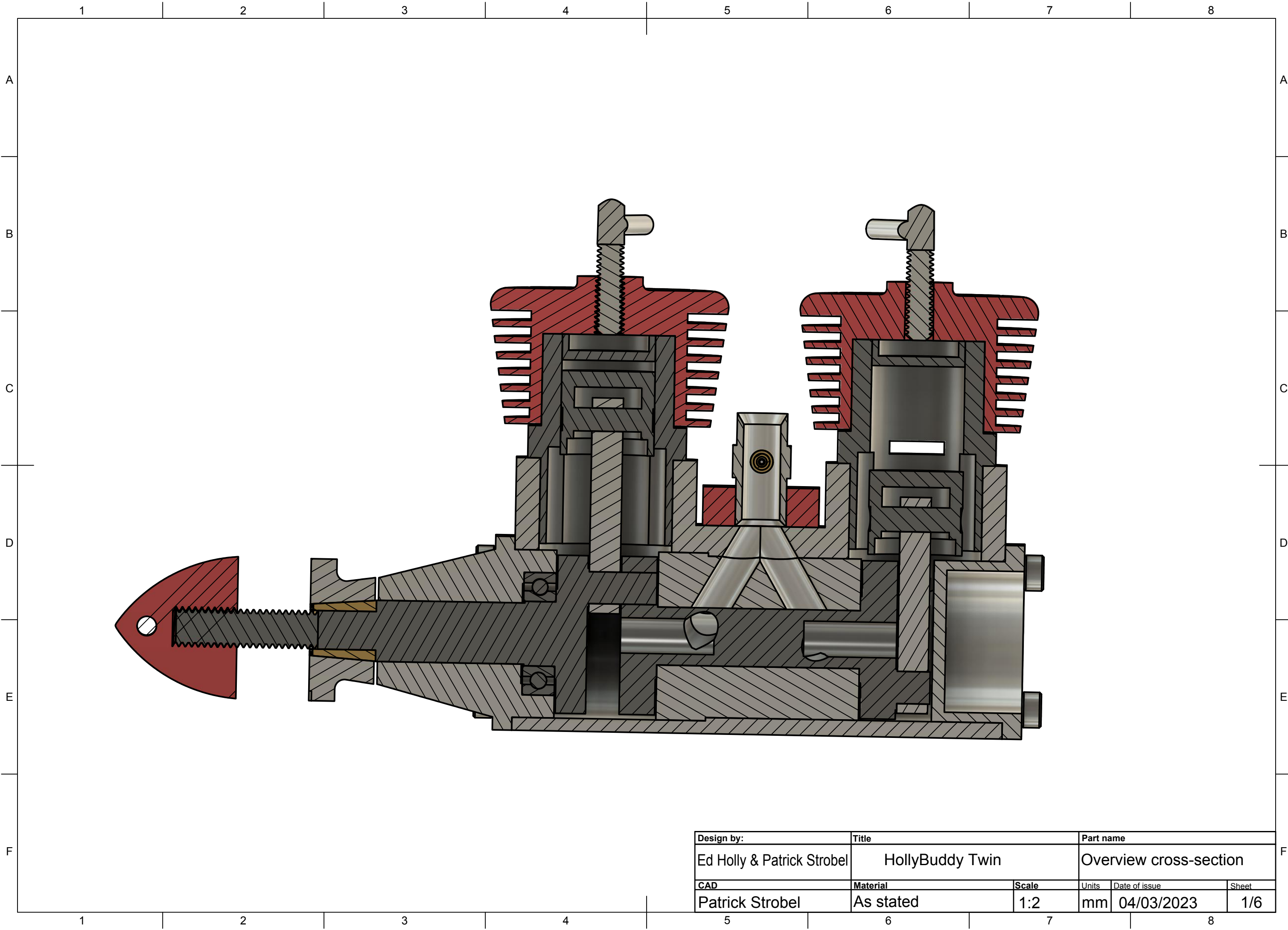


Start with an endmill to create a flat first, next use a centre drill to start the hole and lastly drill through with a nice sharp jobber drill.

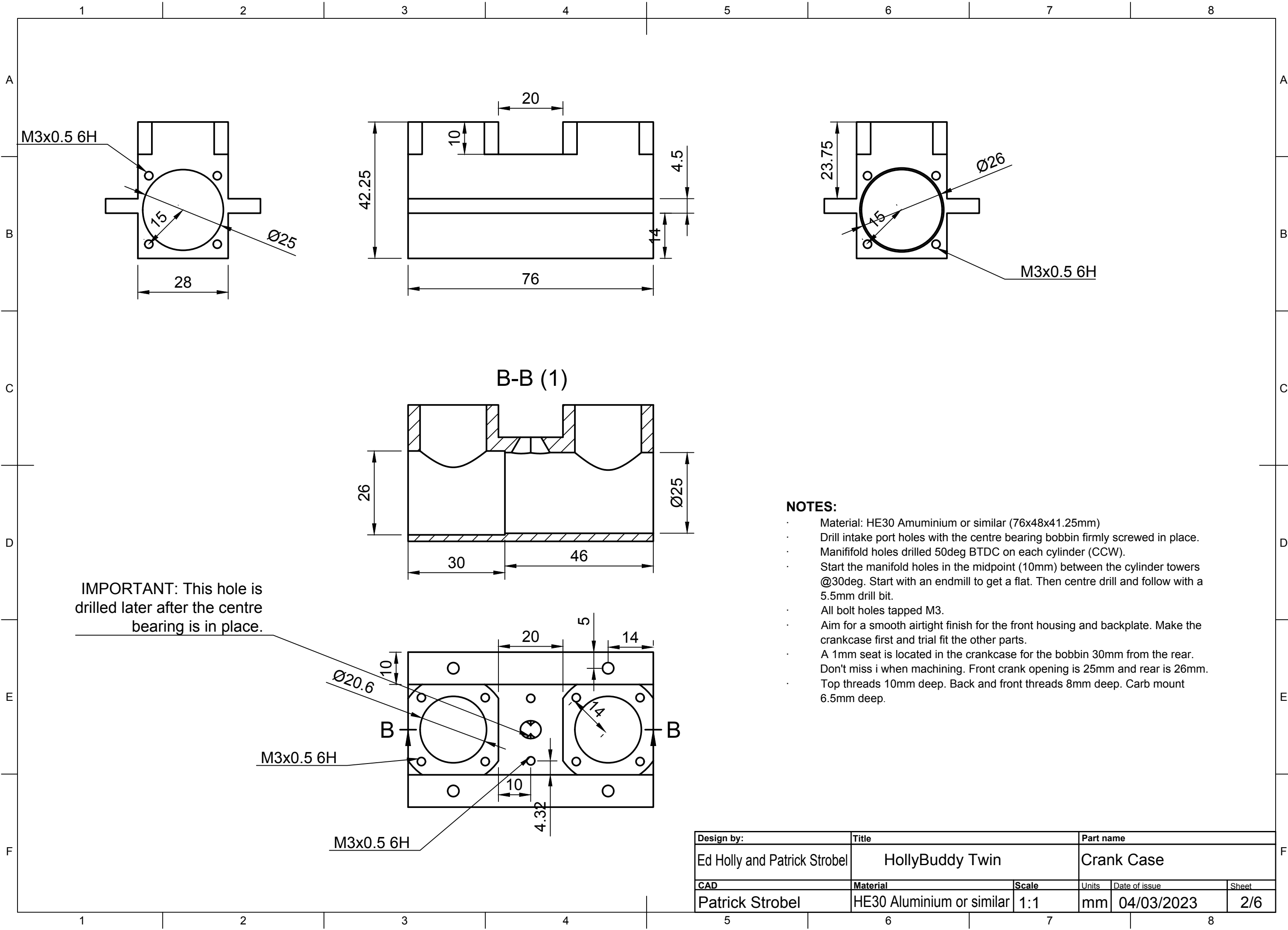


**TIP 4:** Use the hole in the centre bearing to mark out where the holes should be drilled in the centre crankshaft. I rotate the shaft to the correct angle (50deg BTDC) and use a sharp pin to mark out where the hole should be on the crankshaft. Make sure you file off any burrs after.





<b>Design by:</b>		<b>Title</b>		<b>Part name</b>		
Ed Holly & Patrick Strobel		HollyBuddy Twin		Overview cross-section		
<b>CAD</b>		<b>Material</b>		<b>Scale</b>	<b>Units</b>	<b>Date of issue</b>
Patrick Strobel		As stated		1:2	mm	04/03/2023
						<b>Sheet</b>
						1/6

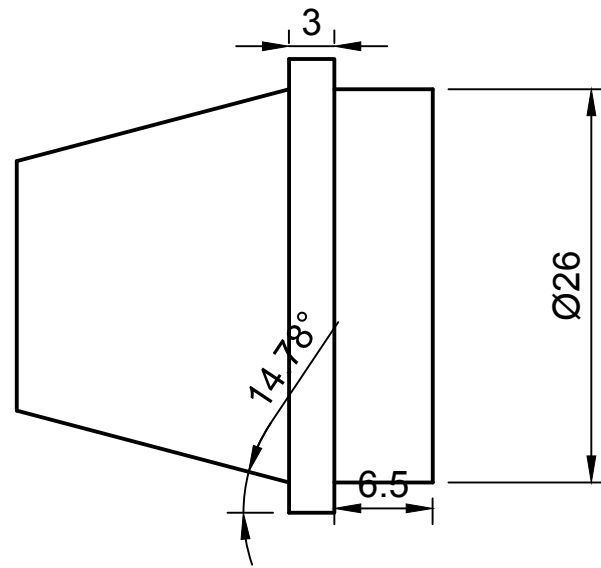
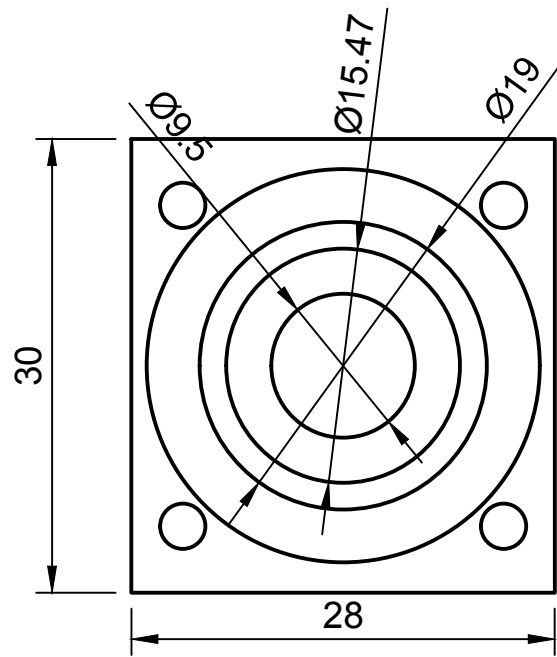


IMPORTANT: This hole is drilled later after the centre bearing is in place.

- NOTES:**
- Material: HE30 Aluminium or similar (76x48x41.25mm)
  - Drill intake port holes with the centre bearing bobbin firmly screwed in place.
  - Manifold holes drilled 50deg BTDC on each cylinder (CCW).
  - Start the manifold holes in the midpoint (10mm) between the cylinder towers @30deg. Start with an endmill to get a flat. Then centre drill and follow with a 5.5mm drill bit.
  - All bolt holes tapped M3.
  - Aim for a smooth airtight finish for the front housing and backplate. Make the crankcase first and trial fit the other parts.
  - A 1mm seat is located in the crankcase for the bobbin 30mm from the rear. Don't miss it when machining. Front crank opening is 25mm and rear is 26mm.
  - Top threads 10mm deep. Back and front threads 8mm deep. Carb mount 6.5mm deep.

Design by:		Title		Part name	
Ed Holly and Patrick Strobel		HollyBuddy Twin		Crank Case	
CAD	Material	Scale	Units	Date of issue	Sheet
Patrick Strobel	HE30 Aluminium or similar	1:1	mm	04/03/2023	2/6

**Front Housing**

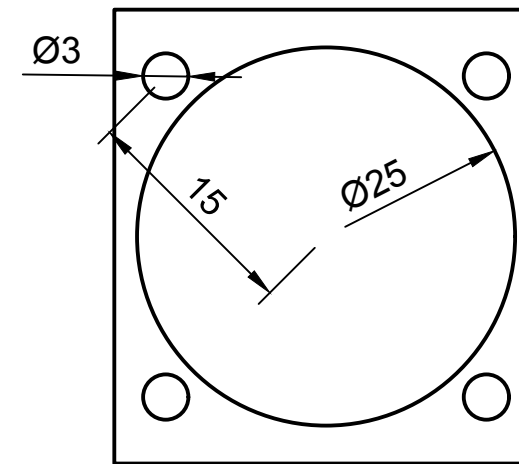
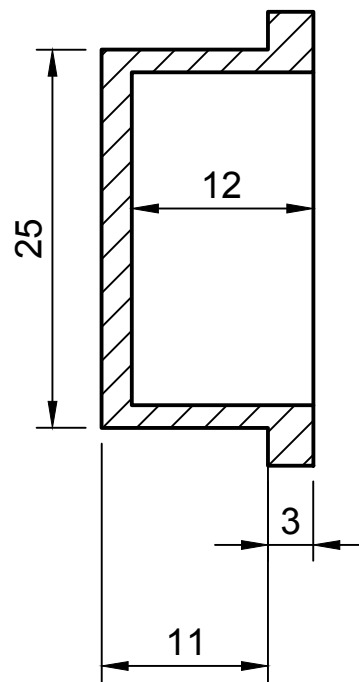
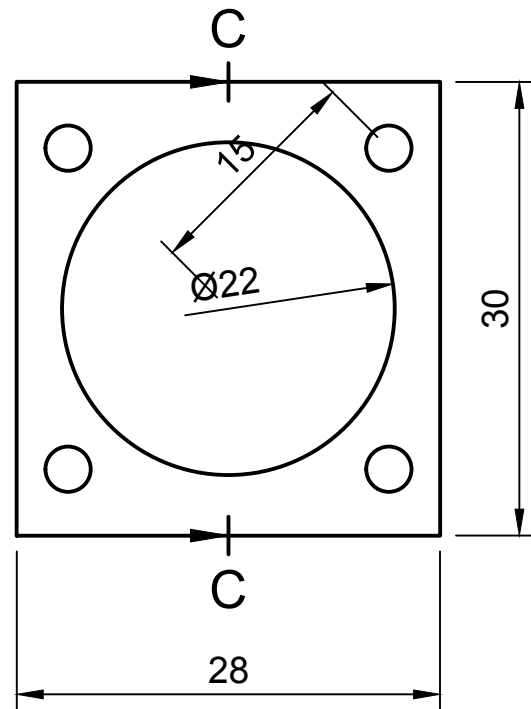


**NOTES:**

- Aim for a good airtight fit into the crank case
- The ball bearing should slide into the seat with a v light push when the front housing is heated with a heat gun.
- The bearing used is SKF 61800 Open Type Thin Section Deep Groove Ball Bearing 10x19x5mm

C-C (2)

**Back Plate**

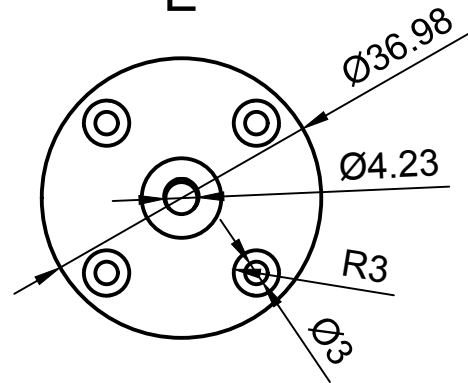
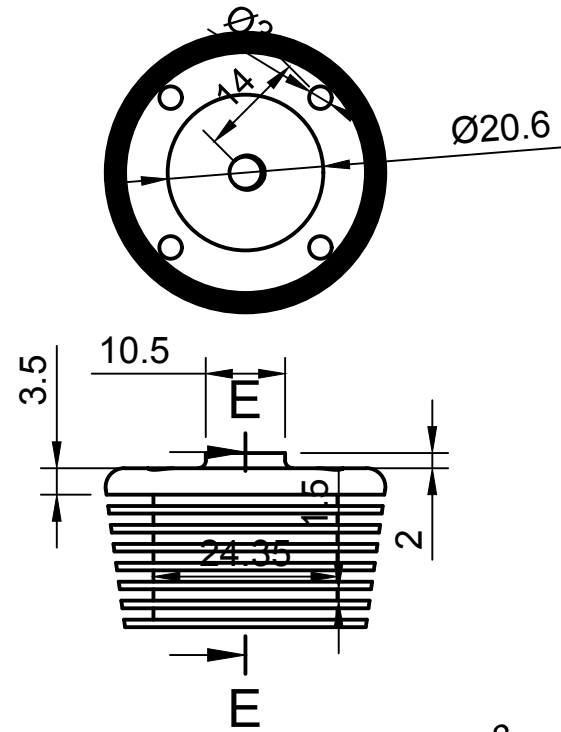


Design by:		Title		Part name	
Ed Holly & Patrick Strobel		Holly Buddy Inline Twin		Crank Case	
CAD	Material	Scale	Units	Date of issue	Sheet
Patrick Strobel	HE30 Aluminium or similar	1:2	mm	04/03/2023	3/6

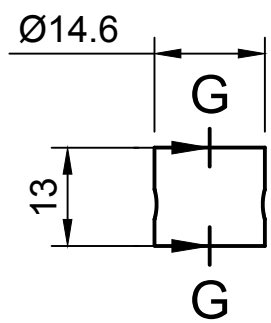




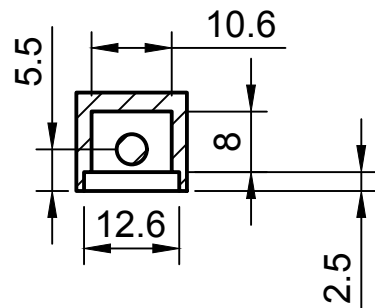
**Cylinder Muff (2 of)**



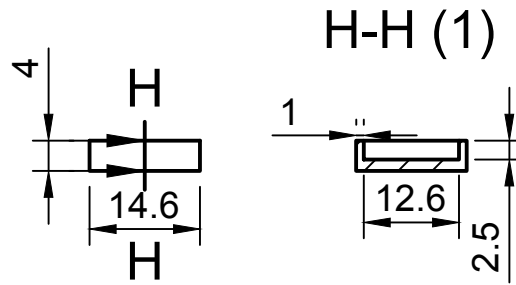
**Piston (2 of)**



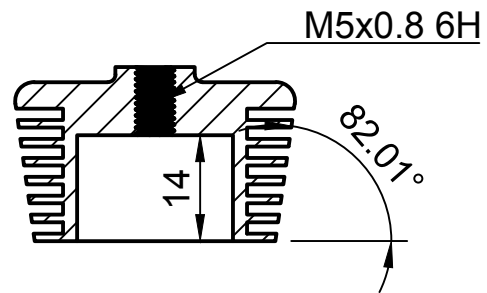
**G-G (1)**



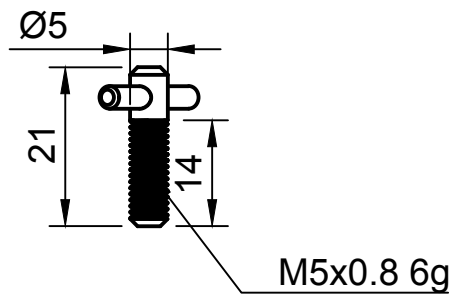
**Contrapiston (2 of)**



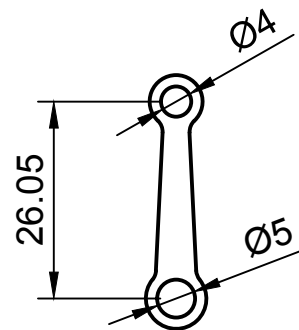
**E-E (1)**



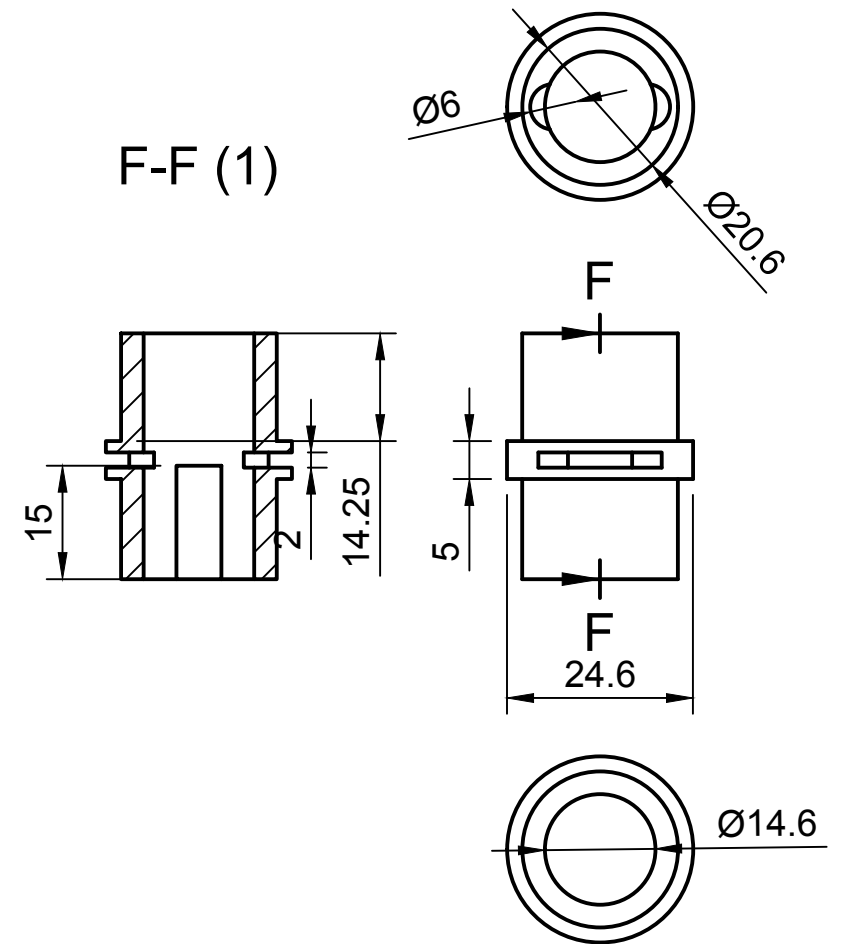
**Compression Screw (2 of)**



**Conrod (2 of)**



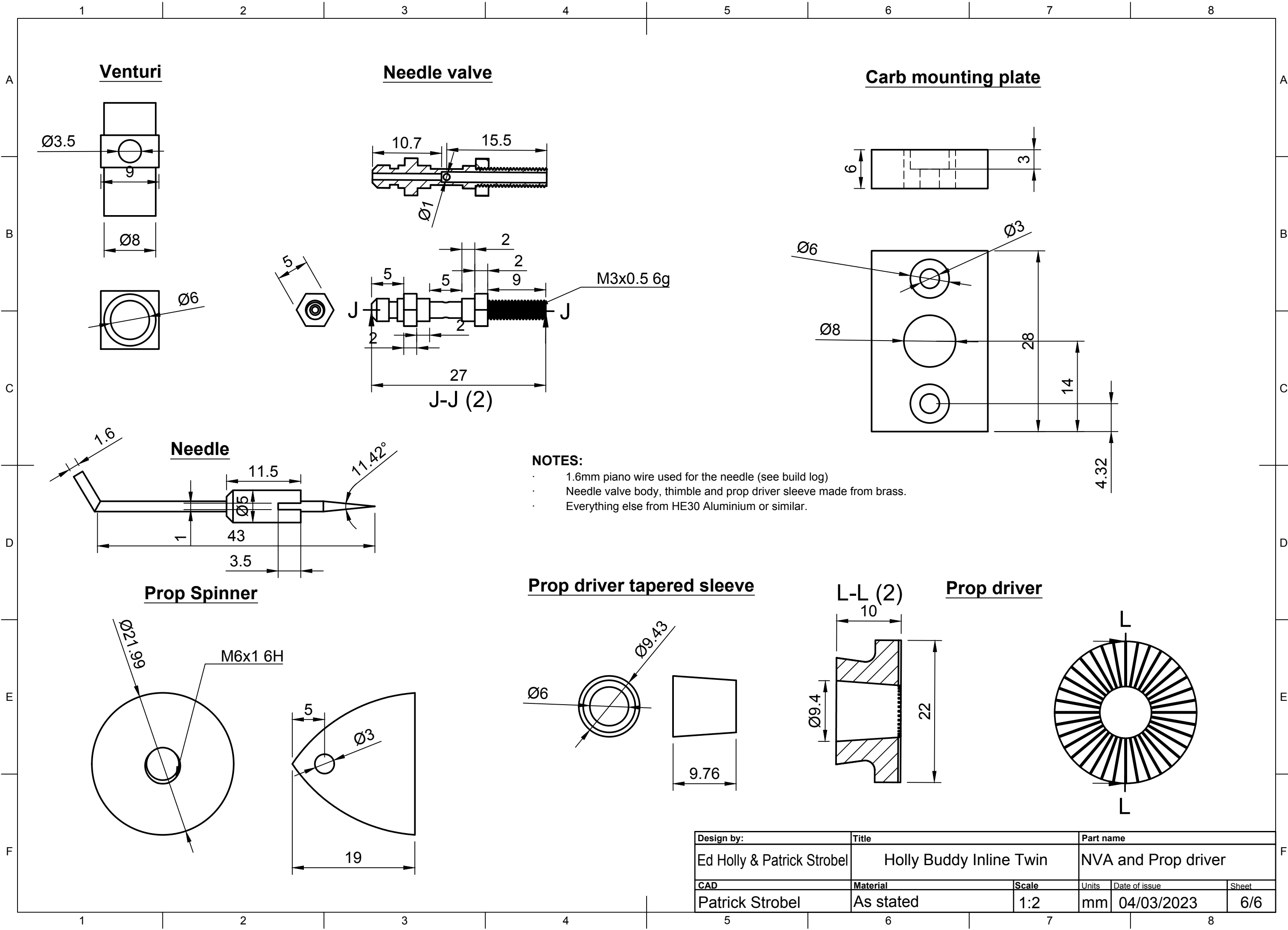
**Cylinder Liner (2 of)**



**NOTES:**

- Cylinder muff made out of HE30 Aluminium
- Piston and contrapiston made from cast iron
- Cylinder liner made from EN1A PB mild steel.
- Conrod made from HE15 or 6061. A lot of stress on this part so make it strong.
- Cylinder and piston lapped to achieve a good seal.
- Exhaust port in cylinder made with a 25x2mm slitting saw.

Design by:	Title	Part name			
Ed Holly & Patrick Strobel	Holly Buddy Inline Twin	Hot end			
CAD	Material	Scale	Units	Date of issue	Sheet
Patrick Strobel	As stated	1:1	mm	04/03/2023	5/6



Design by:	Title	Part name		
Ed Holly & Patrick Strobel	Holly Buddy Inline Twin	NVA and Prop driver		
CAD	Material	Scale	Units	Date of issue
Patrick Strobel	As stated	1:2	mm	04/03/2023
				Sheet
				6/6