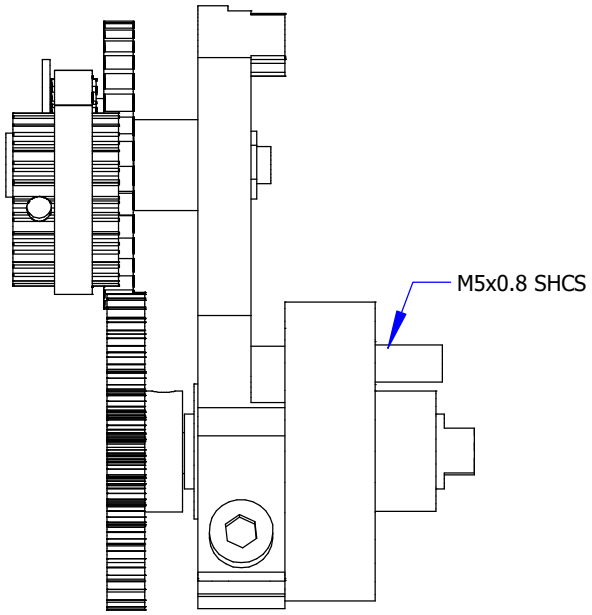
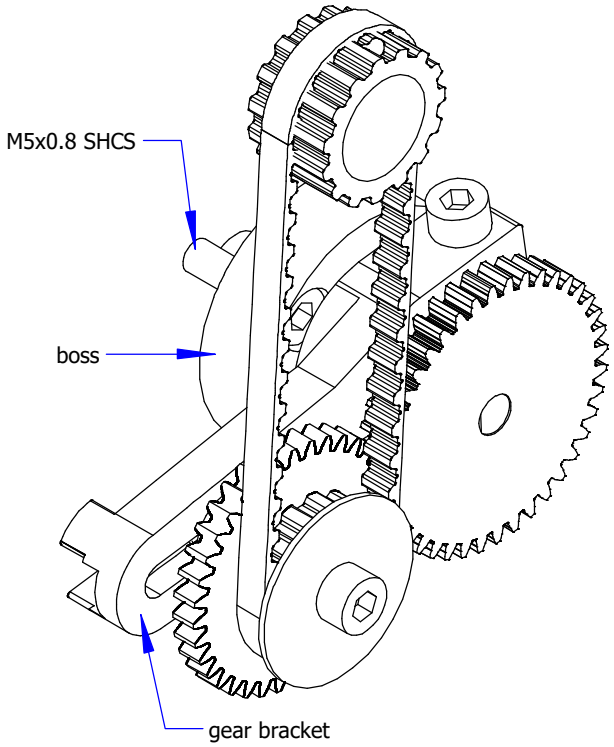
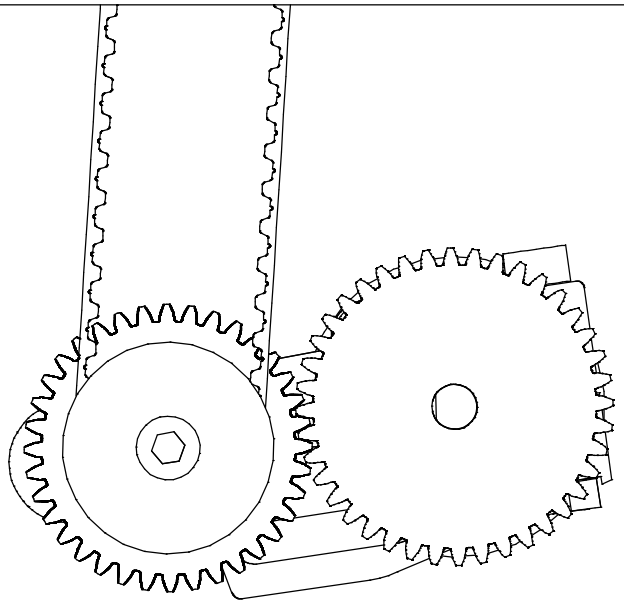
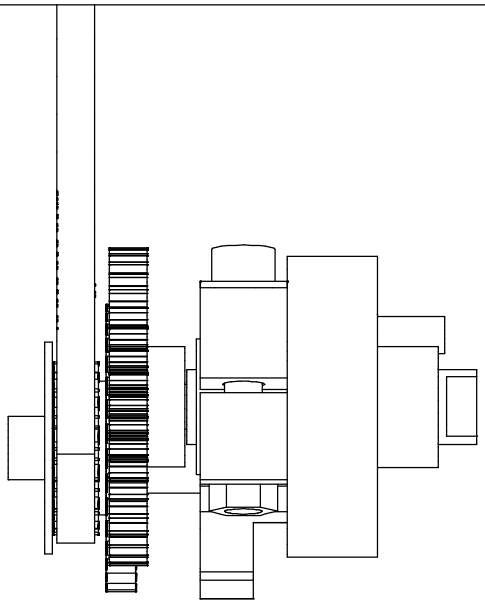


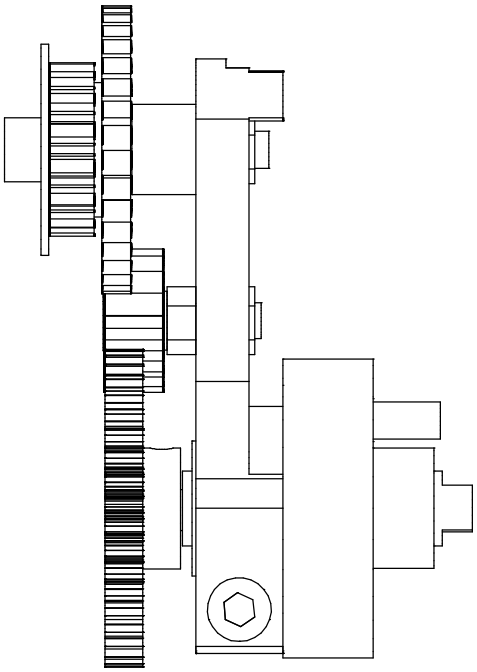


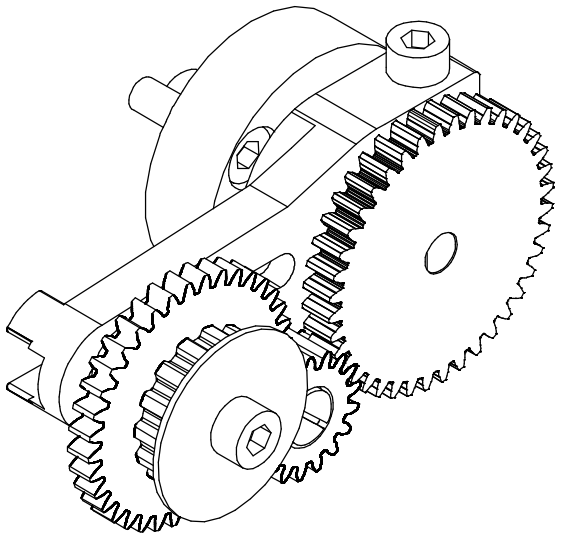


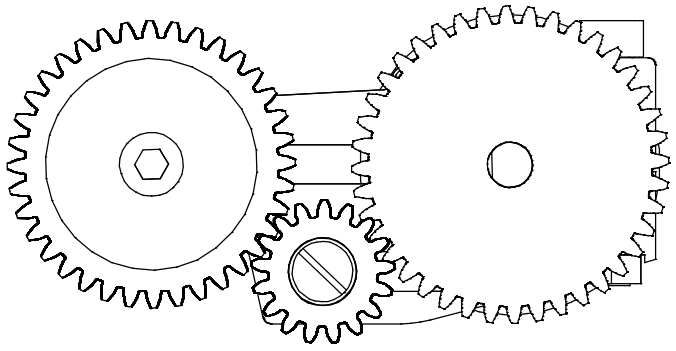


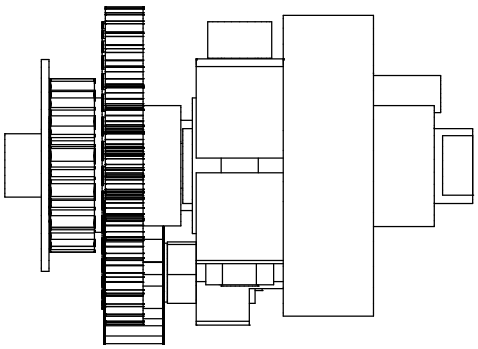
Your selection of gears will depend on the thread pitch that you wish to cut. Refer to the Toyo instruction manual for details.

David Underwood	
Toyo ML210 Thread Cutting	**General Arrangement (Clockwise)**
Drawn: 2021-02-22	Sheet 1 of 12
Unless otherwise specified, dimensions are in millimetres.	



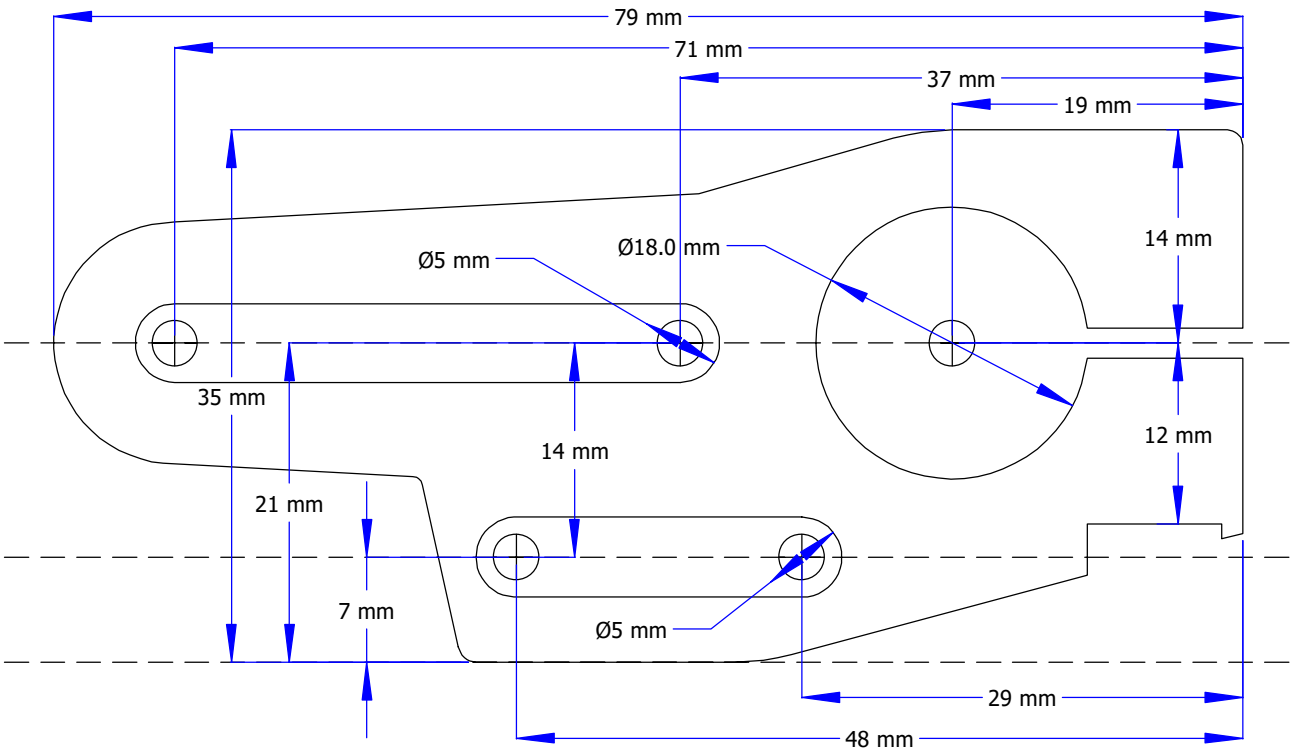






To cut left-hand threads, a reversing gear is inserted n the gear train so the lead screw will turn in the opposite direction. The Toyo instruction manual refers to this gear as the "backgear", so that's what I've called it in these drawings.

David Underwood	
Toyo ML210 Thread Cutting	**General Arrangement (Counter-Clockwise)**
Drawn: 2021-02-22	Sheet 2 of 12
Unless otherwise specified, dimensions are in millimetres.	

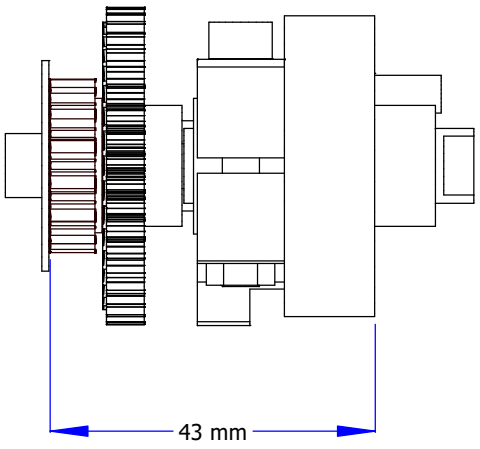


Despite the unfortunate number of dimenstions shown on this drawing, there are only three things that need your attention: the hole where the bracket fits on the boss and the two slots. Regarding the hole, make sure that the gear bracket is a close fit on the boss. Slot widths need to be a clearance fit for the screws that hold the bearings to the bracket.

Because you will shift the change gears around until their teeth mesh nicely, slot position and length measurements are not critical, so long as they allow you to fit your change gears.

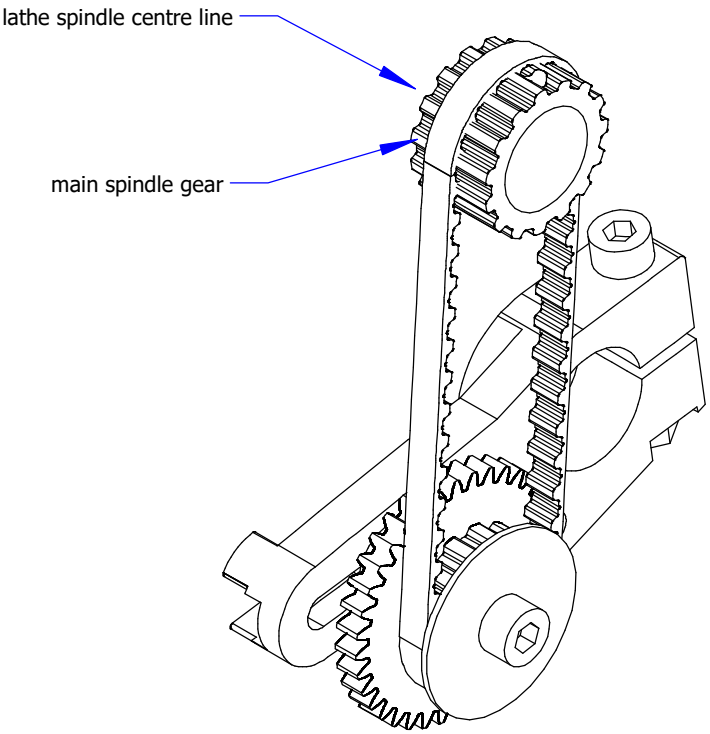
Because the boss is tight against its seat on the headstock casting, this distance is the total distance from that seat to the outside surface of the idler gear.

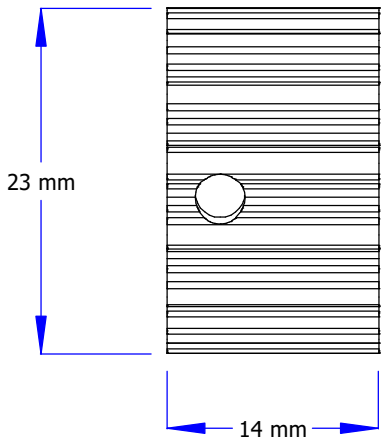
In your own design, pay attention to this distance so your timing gear belt will align with the timing gear on the end of the spindle.

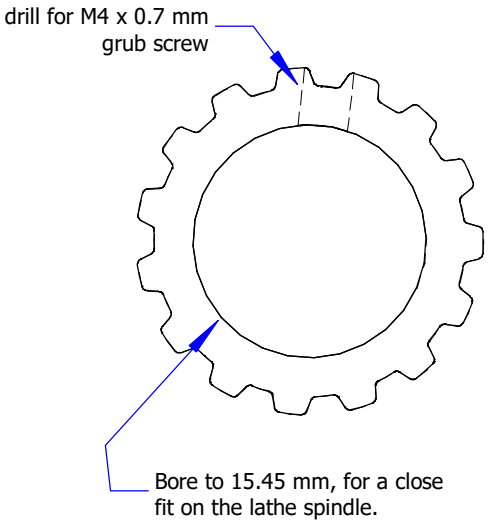


These drawings give you a sense of the spatial relationships that you will want to consider if you design your own thread cutting attachment.

David Underwood	
Toyo ML210 Thread Cutting	**Spatial Relationships**
Drawn: 2021-02-22	Sheet 3 of 12
Unless otherwise specified, dimensions are in millimetres.	







The main spindle gear mounts on the end of the lathe's spindle (not shown), where it is secured by an M4 x 0.7 mm grub screw. In this example, it has 15 teeth.

The timing belt has a matching 5 mm pitch and is 5 mm wide.

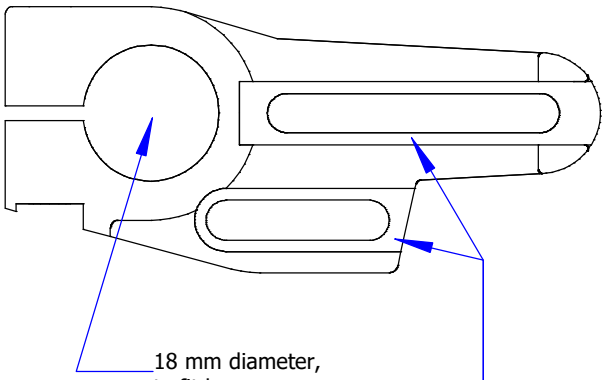
David Underwood

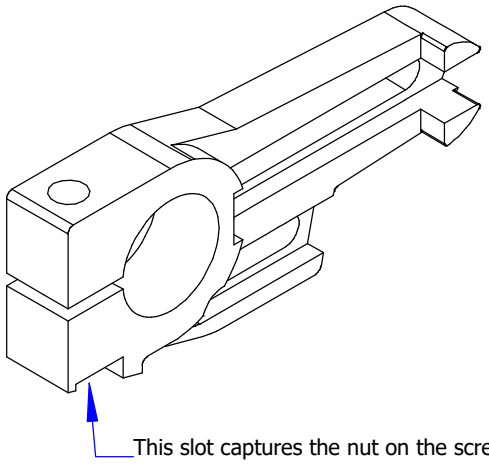
Toyo ML210 Thread Cutting	**Main Spindle Gear**
Drawn: 2021-02-22	Sheet 4 of 12

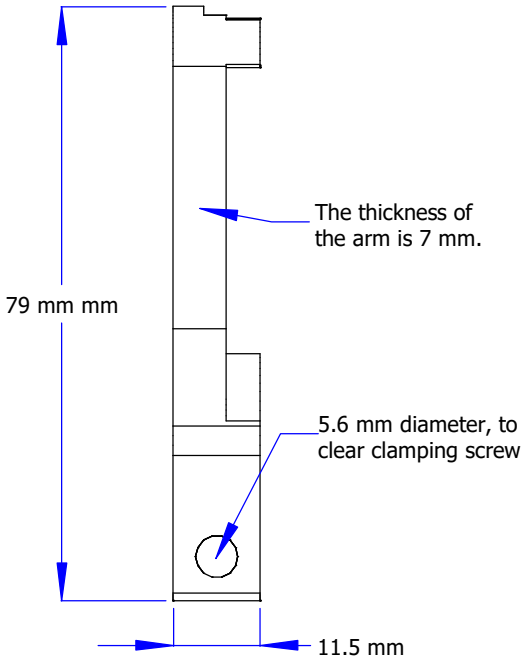
Unless otherwise specified, dimensions are in millimetres.

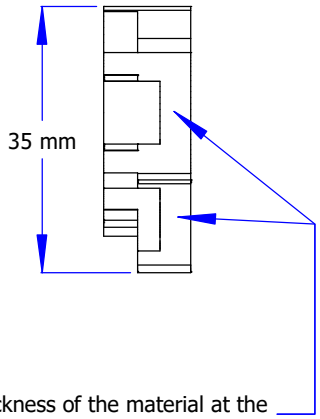
This is a fair representation of the Toyo original bracket, but make your own to suit yourself, observing the spatial relationships shown on Sheet 2.

The important thing is the size and relationship of the hole for the boss and the slots for the change gears.



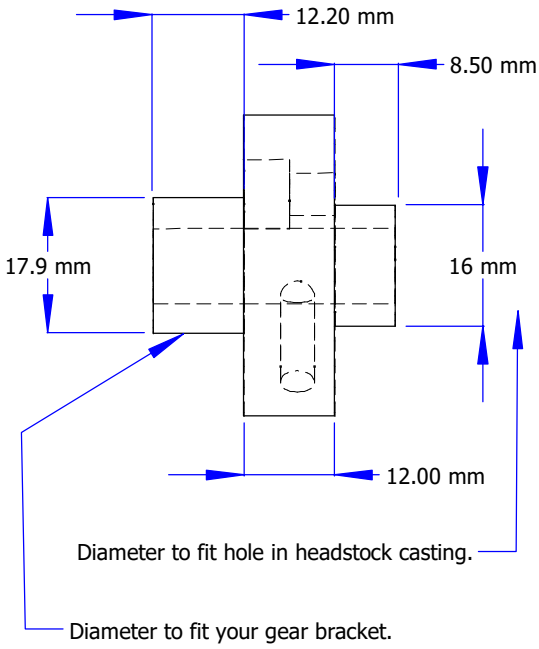


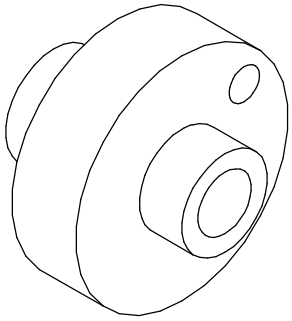


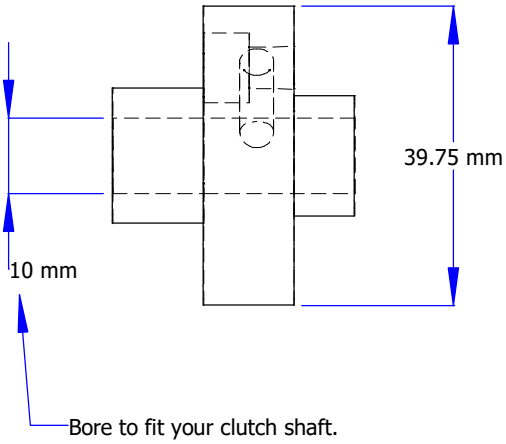


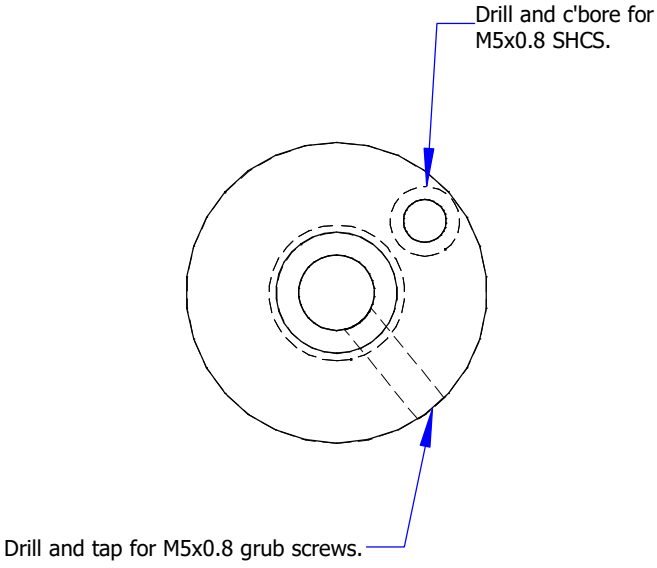
The Toyo original bracket shown on this sheet is a steel casting. There are visible indications of machining in the two holes. In addition, the front and back sides of the bracket have been ground flat and parallel to each other. No doubt this was done prior to finishing the hole that fits over the boss that attaches directly to the lathe, thus ensuring proper alignment of the bracket.

David Underwood	
Toyo ML210 Thread Cutting	**Gear Bracket**
Drawn: 2021-02-22	Sheet 5 of 12
Unless otherwise specified, dimensions are in millimetres.	



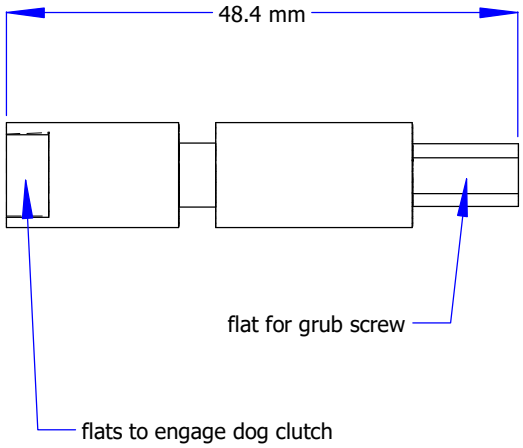


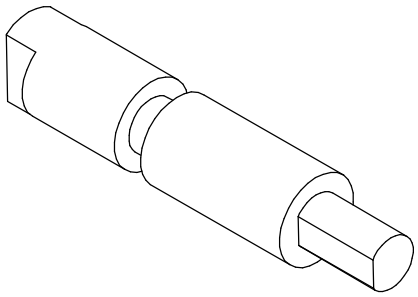


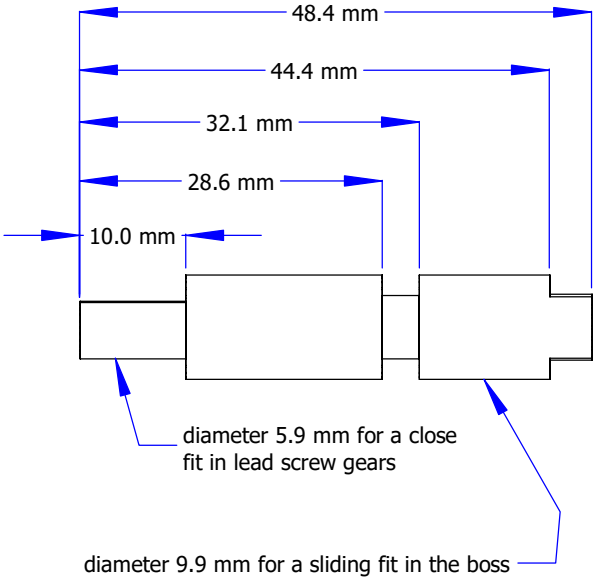


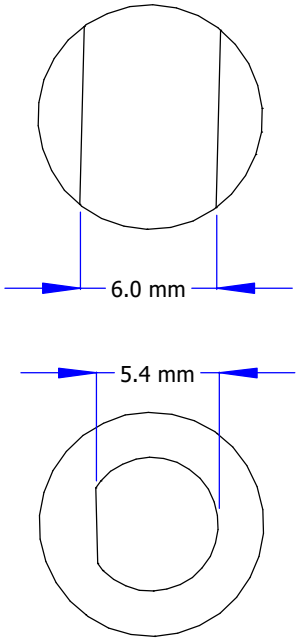
In addition to supporting the gear bracket, the boss is, of course, a bearing, so use a material suited to that use. The one made by Toyo is made of steel.

David Underwood	
Toyo ML210 Thread Cutting	**Boss**
Drawn: 2021-02-22	Sheet 6 of 12
Unless otherwise specified, dimensions are in millimetres.	





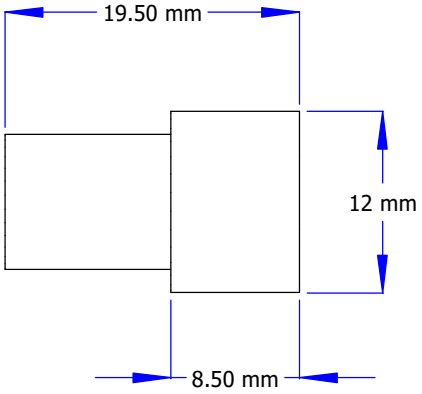


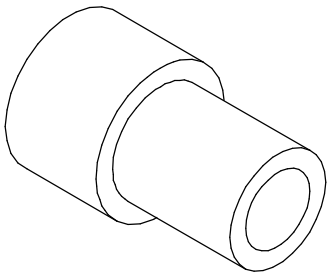


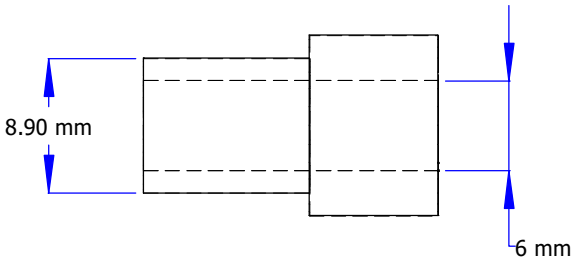
The Toyo manual refers to this part as the "lead screw", but it's more of a proxy for the lead screw. It's the shaft that forms one end of the dog clutch, the other end being part of the lead screw. So, I decided to call it the "clutch shaft".

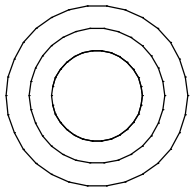
The material is steel and it should have a fine, smooth finish so it will turn nicely in the boss.

David Underwood	
Toyo ML210 Thread Cutting	**Clutch Shaft**
Drawn: 2021-02-22	Sheet 7 of 12
Unless otherwise specified, dimensions are in millimetres.	



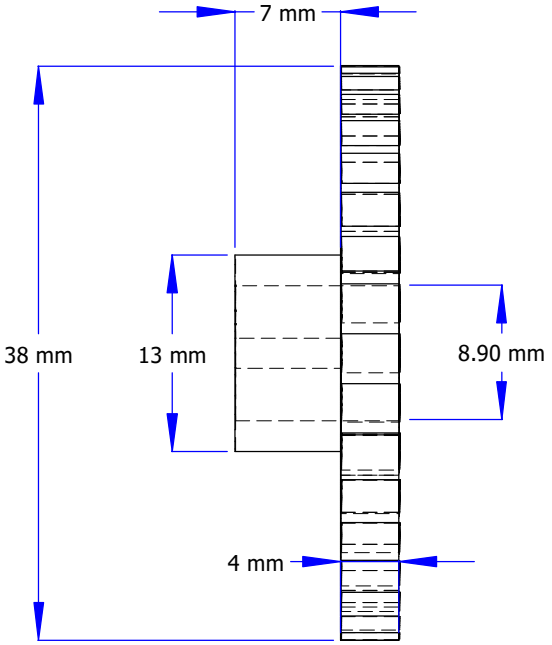


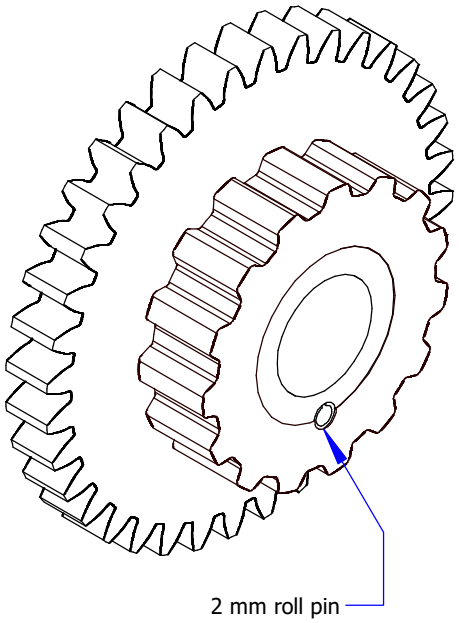


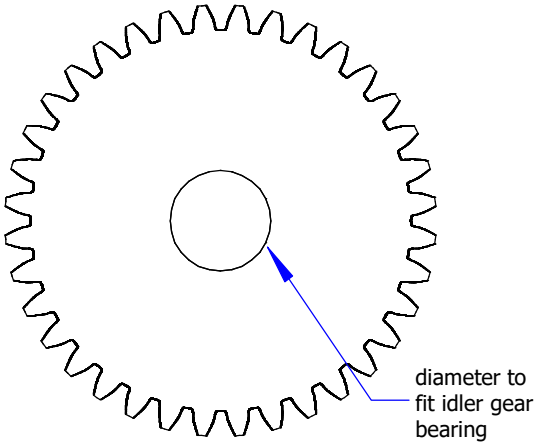


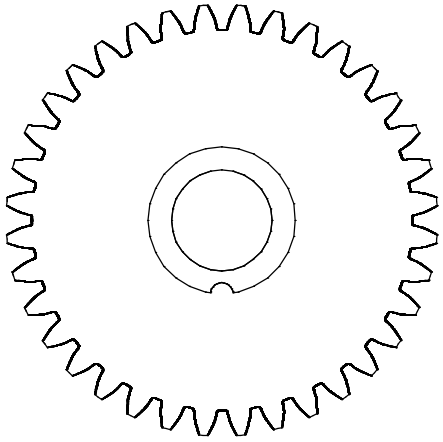
The material is bronze and it should have a fine, smooth finish so it will turn so the idler gear will turn nicely.

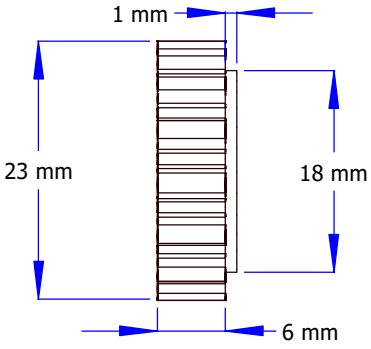
David Underwood	
Toyo ML210 Thread Cutting	**Idler Gear Bearing**
Drawn: 2021-02-22	Sheet 8 of 12
Unless otherwise specified, dimensions are in millimetres.	

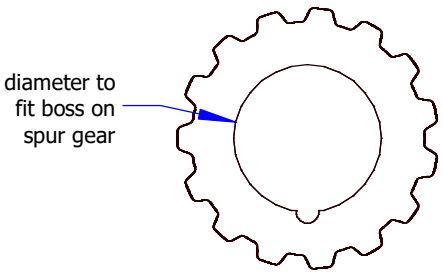






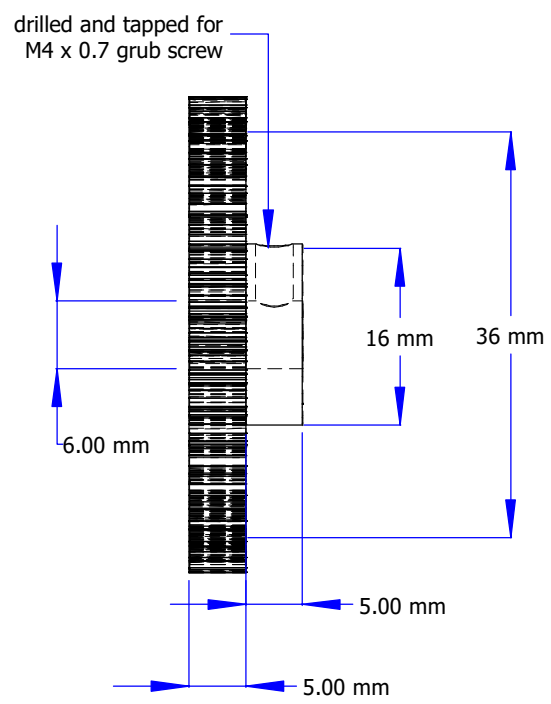


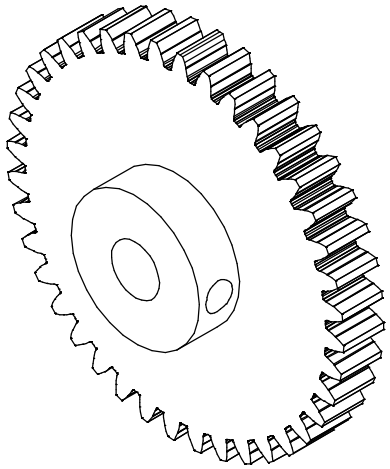


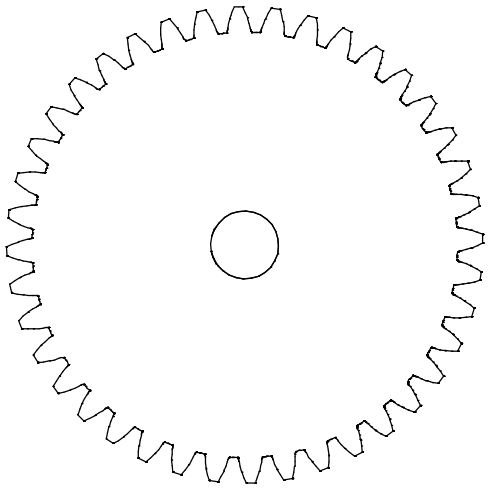


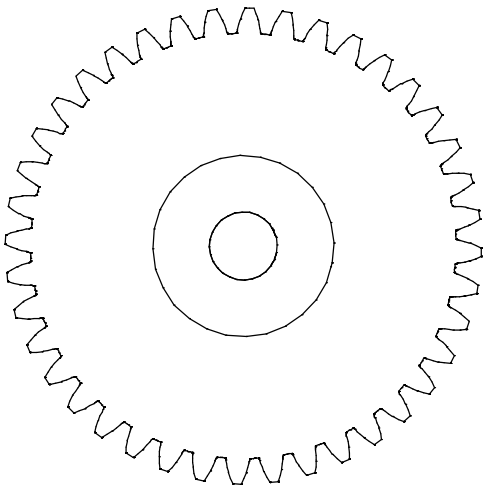
This is a representative idler gear pair. The larger gear is a 0.9 MOD spur gear which, in this example, has 36 teeth. The smaller gear is a 5 mm pitch timing gear with 15 teeth.

David Underwood	
Toyo ML210 Thread Cutting	**Idler Gears**
Drawn: 2021-02-22	Sheet 9 of 12
Unless otherwise specified, dimensions are in millimetres.	



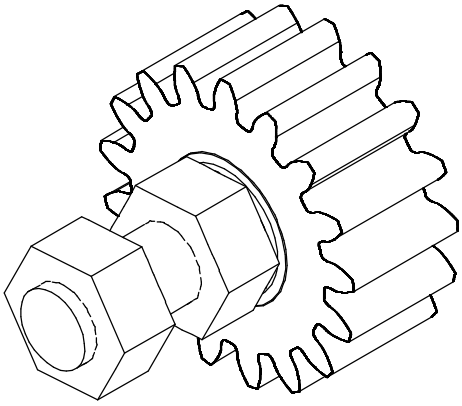


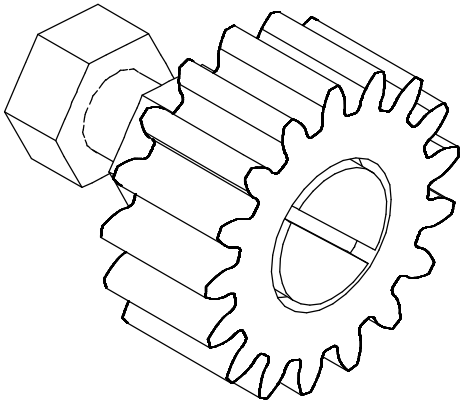




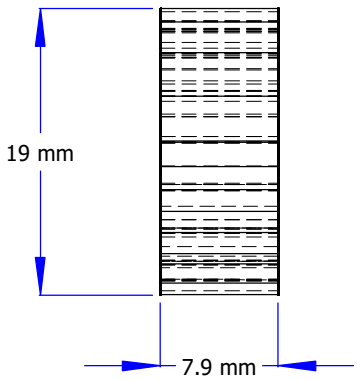
Since this gear drives the lead screw (via the clutch), I've chosen to call it the lead screw gear. It's a 0.9 MOD steel spur gear.

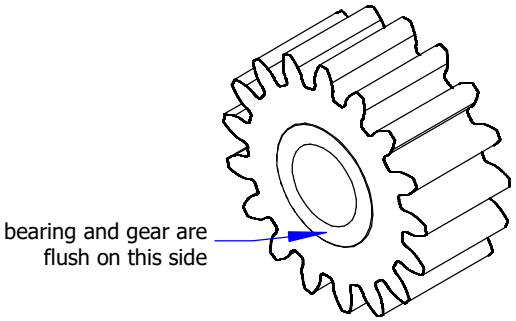
David Underwood	
Toyo ML210 Thread Cutting	**Lead Screw Gear**
Drawn: 2021-02-22	Sheet 10 of 12
Unless otherwise specified, dimensions are in millimetres.	

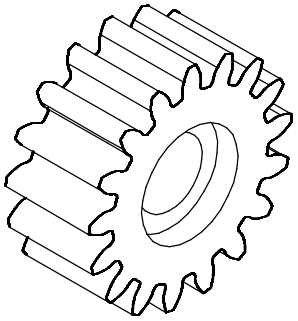




A bronze bearing is pressed into a 0.9 MOD spur gear (Toyo's has 17 teeth) and the bearing runs on the shoulder of an M5 x 0.8 mm screw. On one side, the bearing is retained by the screw head and on the other, it's retained by a steel washer between the bearing and the first nut. This assembly is held on the gear bracket by a second nut.

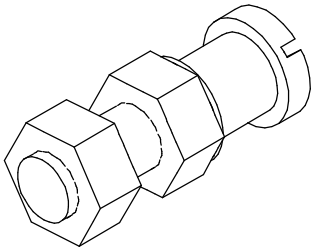


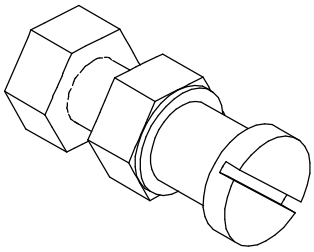


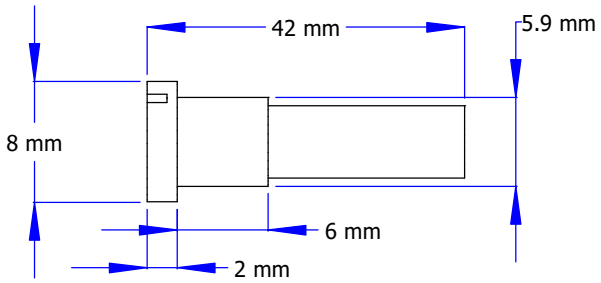


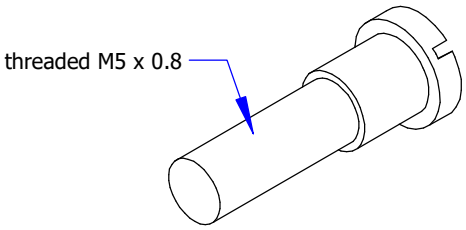
The backgear reverses the direction of the lead screw gear so you can cut left-hand threads.

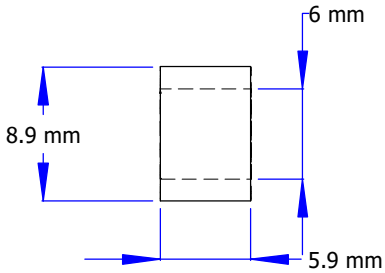
David Underwood	
Toyo ML210 Thread Cutting	**Backgear**
Drawn: 2021-02-22	Sheet 11 of 12
Unless otherwise specified, dimensions are in millimetres.	

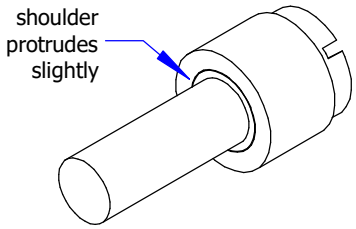


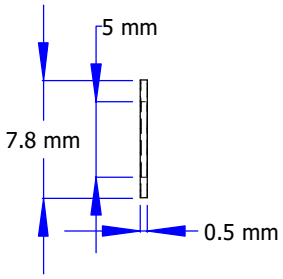


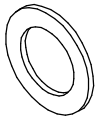


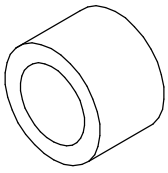












The backgear runs on a bronze bearing that is pressed into the backgear. The bearing runs on the shoulder of a screw that is threaded M5 x 0.8 mm.

The shoulder is a bit longer than the bearing and protrudes a tiny bit, so the nut will tighten the washer against the shoulder, allowing the bearing and backgear to spin freely.

David Underwood	
Toyo ML210 Thread Cutting	**Backgear Screw And Bushing**
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Unless otherwise specified, dimensions are in millimetres.	