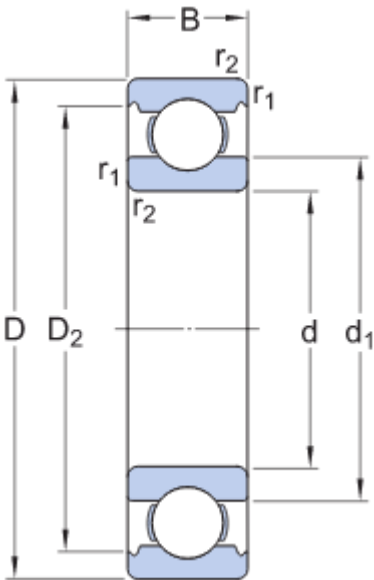


Research

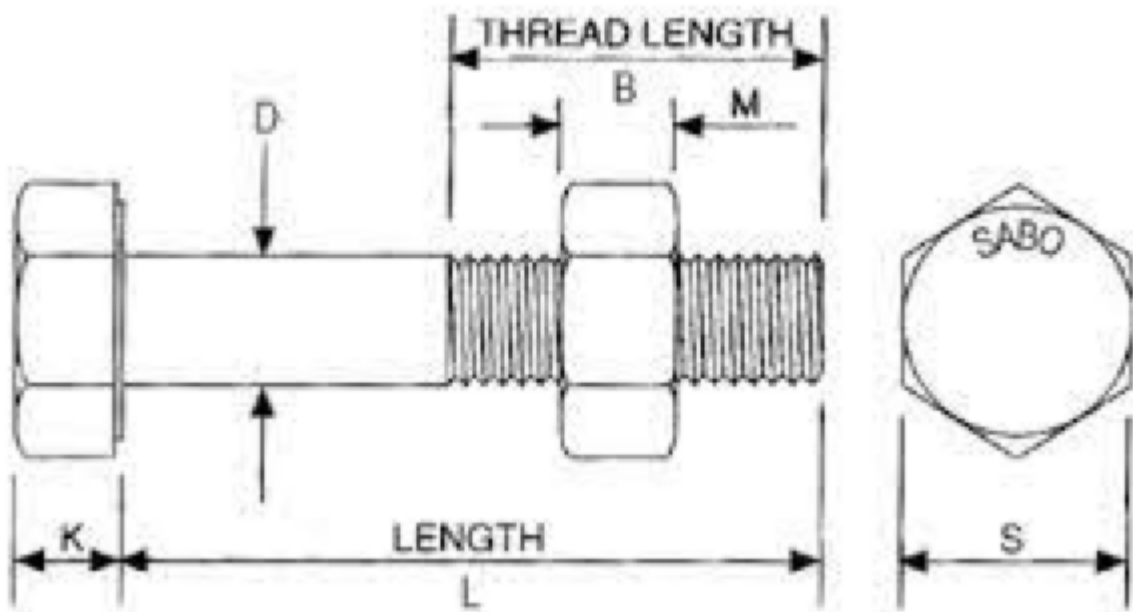
Components

SKY 16100 Deep Groove Ball Bearing



Symbol	Measure	Description
d	10 mm	Bore diameter
D	28 mm	Outside diameter
B	8 mm	Width
d1	≈17 mm	Shoulder diameter
D2	≈24.72 mm	Recess diameter
r1,2	min.0.3 mm	Chamfer dimension

Smooth Shank Bolt



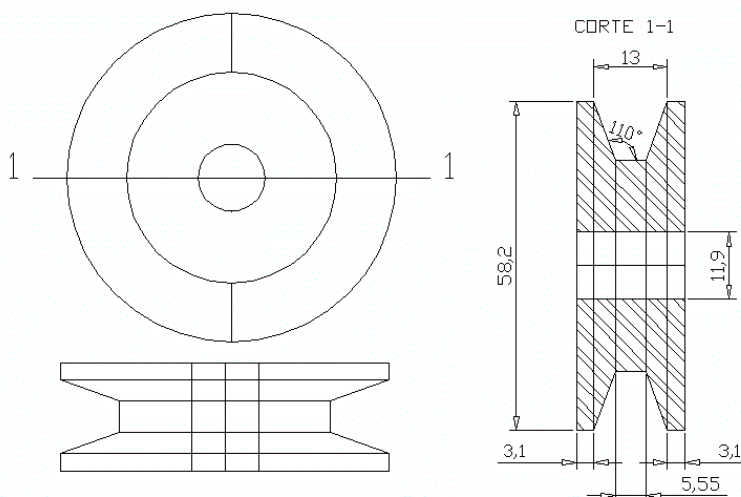
Smooth shank bolts are similar to normal bolts, however they have no thread on 'D' to avoid friction.

Pulley Wheels

Pulley wheels consist of a core, and an inner and outer ring. The structure of these will vary accommodate their function, such as using a belt vs using a rope, needing to carry large or medium-weight loads, and the size of the housing and shaft they are attached to.

Outer ring

The assembly requires a rope to be fitted through the pulley. A pulley with a curve recess in the outer ring would hold onto a rope well, and would prevent the rope from becoming caught in sharper curves. However, having a sharper indent causes the pulley wheel to apply pressure on the sides of the rope, which means that the rope will never slip over the pulley wheel and all friction will occur on the shaft of the pulley. For this, I believe that a pulley wheel with a sharp recess is the best fit for the assembly because it reduces friction and increases reliability.



Inner Ring

The inner ring tends to be made of solid material or spurs. Some have cutouts, presumably to save on materials, especially on larger pulley wheels. I believe that having a solid inner ring is sensible for this assembly, as the pulley wheel is neither large nor thick.



Core

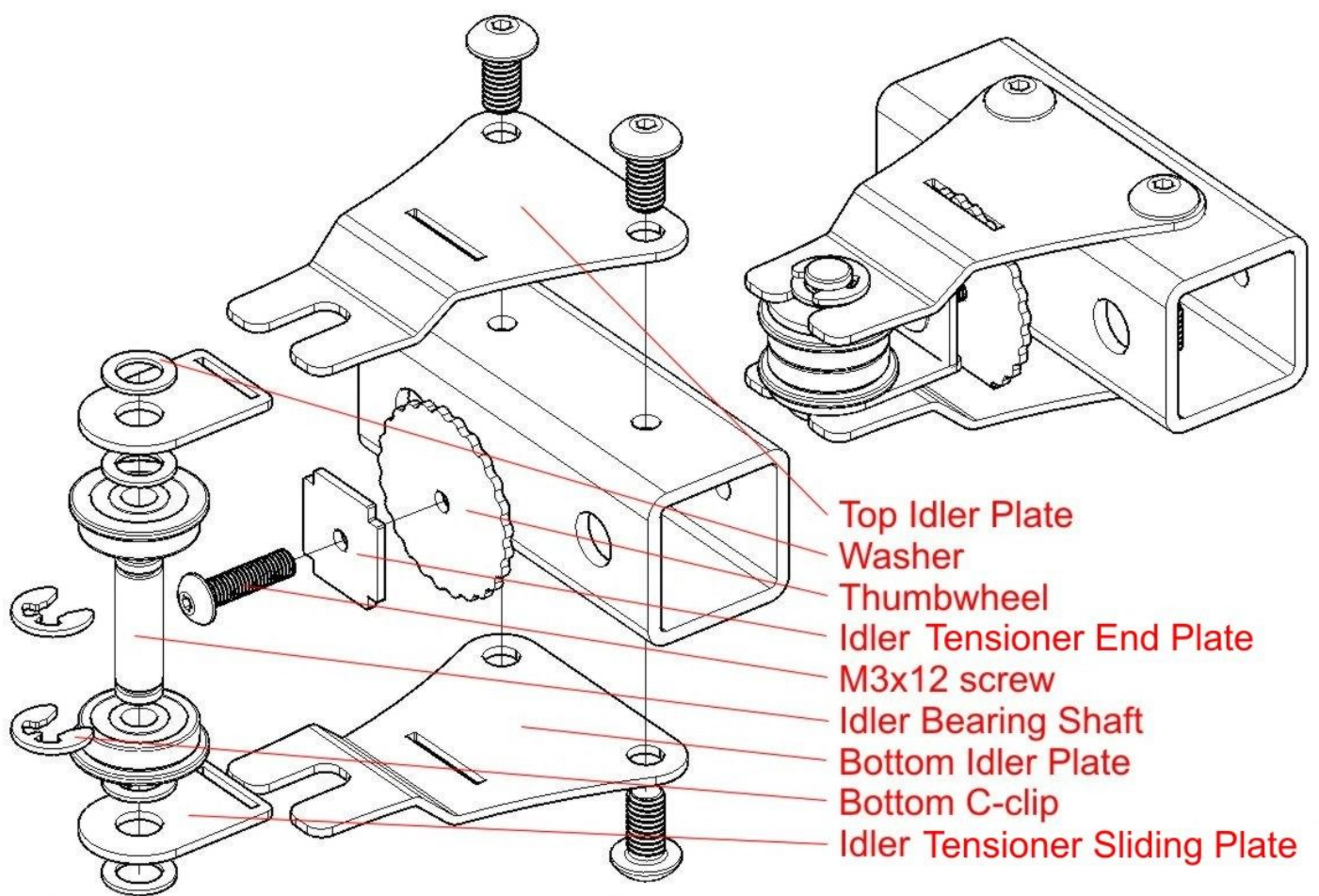
The core of a pulley can be mounted directly on a shaft, or onto a bush on a shaft. I believe using a bush to eliminate friction is preferable.

Pulley Assemblies

The general pulley assembly consists of a wheel, a shaft, a block, and any special extras that it may need. I have discussed pulley wheels in the pulley wheel section, and the shaft is specified to be a smooth shank bolt. This leaves the block: the attachment point of the wheel to the surface.

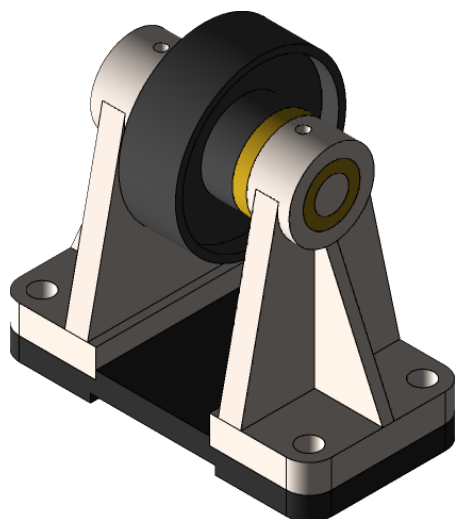
Considerations:

- The block must accommodate the rope that must pass through the pulley assembly
- Must be able to attach and reattach to a 114 × 38mm Truss
- Attachment to the truss must be secure, both from slipping down and side to side
- The rope must not rub against any component to reduce friction and prevent wear.
- Must be strong to accommodate the 120kg load capacity
- Must mount the SKF 16100 bearings securely



[4]

A pulley system like the one above is industrial and can be disassembled easily. Additionally, its pulley wheel mounting gives a good amount of space for a ball-bearing. Having a pulley system that can be disassembled could be a method of attaching it and re-attaching it. This specific pulley seemingly cannot be removed, and also has less optimization for low friction and load-bearing as the pulley I wish to design.



[5]

This bracket mount is very sturdy and seems like a good way to mount the pulley wheel onto another structure that grips onto the truss. Additionally, the wide base could work well with a

clamp or any securing method. The rib's also work to support the load. The wide mounting points for a shaft also allow us to put a ball bearing in each side.

1. Designs CAD *Pulley Wheel Diagram* . Designs CAD. Available at: <https://designscad.com/downloads/pulley-dwg-block-autocad/> (Accessed: March 12, 2023). ↩
2. Groove Pulley Manufacturers *Smooth Groove Pulley* . Groove Pulley Manufacturers. Available at: <https://pulleywheel.net/product/groove-pulleys/> (Accessed March 12, 2023) ↩
3. IndiaMart *Inner Rings of Pulleys images* . Indiamart online retailer. Available at: <https://dir.indiamart.com/impcat/pulley-wheels.html> (Accessed March 12, 2023) ↩
4. very unfortunately a source for this image could not be found - it was a link on a pinterest board to a link to google that led to nowhere. A reverse image source also did not work. ↩
5. Tassio Lenno (2018) *Pulley Base Design* . Grabcad. Accessed at: <https://grabcad.com/library/simple-pulley-model-1> (Accessed March 12, 2023) ↩