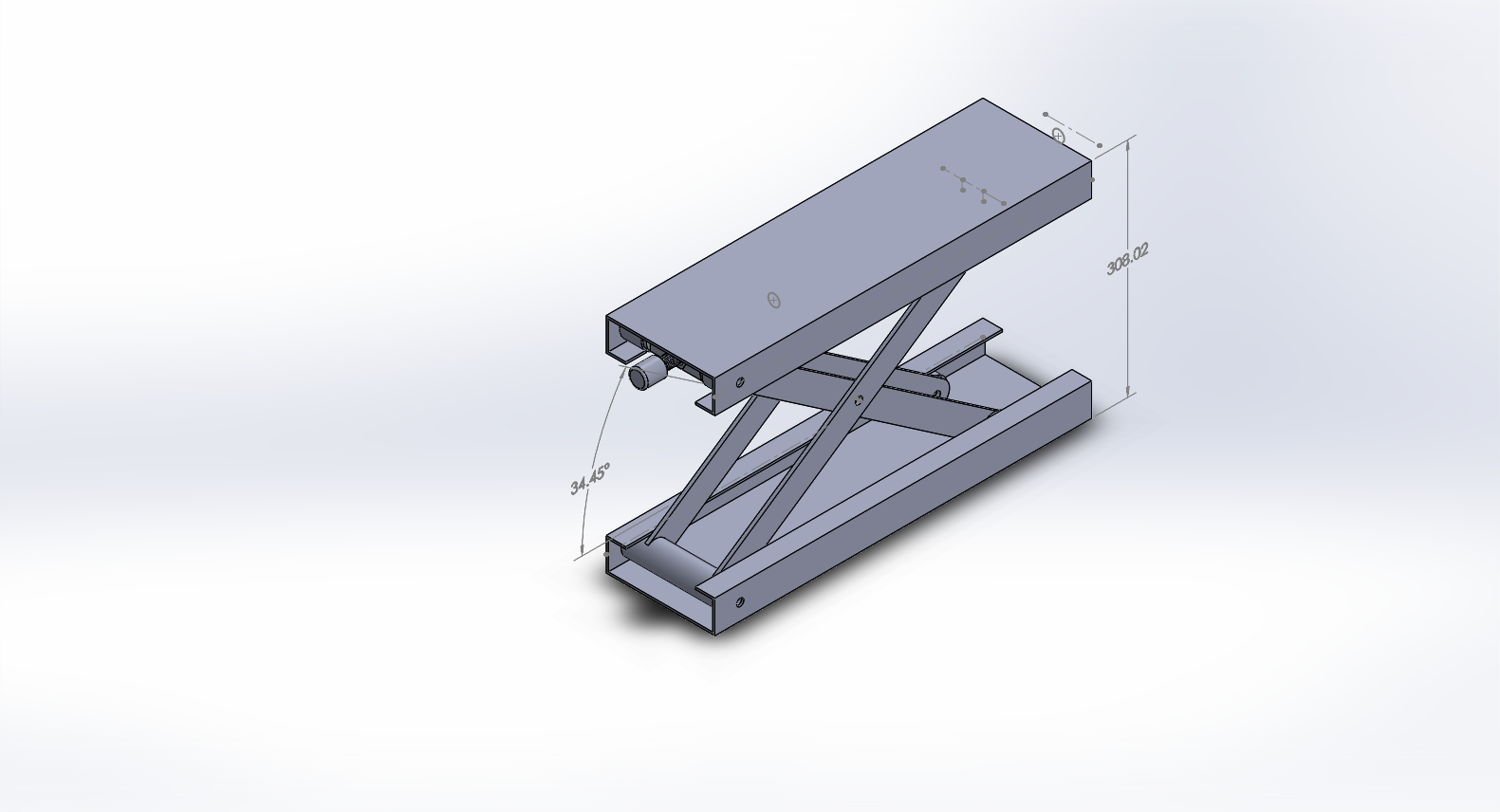
Lifting device calculations

The dimensions in this report base on the CAD model updated on 29 May 2017.



# Assumptions

Choosing lead screw SFU 3210-3 for initial calculations:

* Pitch diameter: 16mm
* Lead: 10mm
* Dynamic loading: 729kg
* Static loading: 1350kgf

Friction coefficient between steel screw and steel balls with machine oil: 0.15

User weight (W): 1000N (~101kg)

# Calculate Linear Force Acting on Lead Nut

Rx2

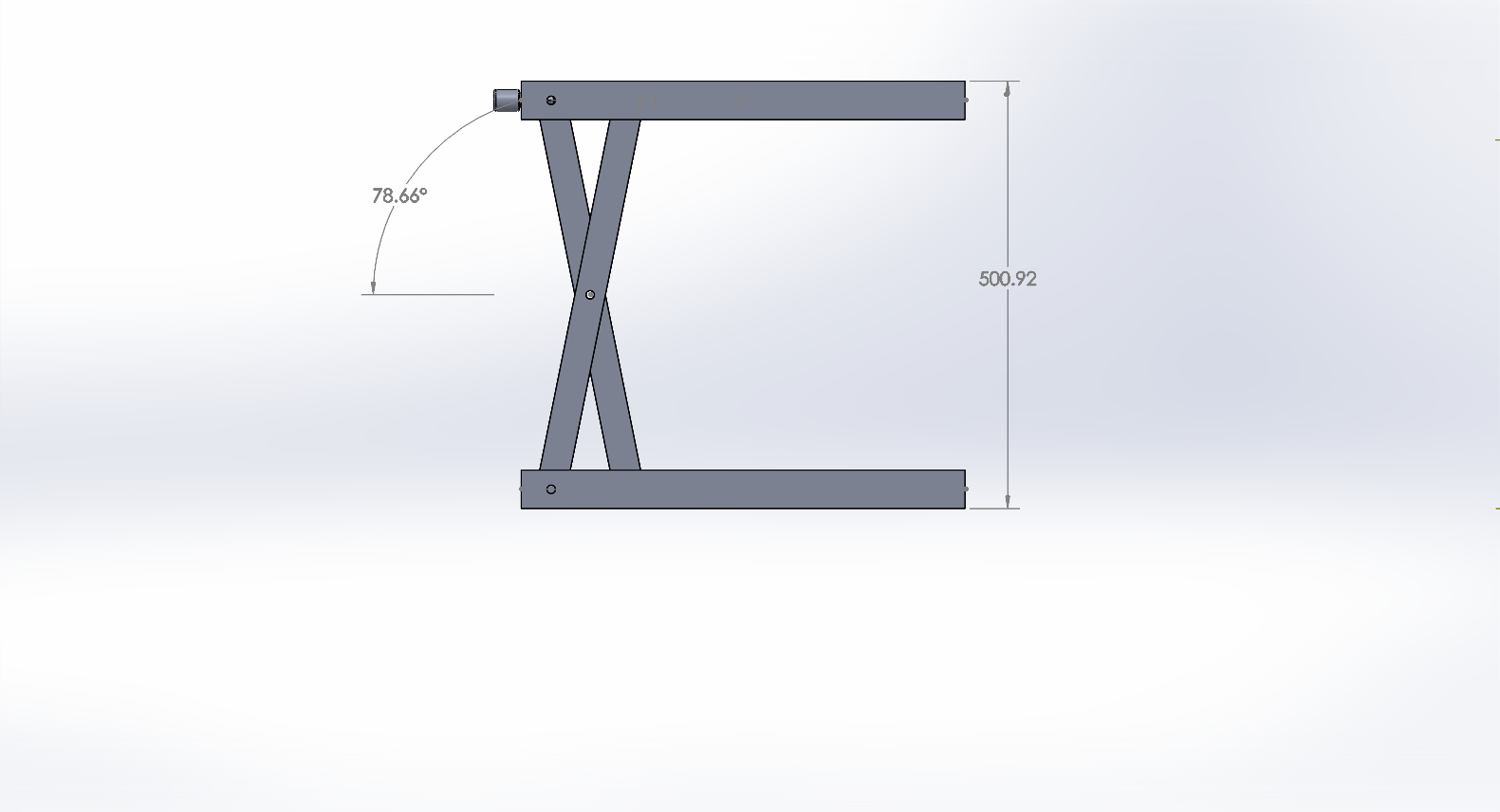
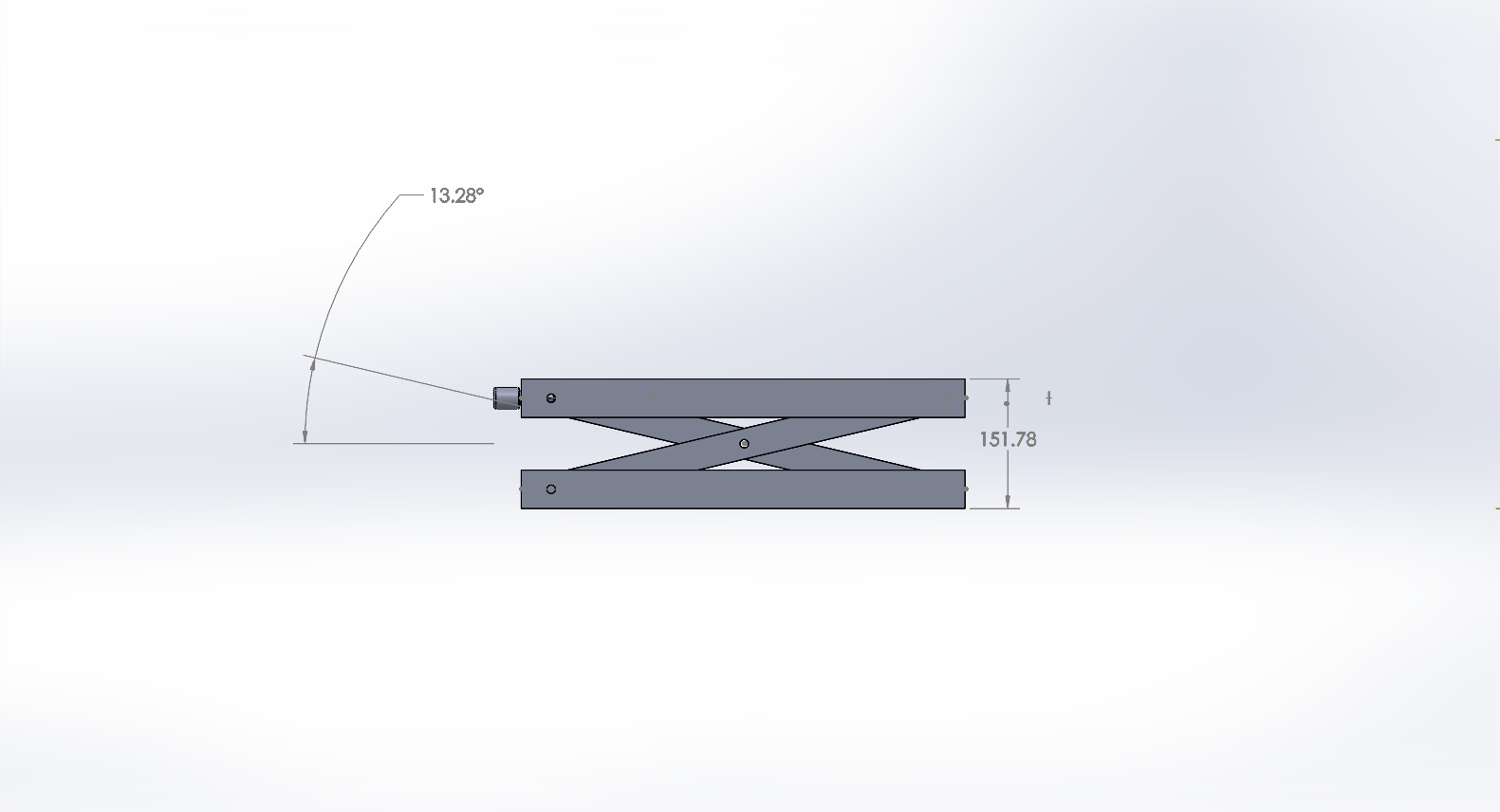
Ɵ

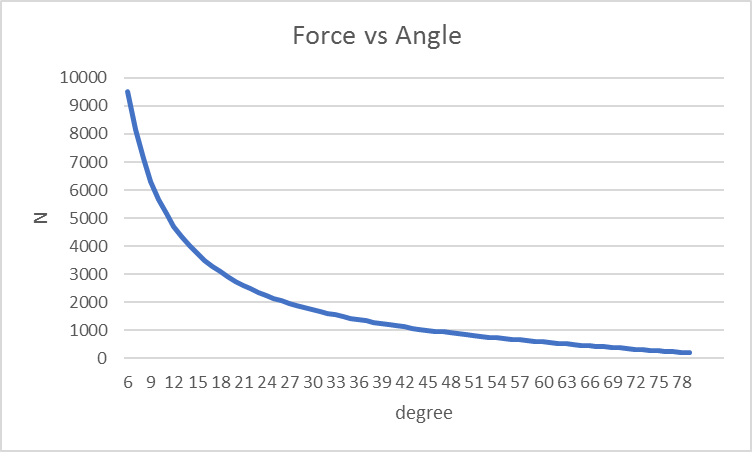
Ɵ

W

(see appendix for step by step)

The requirement height varies from 150mm to 500mm corresponding to Ɵ from 13.28 to 78.66 degree.

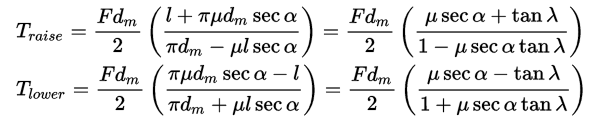




Critical force occurs when the jack is at its lowest position, Ɵ= 13.28 N= 4236 N.

# Calculate Torque Required on Lead Screw

Adopt equations for trapezoidal thread from Wiki (<https://en.wikipedia.org/wiki/Leadscrew>)



Where:

* *T* = torque
* *F* = load on the screw
* *dm* = pitch diameter
* {\displaystyle \mu \,}μ = coefficient of friction (common values are found in the adjacent table)
* *l* = lead
* {\displaystyle \phi \,}{\displaystyle \lambda \,}λ = lead angle

Maximum Torques:

Traise = 8.58 Nm

Tlower = -1.74 Nm (sign indicates opposite direction)

Assuming the handle arm (r) is 0.2m, the maximum required input is:

# Calculate Number of Turns

From lowest to highest position, the lead nut must travel: 360 mm.