

### Non-linear relationship between the pulse and the height

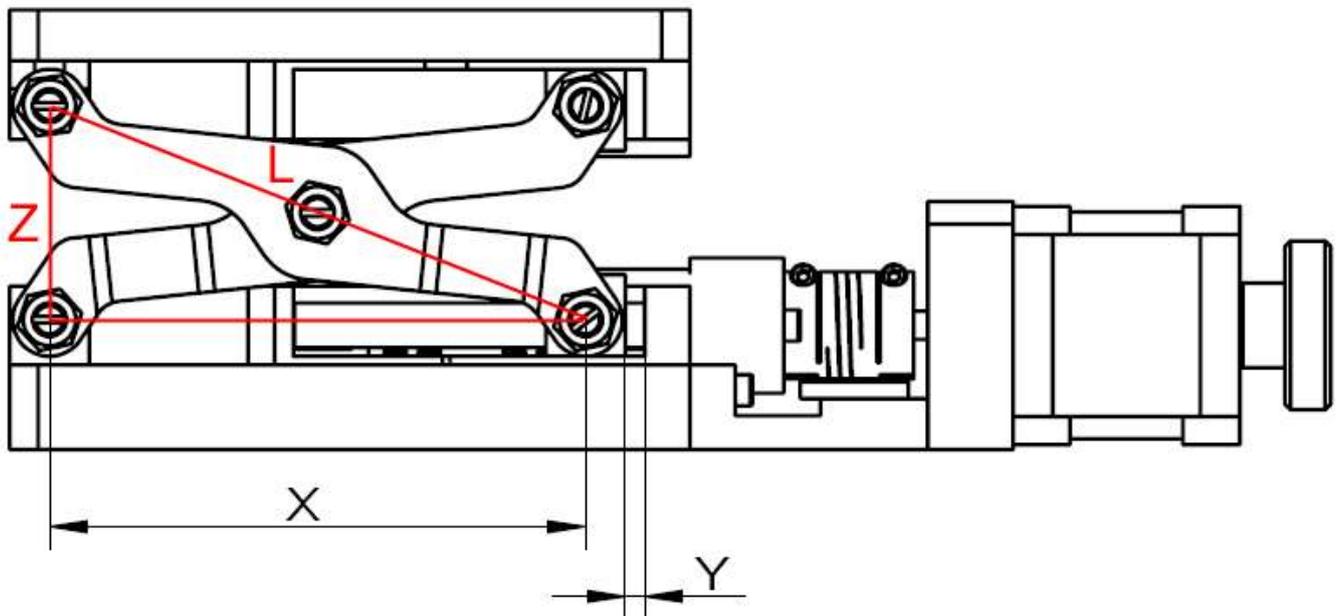


Figure 1

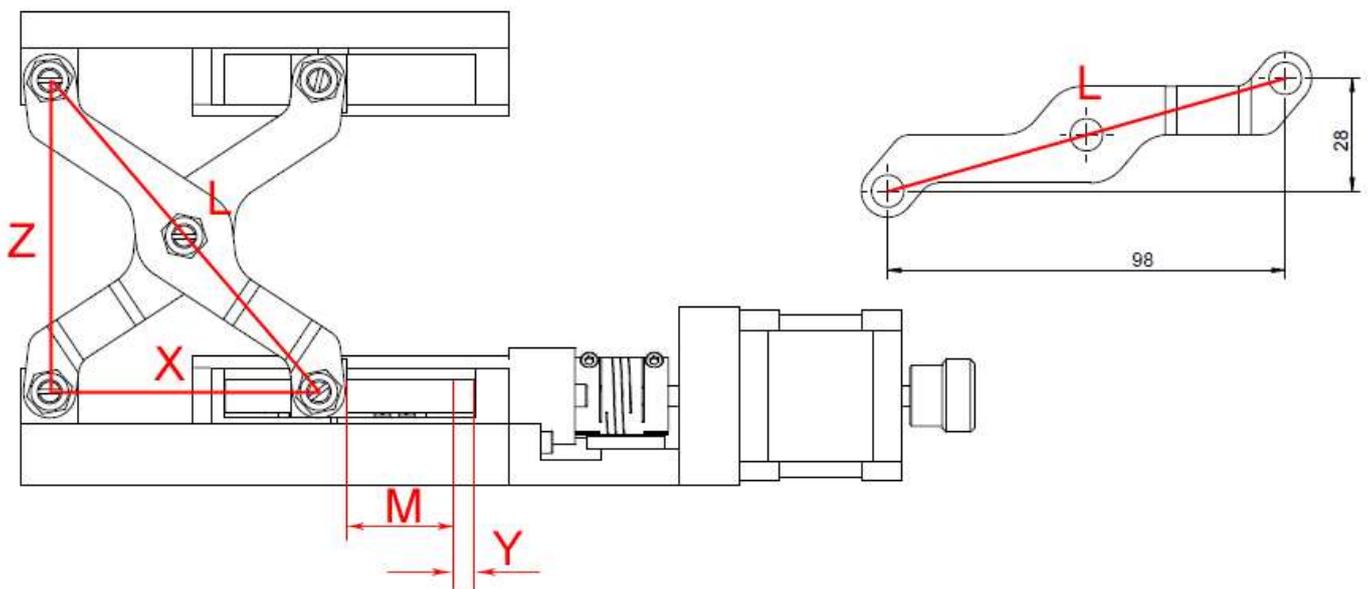


Figure 2

Figure 1 shows the position of the scissors structure when the lab jack is at the Home position. Y is not a fixed value due to the assembly deviation of the limit switch of each lab jack and it needs to be measured manually.

Figure 2 shows the position of the scissors structure when the lab jack is lifting to a certain height. M is the linear moving distance of the lead screw after the motor receives some pulses.  $X+M+Y=98\text{mm}$ .

We can get the relationship between the pulse and lifting height through the Pythagorean theorem.

NO.1 Formula:

$$Z = \sqrt{L^2 - X^2}$$

NO.2 Formula:

$$L^2=98^2+28^2=10388$$

NO.3 Formula:

$$X=98-M-Y$$

Y is the value measured manually when the lab jack is at the Home position.

M is the linear moving distance of the lead screw after the motor receives some pulses.

Now we can get Y from the following formulas:

(1) Integer step value of per rotation of the stepper motor =  $360 / \text{step angle of the stepper motor}$

(2) Pulse equivalent: the displacement (mm) by single pulse caused, namely control resolution.

(3) Pulse equivalent = pitch of the lead screw (mm) / (integer step value of per rotation of the step motor \* subdivision)

Displacement (mm) = pulse number \* pulse equivalent

For [Motorized Lab Jack MOZ-80-50](#), the step angle is 1.8, the pitch is 1.25mm, when the subdivision is 8, the pulse equivalent will be 0.00078125mm.

$M = \text{pulse equivalent} * \text{pulses}$ . Let's assume that we send 10000 pulses, then  $M = 7.8125\text{mm}$ . If the Y is 1mm after manually measuring,  $X = 98 - 7.8125 - 1 = 89.1875\text{mm}$ .

Finally, we will get the value of Z:

$$L^2=10388$$

$$X^2=(89.1875)^2 \approx 7954.4102$$

$$Z = \sqrt{10388 - 7954.4102} \approx 49.3314\text{mm}$$

That means if Y is 1mm, when we send 10000 pulses, the lifting height of lab jack will be approximately 49.3314mm.

If you have any questions, please contact us.