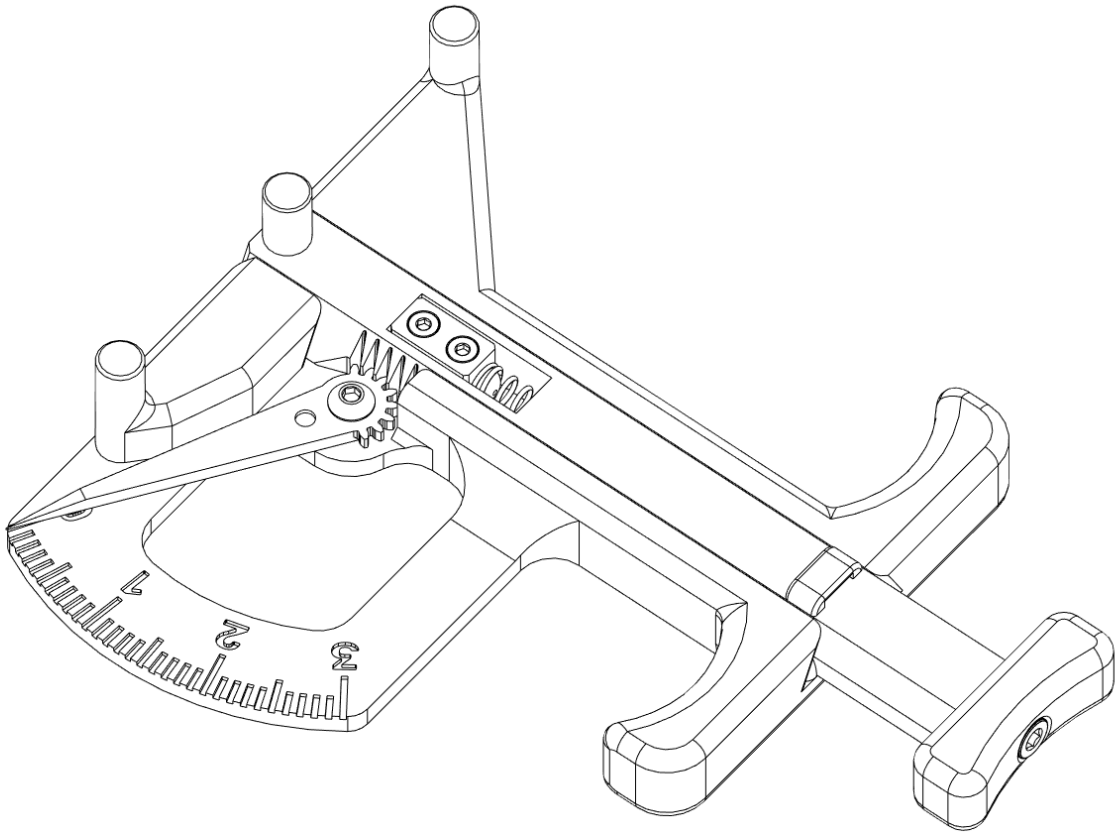
GT2 Belt Tensiometer (RC2)

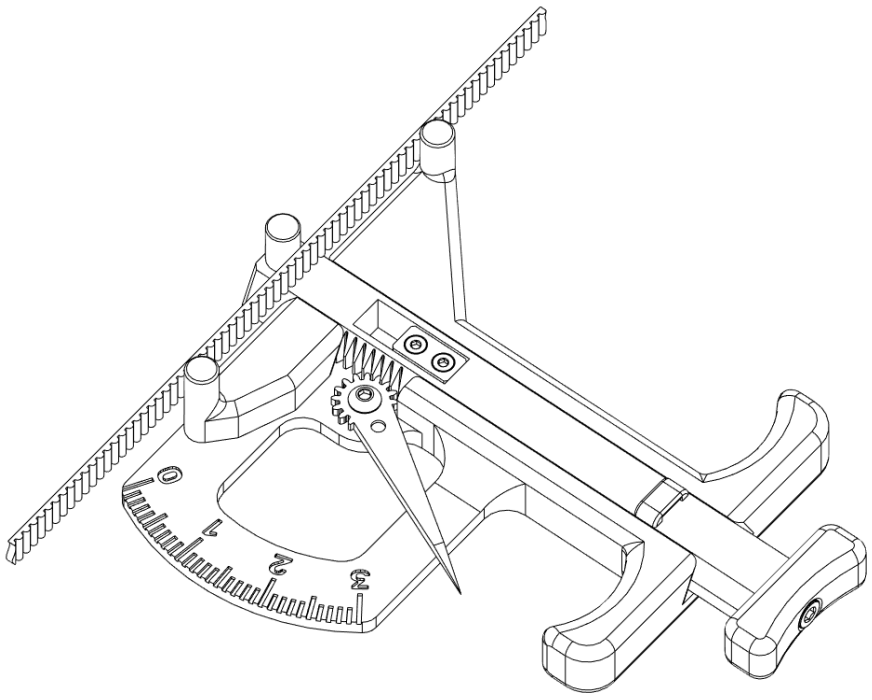


DETAILS:

This 3D printed tension meter is designed to measure belt deflection to determine belt tension for Gates 6 and 9mm GT2 belts. The goal is to eliminate the need for phone apps that use frequency to determine tension and to provide an easily repeatable number to use when tensioning belts on a 3D printer.

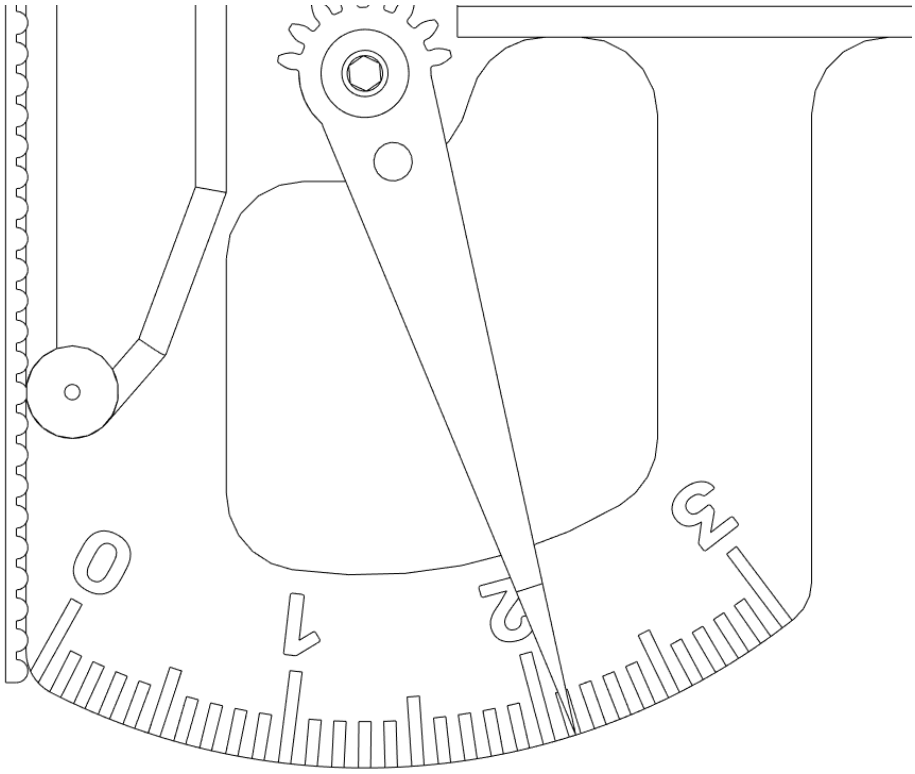
TENSION MEASUREMENT FOR A/B BELTS:

1. Refer to your printer's documentation for proper belt tension or refer to the table and references on pages 5-6.
2. Printer should be cold and motors on for this test.
3. Move your toolhead through its complete X and Y travel to set your belts.
4. Center your toolhead on the X axis and then position your Y axis so you have enough belt exposed to fit the tension meter with room on either side, 150mm or more is recommended.
5. Depress plunger and place meter on the belt span so that belt is routed through the gauge pins as shown.



6. Slowly release the plunger and note the reading on the dial. *rocking the meter very slightly fore and aft or lightly “pumping” plunger can help to settle the needle and get an accurate reading.
7. Repeat three times to ensure you are getting consistent readings.

8. Adjust belt tension then repeat steps 3-5 until you reach the desired tension (see table below) The A/B belt tensions can affect each other. Tightening one will also tighten the other. Go back and forth adjusting each until they are equal.



9. Home X and Y to seat the belts then repeat steps 2-5 to verify that tension is correct and make followup adjustments as needed.
10. Your belts should now be properly tensioned.

TENSION MEASUREMENT FOR Z BELTS:

1. Printer should be cold and motors on for this test.
2. Move your Z axis through its entire range of motion to normalize belt tension.
3. Position your Z axis so that enough belt is exposed to fit the tension meter with a bit of room left on each side. 150mm or more is recommended.
4. The tensioning process for Z belts is the same as A/B. Follow steps 5-9 for A/B instructions substituting Z values until your desired tension is reached and all Z belts are equal.

Note: Depending on your printer your belt tension may increase slightly when utilizing a heated chamber so keep this in mind when selecting tensions in the higher range. When checking tension always remember to run the printer through its full range of travel before measuring to normalize the tension in the belt path.

Tension guidelines for tested printers		
PRINTER MODEL - BELT	**MIN TENSION (meter reading)**	**MAX TENSION (meter reading)**
Voron - A/B (all stock models)	1.8 (1.9 EPDM)	2.2 (2.3 EPDM)
Voron 2.4 and Micron - Z	2.5 (2.6 EPDM)	2.8 (2.9 EPDM)
Switchwire - “Z”	1.8 (1.9 EPDM)	2.2 (2.3 EPDM)
Bambu Lab X1 and P series	N/A	2.4*
Prusa Mk3 and MK4	1.8**	2.5**
Creality Ender3	1.8**	2.2**

* Based on measurements taken from factory tensioned/calibrated printers.

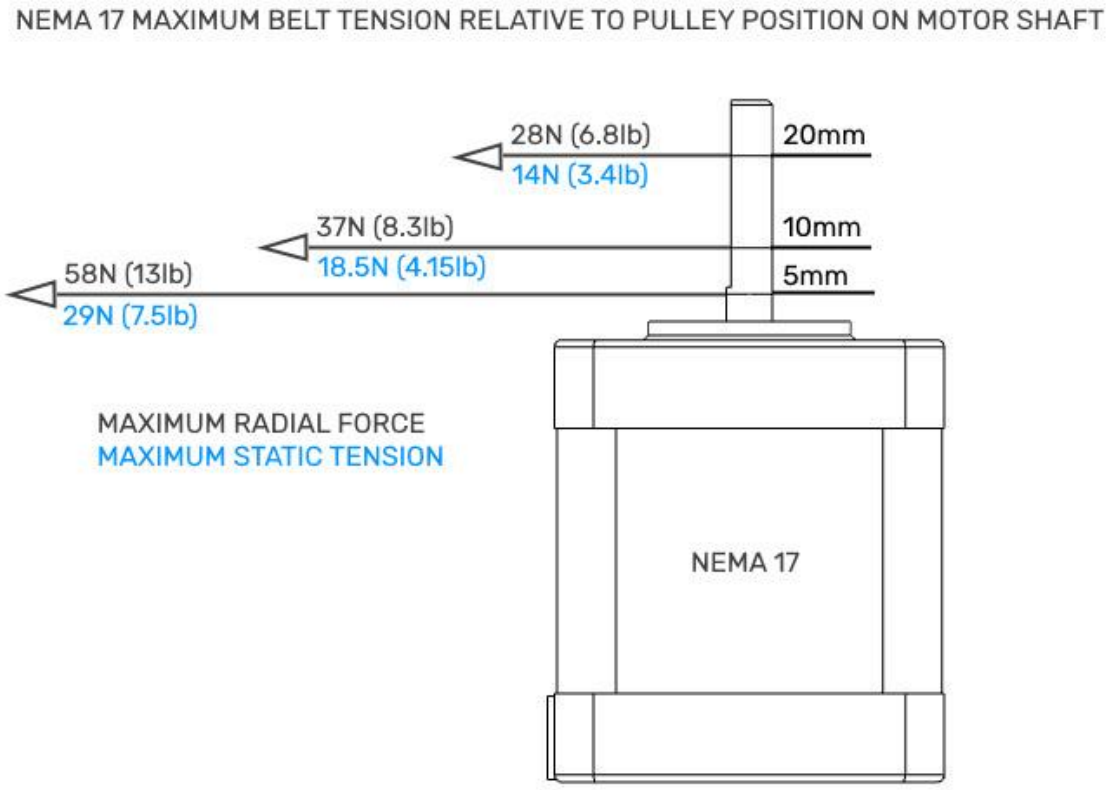
** Based on common specifications for unsupported NEMA17 stepper motor shaft and community input.

6mm & 9mm GT2 and GT3		
STATIC BELT TENSION N (lb)	**METER READING (NEOPRENE)**	**METER READING (EPDM)**
8.90 (2.0)	1.8	1.9
11.12 (2.5)	2.0	2.1
13.34 (3.0)	2.1	2.2
15.57 (3.5)	2.3	2.4
17.8 (4.0)	2.4	2.5
20.02 (4.5)	2.5	2.6
22.24 (5.0)	2.6	2.7
24.47 (5.5)	2.7	2.8
26.69 (6.0)	2.8	2.9
29.40 (6.5)	2.9	3.0

Common NEMA 17 Stepper Motor Maximum Radial Force Ratings

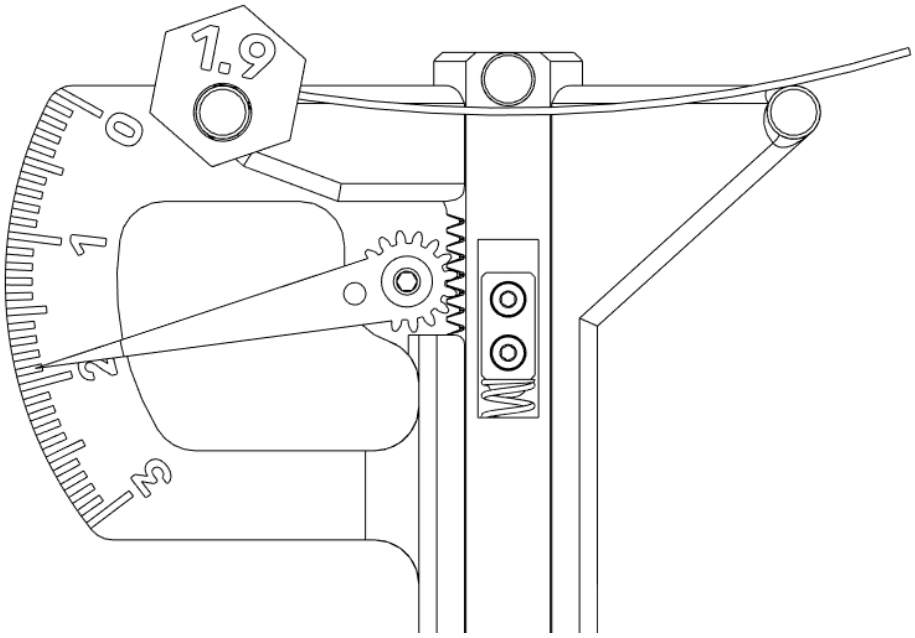
Distance from Step Motor Flange:	5mm	10mm	20mm
recommended Radial force:	20N (4.5lb)	13N (2.9lb)	9N (2.0lb)
maximum Radial force:	58N (13lb)	37N (8.3lb)	28N (6.8lb)

Radial Force = Static Belt Tension * 2



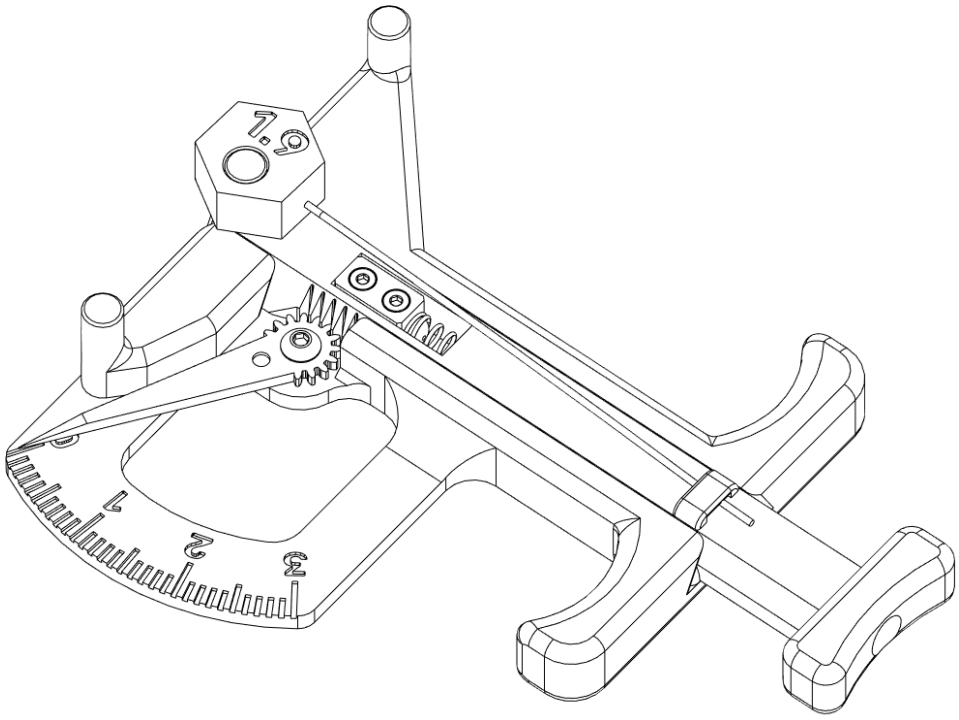
CALIBRATION:

1. Depress plunger and place calibration wire into the jaws making sure the pivot is seated all the way on the left pin as shown. Eye protection is recommended for this step.



2. Release the plunger and note the reading on the dial. Lightly tapping or “pumping” the plunger handle can help to settle the needle and get a better reading.
3. Tighten the screw one turn then depress and release the plunger again. Note that the reading has changed.
4. Repeat steps 3 and 4 until your meter consistently reads 1.9 when checking the deflection of the music wire.
5. Your meter is now calibrated and ready for use.

Calibration wire can be stowed on the center pin with wire secured beneath the slides wire keeper.



CARING FOR YOUR METER:

- Protect measurement pins from shock or excessive force. While the pins are designed to to exceed the measurement forces applied by the meter but will break if subjected to excessive force or drops.
- Keep away from harsh cleaners or anything containing acetone as these can damage the ABS plastic.
- No lubrication should be necessary. This design has been tested to several thousand cycles without need for followup lubrication.
- Please try to reuse the shipping box for storage. I did my best to specify a box that could be reused and minimize waste.

Rev. C