# Procedure for belt tensionning on the Vcore3

## Evolution

| Rédacteur | Responsable X | Qualité |
|---|---|---|
| FBR | FBR | FBR |
| | | |

| Indice | Date | Description de l'évolution | Auteur |
|---|---|---|---|
| 0.0 | 11/02/2022 | Création | FBR |
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This preocedure is made upon the work of Eddietheengineer, help and tests realized with John Beima.

## What is needed :

-A Vcore or another printer with GT2 genuines Gates belts

-Android phone with Spectroid / Sonic tension-meter 508C type

-Sheet for Gates calculation with Gates values

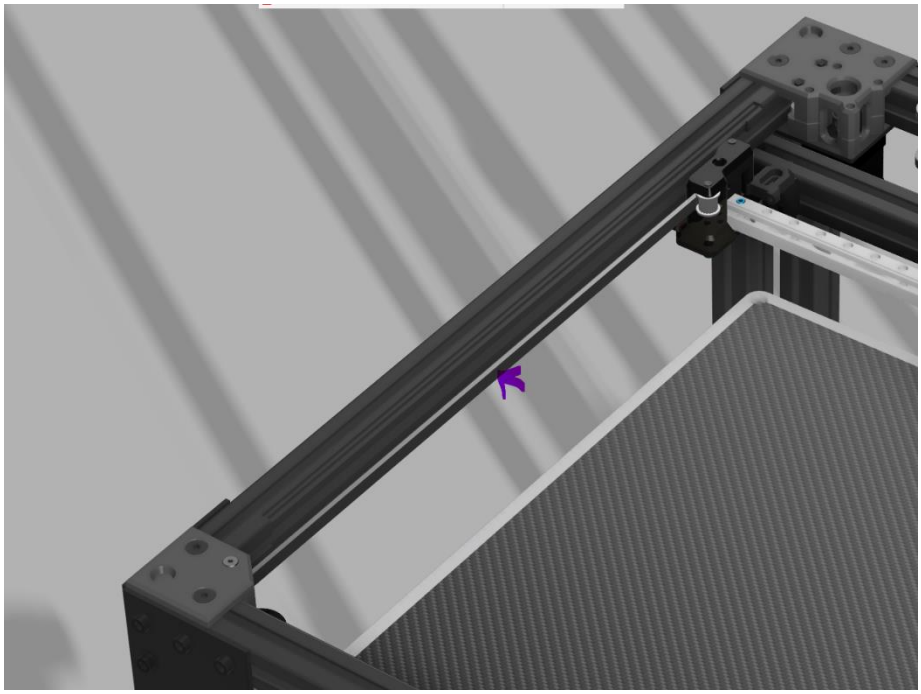
-A ruler

-15min of you time

If you want to skip to the calculated Values go to the last parts 😉

## 1-What we want to measure ?:

Put your X gantry to the Y endstop, We want to measure the frequency of the belt section here, and get the L lenght of it, center to center of the pulleys. In this exemple it is 530mm (0.53m)



## 1-Checking GATES values

**Table 8 – Static Belt Tension – General Values Tst (lb) Per Span**

**PowerGrip® GT®3 Belt Widths**

| Section | 4 mm | 6 mm | 9 mm | 12 mm | 15 mm | 20 mm | 25 mm |
|---|---|---|---|---|---|---|---|
| 2MGT GT3 | 6 | 10 | 17 | 24 | - | - | - |
| 3MGT GT3 | - | 14 | 24 | 33 | 43 | 61 | - |
| 5MGT GT3 | - | - | 27 | 38 | 50 | 70 | 91 |

**PowerGrip HTD Belt Widths**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 3M | - | 6 | 9 | 13 | 17 | 25 | - |
| 5M | - | - | 10 | - | 19 | 26 | 34 |

**PowerGrip Timing Belt Widths**

| Section | 1/8" | 3/16" | 1/4" | 5/16" | 3/8" | 7/16" | 1/2" |
|---|---|---|---|---|---|---|---|
| MXL | 2 | 3 | 4 | 4 | 5 | - | - |
| XL | - | - | 5 | 6 | 7 | 8 | 10 |

Aim is to reach 6Lb on those 9mm belts

## 2-Calculations

The formula used is :

$$f_0 = \frac{1}{2L}\sqrt{\frac{F}{\mu}}$$

L is the value you have to find one your machine, theorically you aim to check the longest lenght, In the Vcore we will use the previous displayed one for convenience of testing.

In the Excel file ***"Belt_Tension_Calculation.ods"*** in the Git, in the rows concerned about the 9mm GT2 belt you will have to enter the lenght measured, Typically 530 for a V500 for instance.

| f0= | =1/2L | L | =SR(F/u) | =F/u | F - lb | F - Adj | F - N | F | u (9mm GT2) |
|---|---|---|---|---|---|---|---|---|---|
| 43,68 | 0,943396 | 0,53 | 46,30032918 | 2143,72048193 | 6 | 1 | 4,44822 | 26,689320 | 0,01245 |
| 53,50 | 0,943396 | 0,53 | 56,7060907 | 3215,58072289 | 6 | 1,5 | 4,44822 | 40,033980 | 0,01245 |
| 61,77 | 0,943396 | 0,53 | 65,47855346 | 4287,44096386 | 6 | 2 | 4,44822 | 53,378640 | 0,01245 |

The results are calculated in the SR column

| f0= | =1/2L | L | =SR(F/u) | =F/u | F - lb | F - Adj | F - N | F | u (9mm GT2) |
|---|---|---|---|---|---|---|---|---|---|
| 43,68 | 0,943396 | 0,53 | 46,30032918 | 2143,72048193 | 6 | 1 | 4,44822 | 26,689320 | 0,01245 |
| 53,50 | 0,943396 | 0,53 | 56,7060907 | 3215,58072289 | 6 | 1,5 | 4,44822 | 40,033980 | 0,01245 |
| 61,77 | 0,943396 | 0,53 | 65,47855346 | 4287,44096386 | 6 | 2 | 4,44822 | 53,378640 | 0,01245 |

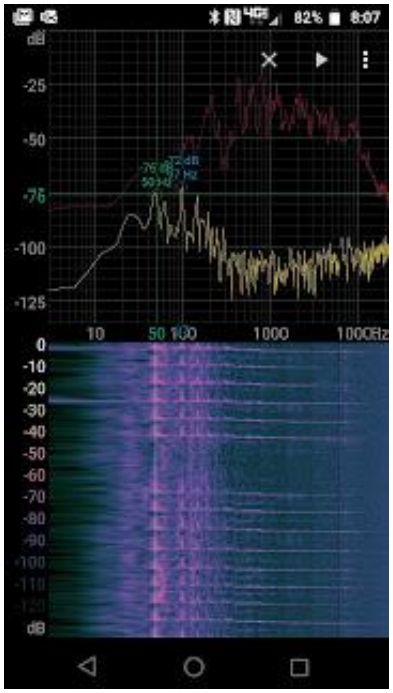
The last 2 rows are what we want to get (F-adj 1.5-2)

| | |
|---|---|
| 0,53 | 56,7060907 |
| 0,53 | 65,47855346 |

Here between +-56.7-65.4Hz

## 3-Frequency tuning :

We will use Spectroid here. Got and pinch the belt at the middle, try to make a repetitive pinch to get a ponderate value




We want to look at the first occurrence, displayed at a certain frequency

Then tune the tensionner to reach the range previously calculated (+-56.7-65.4Hz)

Repeat it on the othe side

Don’t forget we have a Hz margin, assuming the frame is squared, and you still need to make a slight variation to accomodate a fine tuning for the Octogon calibration to reach perfect Rotation_Distance values.

## 4-Disclaimer :

This guide was made after long researchs and tests, considering input shaping, tension, XY accuracy. I thing it is the best way to reach every objectives. If someone get other intel or methods that goes against this one, I will be glad to discuss it.

## 5-Final values :

If you don't want to spend time in the math you can tune you Vcore directly with the next values, accordingly to the Vcore Size, you will be in the right spot.

# Vcore3 300mm

# 86-100Hz

# Vcore3 400mm

# 66-75Hz

# Vcore3 500mm

# 53-64Hz

## 8 Useful links :

https://en.wikipedia.org/wiki/String_vibration

https://www.gates.com/content/dam/gates/home/knowledge-center/resource-library/catalogs/light-power-and-precision-manual.pdf

https://www.youtube.com/watch?v=FoOMxGOeNvs&t

https://github.com/eddietheengineer/documentation/tree/master/belt_tension/data

Special thanks to the amazing work of Eddietheengineer to bring clear and deep explanation for that kind of advanced tuning features