

Headless Bass

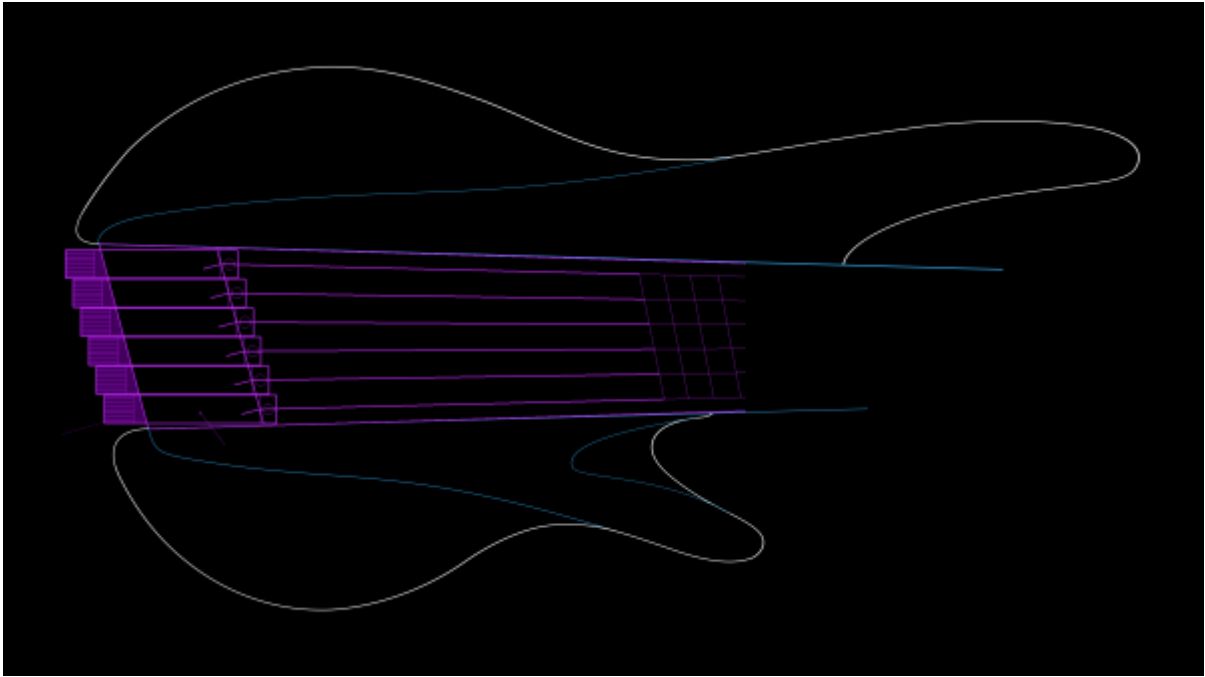
Ressourcen

Holz

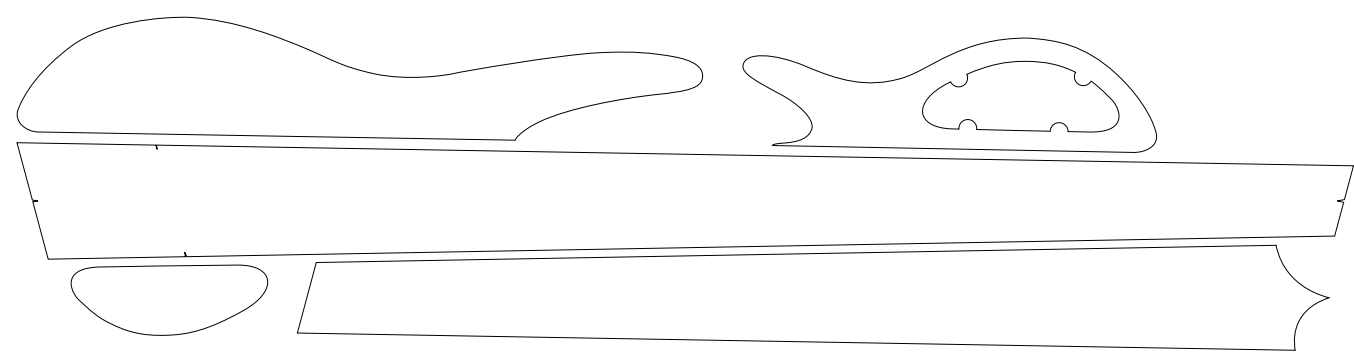
- Bubinga
- Ebenholz
- Mahagonie
- Wenge Furnier
- Walnuss Wurzelholz

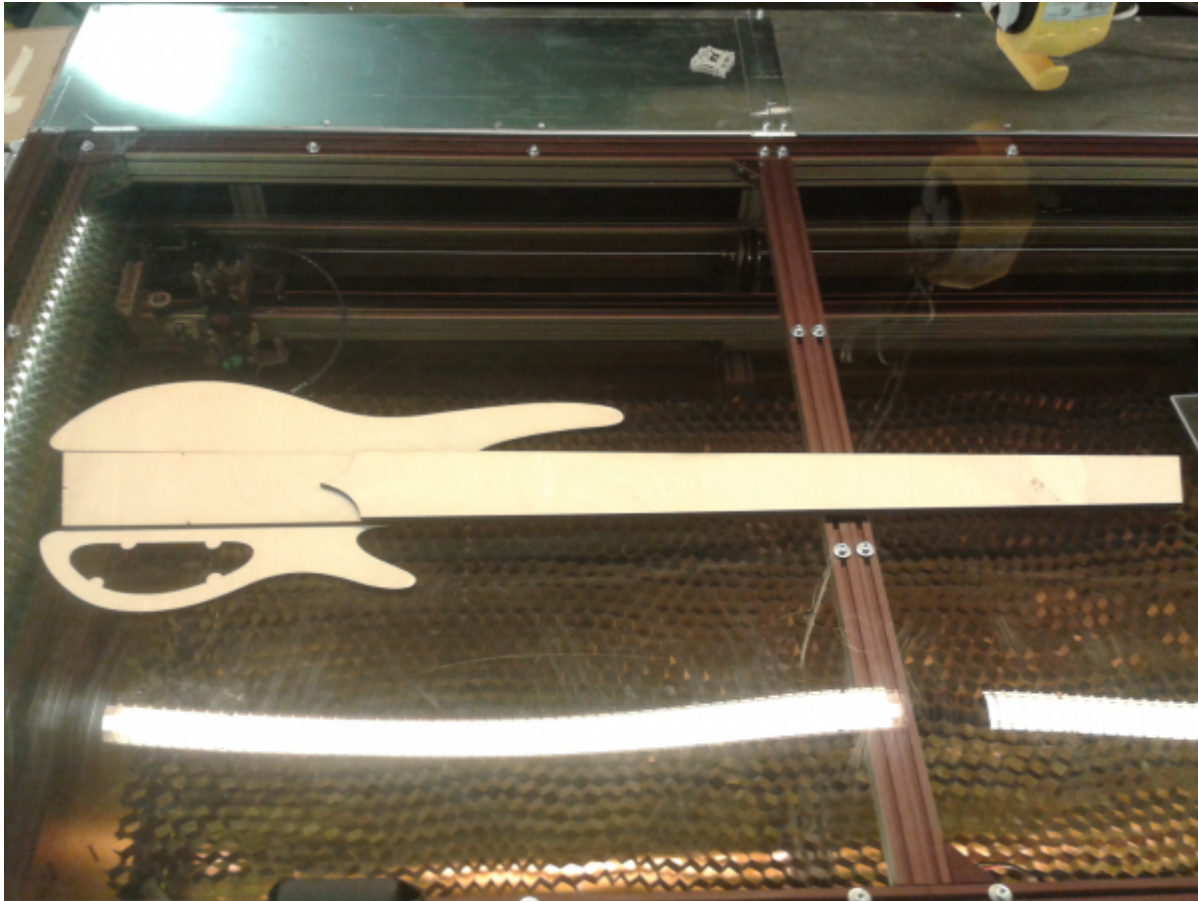


Design



Lasercutting Templates

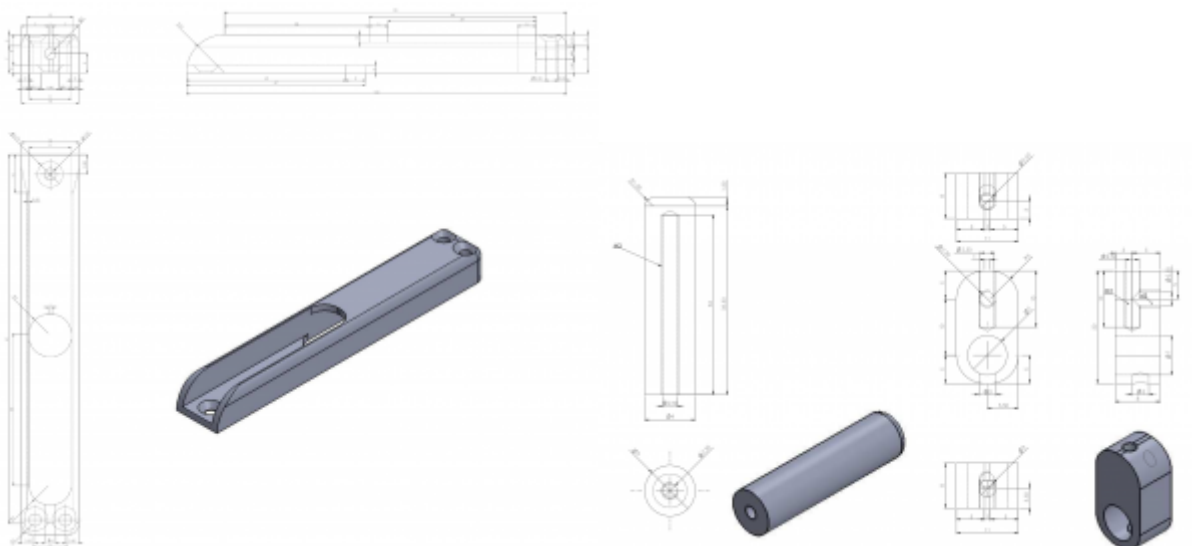




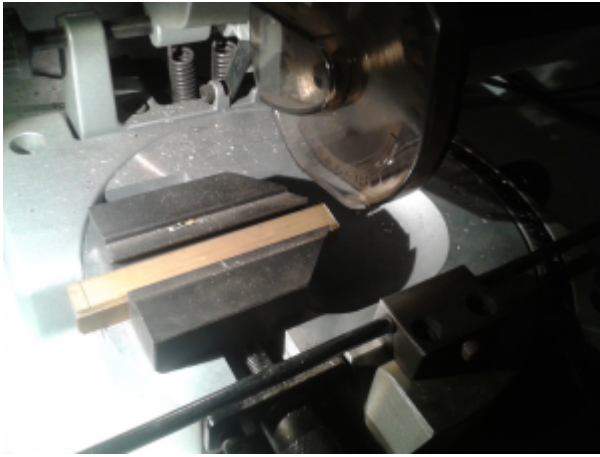
[Video](#)

Mechanik

- CAD Design



- Messing Profile auf Maße kappen



- Fräsen, Drehen, Bohren, Senken, Schleifen, ...

[Video \(Prototyp\)](#)





- GCode:

Werkbett 1

%

(Creates a nice bed to place the workpiece)

G21 (using mm)

G40 (manual toolrad comp)

(Operation config)

#<z-safe> = 20 (safe height)

#<z-feed> = 0.5 (depth feed steps)

#<toolrad> = 4

#<feedrate> = 200

(Workpiece params)

#<width> = [15 + 0.5] (2 x .25mm margin for workpiece)

#<length> = [93.8 + 0.5] (2 x .25mm margin for workpiece)

#<depth> = -2

G00 X0 Y0 Z[#<z-safe>]

(Corners)

G00 X[#<width> * 0.5] Y[#<length> * 0.5]

G01 Z[#<depth>] F[#<feedrate>]

G00 Z[#<z-safe>]

G00 X[#<width> * -0.5]

G01 Z[#<depth>] F[#<feedrate>]

G00 Z[#<z-safe>]

G00 Y[#<length> * -0.5]

G01 Z[#<depth>] F[#<feedrate>]

G00 Z[#<z-safe>]

G00 X[#<width> * 0.5]

G01 Z[#<depth>] F[#<feedrate>]

G00 Z[#<z-safe>]

(Return to Origin)

G00 X0 Y0 Z[#<z-safe>]

(Square)

G00 X[#<width> * 0.5 - #<toolrad>]

G01 Z[#<depth>] F[#<feedrate>]

G01 Y[#<length> * -0.5 + #<toolrad>] F[#<feedrate>]

G01 X[#<width> * -0.5 + #<toolrad>] F[#<feedrate>]

G01 Y[#<length> * 0.5 - #<toolrad>] F[#<feedrate>]

G01 X[#<width> * 0.5 - #<toolrad>] F[#<feedrate>]

G01 Y0 F[#<feedrate>]

G00 Z[#<z-safe>]

(Return to Origin)

G00 X0 Y0 Z[#<z-safe>]

%

Aussparung 1

%

(Creates the first, closed pocket)

G21 (using mm)

G40 (manual toolrad comp)

(Operation config)

#<z-safe> = 20 (safe height)

#<z-feed> = 0.25 (depth feed steps)

#<toolrad> = 4

#<feedrate> = 200

(Workpiece params)

#<wp_length> = 93.8

#<width> = [12 + 0.2] (0.1mm margin on each side)

#<length> = 40

#<depth> = [8 + 1] (1mm safety margin)

#<steps> = [#<depth> / #<z-feed>]

G00 X0 Y0 Z[#<z-safe>]

G00 Y[#<wp_length> * 0.5 - #<toolrad> - 8] X[#<width> * 0.5 - #<toolrad>]

#<current_depth> = [#<depth>]

0101 repeat [#<steps>]

 #<current_depth> = [#<current_depth> - #<z-feed>]

 G01 Z[#<current_depth>] F[#<feedrate> * 0.05]

 G01 Y[#<wp_length> * 0.5 - #<toolrad> - #<length> - 8] F[#<feedrate>]

 G01 X[#<width> * -0.5 + #<toolrad>] F[#<feedrate>]

 G01 Y[#<wp_length> * 0.5 - #<toolrad> - 8] F[#<feedrate>]

 G01 X[#<width> * 0.5 - #<toolrad>] F[#<feedrate>]

0101 endrepeat

G00 Z[#<z-safe>]

(Return to Origin)

G00 X0 Y0 Z[#<z-safe>]

%

Aussparung 2

%

(Creates a the second, open pocket)
(flip workpiece with closed pocket facing down on the clamped side)

G21 (using mm)

G40 (manual toolrad comp)

(Operation config)

#<z-safe> = 20 (safe height)

#<z-feed> = 0.25 (depth feed steps)

#<toolrad> = 4

#<feedrate> = 200

(Workpiece params)

#<wp_length> = 93.8

#<width> = [12 + 0.2] (0.1mm margin on each side)

#<length> = 46.9

#<depth> = [8 + 1] (1mm safety margin)

#<steps> = [#<depth> / #<z-feed>]

G00 X0 Y0 Z[#<z-safe>]

G00 Y[#<wp_length> * 0.5 + #<toolrad>] X[#<width> * 0.5 - #<toolrad>]

#<current_depth> = [#<depth>]

0101 repeat [#<steps>]

 #<current_depth> = [#<current_depth> - #<z-feed>]

 G01 Z[#<current_depth>] F[#<feedrate>]

 G01 Y[#<wp_length> * 0.5 - #<toolrad> - #<length>] F[#<feedrate>]

 G01 X[#<width> * -0.5 + #<toolrad>] F[#<feedrate>]

 G01 Y[#<wp_length> * 0.5 + #<toolrad>] F[#<feedrate>]

 G01 X[#<width> * 0.5 - #<toolrad>] F[#<feedrate>]

0101 endrepeat

G00 Z[#<z-safe>]

(Return to Origin)

G00 X0 Y0 Z[#<z-safe>]

%

Seitliche Verrundung

%

(creates a bevel on the back side)

(clamp workpiece on open pocket)

G21 (using mm)

G40 (manual toolrad comp)

(Operation config)

#<z-safe> = 20 (safe height)

#<z-feed> = 0.25 (depth feed steps)

#<toolrad> = 4

#<feedrate> = 200

(Workpiece params)

#<wp_width> = 15

#<depth> = [10 + 1] (1mm safety margin)

#<bevel> = 3

#<wp_length> = [93.8 - #<bevel> + 2.5]

#<steps> = [#<depth> / #<z-feed> * 0.5]

G00 X0 Y0 Z[#<z-safe>]

G00 Y[#<wp_length> * 0.5 + #<toolrad> - [#<bevel> + #<toolrad>]]

X[#<wp_width> * 0.5 + #<toolrad>]

#<current_depth> = [#<depth>]

0101 repeat [#<steps>]

 #<current_depth> = [#<current_depth> - #<z-feed>]

 G01 Z[#<current_depth> - 2] F[#<feedrate>]

 G03 X[#<wp_width> * 0.5 + #<toolrad> - [#<bevel> + #<toolrad>]]

Y[#<wp_length> * 0.5 + #<toolrad>] I[#<bevel> + #<toolrad>] * -1]

F[#<feedrate>]

 G01 X[#<wp_width> * -0.5 - #<toolrad> + [#<bevel> + #<toolrad>]]

F[#<feedrate>]

 G03 X[#<wp_width> * -0.5 - #<toolrad>] Y[#<wp_length> * 0.5 + #<toolrad>
- [#<bevel> + #<toolrad>]] J[#<bevel> + #<toolrad>] * -1] F[#<feedrate>]

 #<current_depth> = [#<current_depth> - #<z-feed>]

 G01 Z[#<current_depth> - 2] F[#<feedrate>]

 G02 X[#<wp_width> * -0.5 - #<toolrad> + [#<bevel> + #<toolrad>]]

Y[#<wp_length> * 0.5 + #<toolrad>] I[#<bevel> + #<toolrad>]] F[#<feedrate>]

 G01 X[#<wp_width> * 0.5 + #<toolrad> - [#<bevel> + #<toolrad>]]

F[#<feedrate>]

 G02 Y[#<wp_length> * 0.5 + #<toolrad> - [#<bevel> + #<toolrad>]]

X[#<wp_width> * 0.5 + #<toolrad>] J[#<bevel> + #<toolrad>] * -1]

F[#<feedrate>]

0101 endrepeat

```
G00 Z[#<z-safe>]

(Return to Origin)
G00 X0 Y0 Z[#<z-safe>]
%
```

Werkbett 2

```
%

(Creates a nice bed to place the workpiece)

G21 (using mm)
G40 (manual toolrad comp)

(Operation config)
#<z-safe> = 20 (safe height)
#<z-feed> = 0.5 (depth feed steps)
#<toolrad> = 4
#<feedrate> = 200

(Workpiece params)
#<width> = [10 + 0.5] (2 x .25mm margin for workpiece)
#<length> = [93.8 + 0.5] (2 x .25mm margin for workpiece)
#<depth> = -2

G00 X0 Y0 Z[#<z-safe>]

(Corners)

    G00 X[#<width> * 0.5] Y[#<length> * 0.5]
    G01 Z[#<depth>] F[#<feedrate>]
    G00 Z[#<z-safe>]

    G00 X[#<width> * -0.5]
    G01 Z[#<depth>] F[#<feedrate>]
    G00 Z[#<z-safe>]

    G00 Y[#<length> * -0.5]
    G01 Z[#<depth>] F[#<feedrate>]
    G00 Z[#<z-safe>]

    G00 X[#<width> * 0.5]
    G01 Z[#<depth>] F[#<feedrate>]
    G00 Z[#<z-safe>]
(Return to Origin)
G00 X0 Y0 Z[#<z-safe>]

(Square)
```

```

G00 X[#<width> * 0.5 - #<toolrad>]
G01 Z[#<depth>] F[#<feedrate>]
G01 Y[#<length> * -0.5 + #<toolrad>] F[#<feedrate>]

G01 X[#<width> * -0.5 + #<toolrad>] F[#<feedrate>]
G01 Y[#<length> * 0.5 - #<toolrad>] F[#<feedrate>]
G01 X[#<width> * 0.5 - #<toolrad>] F[#<feedrate>]
G01 Y0 F[#<feedrate>]

G00 Z[#<z-safe>]
(Return to Origin)
G00 X0 Y0 Z[#<z-safe>]

%
```

Vordere Verrundung

```

%

(Creates the second bevel on the front side)
(flip workpiece with closed pocket facing down on the clamped side)

G21 (using mm)
G40 (manual toolrad comp)

(Operation config)
#<z-safe> = 20 (safe height)
#<z-feed> = 0.25 (depth feed steps)
#<toolrad> = 4
#<feedrate> = 200

(Workpiece params)
#<wp_length> = 88
#<wp_width> = 10
#<depth> = [15 + 1] (1mm safety margin)
#<bevel> = [10 + #<toolrad>]

#<steps> = [#<depth> / #<z-feed> * 0.5]

G00 X0 Y0 Z[#<z-safe>]

G00 Y[#<wp_length> * 0.5 + #<toolrad> - #<bevel>] X[#<wp_width> * 0.5 +
#<toolrad>]

#<current_depth> = [#<depth>]

0101 repeat [#<steps>]

    #<current_depth> = [#<current_depth> - #<z-feed>]

    G01 Z[#<current_depth> - 2] F[#<feedrate>]
```

```

    G03 X[#<wp_width> * 0.5 + #<toolrad> - #<bevel>] Y[#<wp_length> * 0.5 +
#<toolrad>] I[#<bevel> * -1] F[#<feedrate>]
    #<current_depth> = [#<current_depth> - #<z-feed>]

    G01 Z[#<current_depth> - 2] F[#<feedrate>]
    G02 X[#<wp_width> * 0.5 + #<toolrad>] Y[#<wp_length> * 0.5 + #<toolrad>
- #<bevel>] J[#<bevel> * -1] F[#<feedrate>]

0101 endrepeat

G00 Z[#<z-safe>]

(Return to Origin)
G00 X0 Y0 Z[#<z-safe>]
%
```

- Knöpfe Rändeln für mehr Grip



- Kopfstück designen ✓
- Fräsen, Bohren ✓

```

%

G21 (using mm)
G40 (manual toolrad comp)

#<feed>          = 400.000000 (Feed definition)
#<z_feed_rate>    = 100.000000 (Feed definition)

#<depth>         = 9.5 (Pocket depth)
```

```

#<z_feed>                = 0.25
#<string_spacing> = 9
#<strings>                = 6
#<z-safe>                  = 5

#<steps>                  = [#<depth> / #<z_feed>]
#<n>                      = 0
#<current_depth>         = 0

0101 repeat [#<strings>]

    G00 Z[#<z-safe>]
    #<current_depth>      = 0
    0102 repeat [#<steps>]

        #<current_depth> = [#<current_depth> - #<z_feed>]
        G00 Y[5.900 + #<string_spacing> * #<n>] X[-7.150] F[#<feed>]

        G01 Z[#<current_depth>] F[#<z_feed_rate>]

        G02 Y[5.900 + #<string_spacing> * #<n>] X[-7.150] I[0.950]
F[#<feed>]

    0102 endrepeat
    #<n> = [#<n> + 1]
0101 endrepeat

G00 Z[#<z-safe>]
G00 X0 Y0
%
```

%

```

G21 (using mm)
G40 (manual toolrad comp)
```

```

#<feed>                = 400.000000 (Feed definition)
#<z_feed_rate>          = 100.000000 (Feed definition)

#<depth>                = 8.5 (Pocket depth)
#<z_feed>                = 0.25
#<string_spacing> = 9
#<strings>                = 6
#<z-safe>                  = 5

#<steps>                  = [#<depth> / #<z_feed>]
#<n>                      = 0
#<current_depth>         = 0

0101 repeat [#<strings>]
```

```

G00 Z[#<z-safe>]
#<current_depth>      = 0
0102 repeat [#<steps>]

    #<current_depth> = [#<current_depth> - #<z_feed>]
    G00 Y[10.440 + #<string_spacing> * #<n>] X[13.148] F[#<feed>]
    G01 Z[#<current_depth>] F[#<z_feed_rate>]
    G01 Y[3.394 + #<string_spacing> * #<n>] X[-13.148] F[#<feed>]
    G01 Y[4.694 + #<string_spacing> * #<n>] F[#<feed>]
    G01 Y[11.740 + #<string_spacing> * #<n>] X[13.148] F[#<feed>]

0102 endrepeat
#<n> = [#<n> + 1]
0101 endrepeat

G00 Z[#<z-safe>]
G00 X0 Y0
%
```

```

%

G21 (using mm)
G40 (manual toolrad comp)

#<feed>          = 400.000000 (Feed definition)
#<z_feed_rate>    = 100.000000 (Feed definition)

#<z_feed>        = 0.25
#<string_spacing> = 9
#<z-safe>        = 5

(Hole 1, 4.2mm)

#<current_depth> = 0
#<depth>         = [9 + 4.121]
#<steps>         = [#<depth> / #<z_feed>]

G00 Z[#<z-safe>]
G00 X[-0.1] Y[15.378 + 0.1] F[#<feed>]

0101 repeat [#<steps>]

    #<current_depth> = [#<current_depth> - #<z_feed>]

    G01 Z[#<current_depth>] F[#<z_feed_rate>]

    G02 X[-0.1] Y[15.378 + 0.1] I[0.1] F[#<feed>]

0101 endrepeat
```

(Hole 2, 7mm)

```
#<current_depth> = 0
#<depth>          = [9 + 6.452]
#<steps>          = [#<depth> / #<z_feed>]
```

```
G00 Z[#<z-safe>]
G00 X[-1.5] Y[26.578] F[#<feed>]
```

```
0102 repeat [#<steps>]
```

```
    #<current_depth> = [#<current_depth> - #<z_feed>]
```

```
    G01 Z[#<current_depth>] F[#<z_feed_rate>]
```

```
    G02 X[-1.5] Y[26.578] I[1.5] F[#<feed>]
```

```
0102 endrepeat
```

(Hole 3, 4.2mm)

```
#<current_depth> = 0
#<depth>          = [9 + 8.783]
#<steps>          = [#<depth> / #<z_feed>]
```

```
G00 Z[#<z-safe>]
G00 X[-0.1] Y[40.278 + 0.1 - 2.4] F[#<feed>]
```

```
0103 repeat [#<steps>]
```

```
    #<current_depth> = [#<current_depth> - #<z_feed>]
```

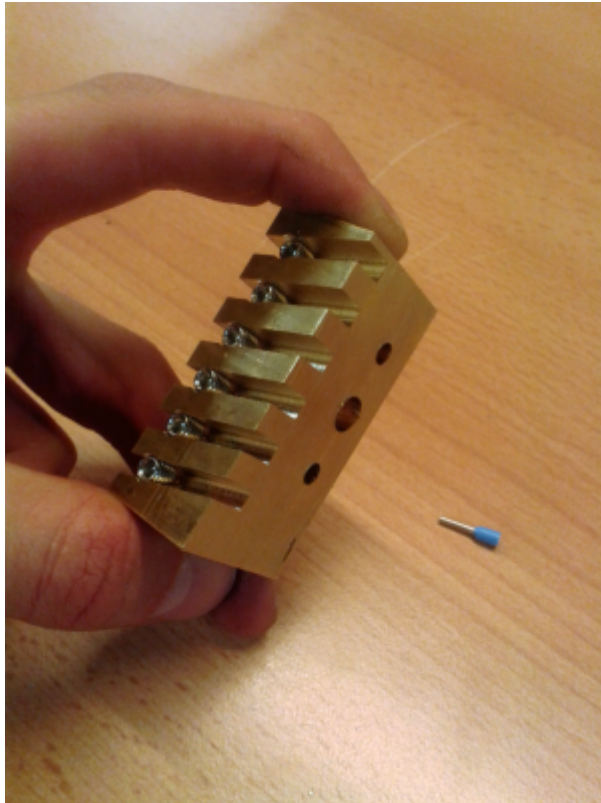
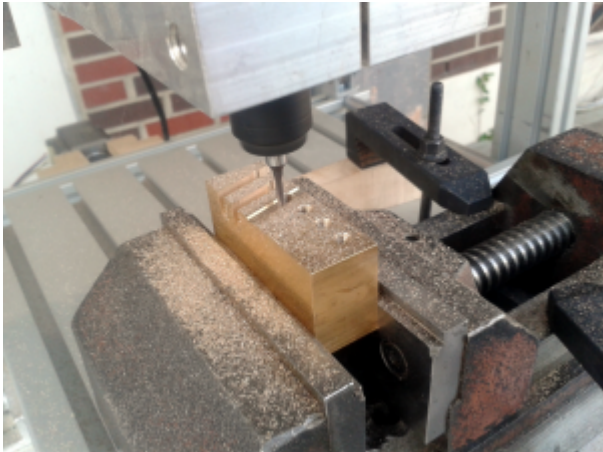
```
    G01 Z[#<current_depth>] F[#<z_feed_rate>]
```

```
    G02 X[-0.1] Y[40.278 + 0.1 - 2.4] I[0.1] F[#<feed>]
```

```
0103 endrepeat
```

```
G00 Z[#<z-safe>]
G00 X0 Y0
```

```
%
```



- Auf Halsprofil anpassen (Feilen)

Hals

- Trussrod Kanal fräsen ✓



- Template mit Lasersaur schneiden ✓
- Grob mit Band- oder Stichsäge zusägen ✓
- Feinarbeit mit Kopierfräser and der Unterfräse ✓
- ...



- Halsprofil: Verrundetes Trapez mit abflachende Flanken zum Korpus bei konstanter Höhe (mal ein kleines Experiment und Variation einer moderneren Form)



Korpus

- Template mit Lasersaur schneiden ✓
- Grob mit Band- oder Stichsäge zusägen ✓
- Bubinga Flügel:
 - Kammern mit Forstner Bohrern an der Bohrpresse verteilen
 - Aussparung für Elektronik fräsen → CNC
 - GCode mit inkscape erzeugen und editieren: ✓

%

G21 (using mm)
G40 (manual toolrad comp)

```

#<feed_rate> = 400.000000 (Feed definition)
#<z_feed_rate> = 100.000000 (Feed definition)

#<depth> = 32 (Pocket depth)
#<z_feed> = 0.5

#<z_offset> = [-1 * #<depth>] (Z axis offset)
#<x_offset> = 0 (X axis offset)
#<y_offset> = 0 (Y axis offset)

#<z_safe> = [30 - #<z_offset>]

G00 Z[#<z_safe> + #<z_offset>]

#<steps> = [#<depth> / #<z_feed>]
#<current_depth> = [#<depth>]

0101 repeat [#<steps>]

    #<current_depth> = [#<current_depth> - #<z_feed>]

    G01 X[32.054936 + #<x_offset>] Y[22.882033 + #<y_offset>]

    G01 Z[ #<current_depth> + #<z_offset>] F [ #<z_feed_rate>] (Penetrate)

    ...

    G01 X[-19.484225 + #<x_offset>] Y[16.651272 + #<y_offset>] Z[
#<current_depth> + #<z_offset>]

0101 endrepeat

G00 Z[#<z_safe> + #<z_offset>]
G00 X0 Y0
%
```

- Fräsen <https://www.youtube.com/watch?v=IJDeGeCIE6Y>
<https://www.youtube.com/watch?v=X-4hhXkSM1g>
- Walnuss Wurzelholz Top:
- Resawing (in 10mm dicke Bretter sägen) ✓



- evtl. mit Epoxy stabilisieren (Astlöcher) ✓



- Walnuss Wurzelholz Decke und Bubinga Flügel verleimen ✓



- Feinarbeit mit Kopierfräser an der Unterfräse
 - Im Kampf Fräse gegen Bubinga gewann meistens dann doch das Holz: Sehr dicht, Extrem lange Fasern und sehr spröde ... -> Trommelschleifer ✓



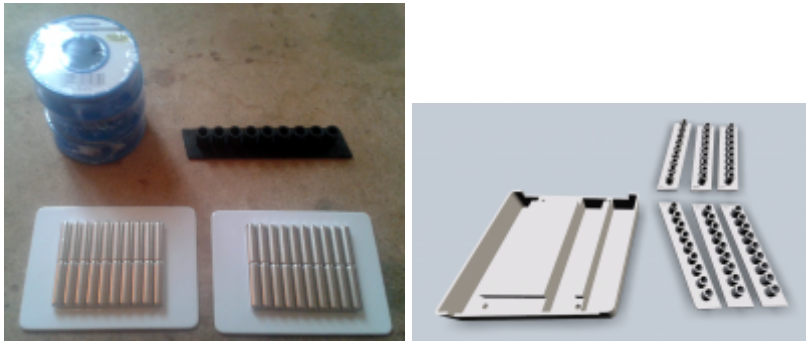
- Flügel mit Hals verleimen



- Grobe Profilierung des Korpus mit Shinto Sägeraspel und Stechbeitel



Pickups



- 3D Drucken
- Wickeln
- mit 2/3 Bienenwachs/Paraffin einkapseln um mikrofonische Effekte zu verhindern
- Ausmessen (Spectrum Analyzer?)

Elektronik

- Passiv/Aktiv?
- DSP?

Griffbrett

- Oberfläche glatt hobeln ✓



- Template Lasern ✓

- Grob zusägen an der Bandsäge ✓
- Feinschliff mit Kopierfräser ✓
- Mit Hals verleimen
- Schnitte für Bünde/Furnierstreifen
 - Radius (<http://en.wikipedia.org/wiki/Fingerboard#Parameters>):
 - konstant (12,,) mit Schleifklotz erzeugen
 - Konisch mit Schlitten und Oberfräse

Finish

- Hartwachsöl (Selber mischen oder Osmo High Solid)
 - 2 Teile Carnauba und 3 Teile Bienenwachs im Wasserbad schmelzen



- Terpentinbalsam und Leinöl beigeben
- Schütteln beim Erkalten (30-60min)



- Mischung teilen, erwärmen im Wasserbad und mit Leinöl und Terpentinbalsam verdünnen bis

im kalten Zustand die Konsistenz passt (dickflüssig für ölen oder hartes Wachs zum polieren)



Weiterführende Links

- [Thread auf TalkBass](#)
- [Vortrag auf der GPN15](#)
- [Vortrag auf dem CCCamp15](#)