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# Strøm

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The *Strøm* open source speaker project have been started with the main goal of creating a fully functional “streaming speaker”, but as an open sourced product. One that you can choose to buy fully built and tested, or choose to built it yourself.



## **REQUIREMENTS**

The main goal of the *Strøm* open source speaker project are to create a fully functional and open source “wifi speaker”.

### **1.1 The Speaker concept**

The primary features of the *Strøm* speaker are:

- Minimalistic design language
- Playback via Spotify Connect and Bluetooth
- Wall mountable
- Sustainable materials
- Open Source

Making it a modern, minimalistic and fully capable speaker.

### **1.2 Design Goals**

The following parameters are used as design goals. These are not *hard* requirements, but reflects the ideal characteristics of the final speaker.

#### **1.2.1 Sustainability**

It is important to use materials that are produced and sourced using sustainable methods, as well as using sustainable productions methods of the speaker itself. A non exhaustive lists of considerations:

- The cabinet must primarily be made out of wood
  - like MDF and plywood
- No plastic
- Built to be repairable

Making a 100% sustainable active speaker is, however, not 100% realistic as there isn’t any fully sustainable PCB’s. At least not readable available.

### 1.2.2 Cabinet

The design of the cabinet must reflect a minimalistic design approach. This means a small physical form factor and a minimalist visual appearance. A non exhaustive lists of considerations:

- Small form factor
- Shallow cabinet for better on-wall placement
- Ultra mat finish of the cabinet
- Cloth covered drivers

### 1.2.3 Acoustics

With this project it is not the goal to create another **boombox**, with over attenuated lows (bass) and highs (treble) as this will quickly result in listening fatigue. This is also called a **smiley face curve**.

However a slight bass boost at lower SPL levels to accommodate for the non-linear human hearing will make the speaker sound natural a lower sound pressure levels (SPL). This boost should be less pronounced at higher SPL levels; the dynamic part of this requirement can become hard to realize, but it will make for a much more appealing listening proposition. A non exhaustive lists of further considerations:

- Max SPL of 100dB
- Frequency range: 80Hz - 17kHz;  $\pm 3$ dB
- Reasonable flat response; within  $\pm 4$ dB
- High speech intelligibility
- SPL dependent bass boost to match the nonlinearity of the human hearing

Below each of the technical design goals are unwrapped to explain what they mean and how the voicing process is used to implemented these requirements.

#### High maximum SPL

SPL (Sound Pressure Level) is a measure of “how loud” a sound is. And the maximum SPL of a speaker tells something about how loud a speaker is capable of playing.

Usually the SPL is measured at a distance of one meter [m]. The unit of SPL is decibel [dB].

The Strøm speaker isn't a large speaker, but it should still be a capable speaker. A speaker that is capable of “playing loud”. But as this can be hard to quantify as the perception of “loud” varies a great deal from person to person. It is also highly affected by the distance between the speaker and the listener as well as its placement in the room. And finally this perception is impacted by any audible distortion from the speaker. The higher the distortion, the higher the SPL is perceived.

So instead of stating that the speaker must play “loud”, a quantifiable number is needed.

We also want to add a few more limitations to this design goal. The maximum SPL should:

- be reachable “anywhere” on the frequency band,
- without reaching the mechanical limits of the driver,
- and should avoid clipping



We have settle on **100dB of maximum SPL** for this small speaker. This will be more than sufficient for must small and medium sized rooms. The implementation of this requirement will affect (limit) the frequency response of the speaker. Most drivers can play down to 20Hz, but maybe not a great volume. So by limiting the frequency band we can push the drivers to higher SPL levels.

### Frequency response

It should be pleasant to listen to this speaker and at the same time you should be able to get an “audio experience”. So no smiley curve frequency response, nor overly exaggerated lows; i.e. this is not a boom box. We are looking to implement a hi-fi speaker with fairly linear frequency response.

A requirement of a linearity within  $\pm 4\text{dB}$  isn't perfect, but it is a pretty decent middle ground.

The better the low range extension a speaker can achieve, the more of the audio frequency range it is capable of reproducing and the more “convincing” this speaker will sound.

As small drivers are used, subwoofer levels of extension are hard to come by, so a compromise is needed. By setting the targeted -3dB point at 80Hz, this speaker will not be a bass monster, but the bass it will reproduce will be crisp and undistorted.

When placed on a wall even lower frequency extension will be possible at the same (or higher) SPL.

## 1.3 Drivers

In order to fulfill the requirements of a small form factor speaker, shallow drivers are needed. This makes it possible to minimize the overall depth of the cabinet.

Only a few really larger shallow drivers exists, which also tends to be rather expensive. They usually deliver good performance, but most of them are considered to be too expensive for this project. In stead of using one large driver, 4 miniature full range transducers are targeted instead. This makes it possible to decrease the overall depth of the cabinet.

The following drivers are used:

- 2.5” full range driver: *SB65WBAC25-4*.



## USER DOCUMENTATION

### 2.1 Maintenance

### 2.2 User Manual

### 2.3 Voicing of the *Strøm* speaker

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**Note:** One important aspect of developing a speaker are to tune the frequency response, as well as to ensure that the drivers isn't driven over their capabilities. It is here the sound of the speaker is developed.

This process is called **voicing**.

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The voicing of a speaker consists of several steps and this *howto* will try to outline a few of them. The following topics will be covered below:

- Voicing goals
- Measurements
- Adjusting the response

#### 2.3.1 Voicing goals

With the Strøm speaker several design goals have been defined (see more in the [Requirements](#) section) and those related to sound reproduction should – where applicable – be implemented through the voicing process.

The following acoustic design goals have been set for the speaker:

- Max SPL of 100dB
- Frequency range: 80Hz - 17kHz;  $\pm 3$ dB
- Reasonable flat response; within  $\pm 4$ dB
- High speech intelligibility
- SPL dependent bass boost to match the nonlinearity of the human hearing

Most of these design goals can be asserted using various measurement techniques.

### 2.3.2 Measuring the speaker

What you need to measure the speaker:

- A measurement microphone like the [UMIK-1](#) (or similar)
- Assembled cabinet with drivers
- External amplifier
- Laptop (or similar) with [Camilla DSP](#) installed.
- Room EQ Wizard ([REW](#))

In order to measure the speaker, make sure that you can “*answer yes*” to all of the above bullets.

#### What do we want to measure?

With REW it is possible to measure a large suite of things, but bare in mind, that this program is initial created to measure rooms and not speakers. We will use REW to perform the following measurements: \* frequency response \* phase response \* impulse response

#### Frequency and phase response

We do not have easy access to an anechoic chamber, but that doesn't mean that we can't produce some useful results. And for this speaker we actively rely on the walls and boundaries to increase our bass response. So a measurement “in place” isn't actually that bad.

We have placed the microphone within 10cm from the baffle to limit the impact of reflections.

Here's the speaker measured before voicing. A single 8th order high pass (HP) filter have been added at 45Hz to protect the driver (from exceeding  $X_{max}$ ).

The frequency and phase response are depicted. It is worth noting that the results haven't been normalize, resulting in that the measured dB can't be related to anything (other than other measurements using the same setup).

Loading... Measured frequency response of an initial test cabinet. Primarily used for validation of the internal cabinet volume.

### 2.3.3 Adjusting the response

As a development workflow I am using the great [HENquist/camilladsp](#) project. This makes it possible to specify the filter banks as a simple YAML config file. For the initial 80Hz target tuning this file have been used: [voicing/voicing-80hz-target.yaml](#).

As we can't make the bass higher – without additional  $X_{max}$  of the driver - we need to lower the rest of the frequency response. This will lower the overall efficiency of the speaker, but result in a much more linear frequency response. See the below graph for a measurement of the initial filters applied to the signal chain.

Loading... Measurement result when initial filtering have been applied. The result isn't perfect but a really good starting point (and a good sounding one of that) which proves that these little drivers are pretty capable in this little cabinet.

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CHAPTER  
**THREE**

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**REPAIR**



**END OF LIFE**





## SPEAKER PARTS AND ASSEMBLY

The speaker cabinet are constructed from MDF, as this material is well suited for this type of application. Both the low internal damping, as well as the ease of processing, of this material makes it a good choice for constructing speaker cabinets.

To minimize the overall volume of the cabinet, a sealed construction is chosen. Each driver, does in fact, have its own internal cabinet. This is done to minimize the internal interference between the drivers; hence limiting interference artifacts.

Each speaker part have its own unique ID to make it easier to identify the correct part. Externally sourced parts will likely also have a SKU or similar.

### 5.1 Speaker parts

#### 5.1.1 Amplifier Module

##### Parts information

See the below for a quick overview of the naming and ID information of this part.

**Part name:** *Amplifier module*

**Parts ID:** 9X6S29

##### Part description

The amplifier module is a generally available, but custom, PCB design which are base upon the popular [Espressif ESP32](#) platform.

This is combined with an audio amplifier from Infineon. The [MA12040P](#) is a strong candidate.

Sourcing

**Todo:** sourcing of this module are still TBD.

5.1.2 Back Panel

Parts information

See the below for a quick overview of the naming and ID information of this part.

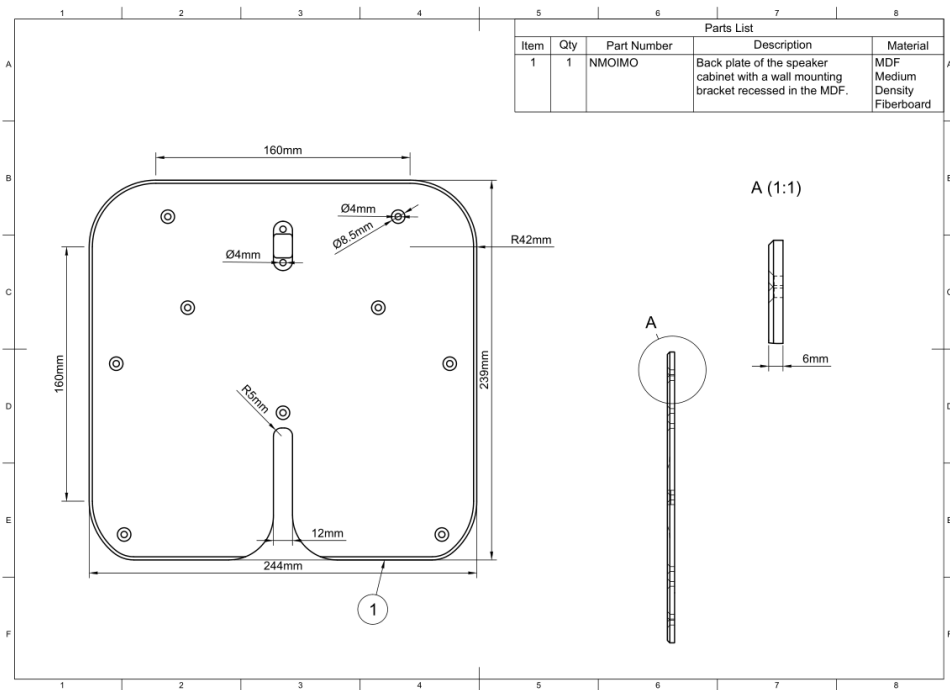
**Part name:** Back Panel  
**Parts ID:** NMOIMO  
**Material:** 6mm, MDF

Part description

The cabinet back panel are the bottom layer in the complete cabinet. This part makes an air tight fit to the rest of the cabinet, sealing the enclosure.

Four counter sunk screw holes – one in each corner – are created in this part for easy assembly.

To ensure a close distance between the back panel and the wall, when wall mounted, a bracket needs to be recessed into this part. This bracket must be fastened with two wood screws.



## Finish

To create a small visual separation between the wall and the speaker, the back panel must be of a dark color. Preferably black. The most important part of the back panel to finish with a black tint, are the 45° angled sides.

**Warning:** Depending on the requirements with regards to MDF degassing, this cabinet part only needs limited finishing, or a full pain job.

## Downloads

Download the drawing as a PDF `back-panel-drawing.pdf`.

Download the CAD file in .STEP format `back-panel.step`.

Fusion 360 Source Files

*The model is developed in Fusion 360. To access the original Fusion 360 source files, follow the link below.*

[Access source files](#)

### 5.1.3 Cabinet Baffle

#### Parts information

See the below for a quick overview of the naming and ID information of this part.

**Part name:** *Baffle*

**Parts ID:** 47TTHC

**Material:** 12mm, MDF

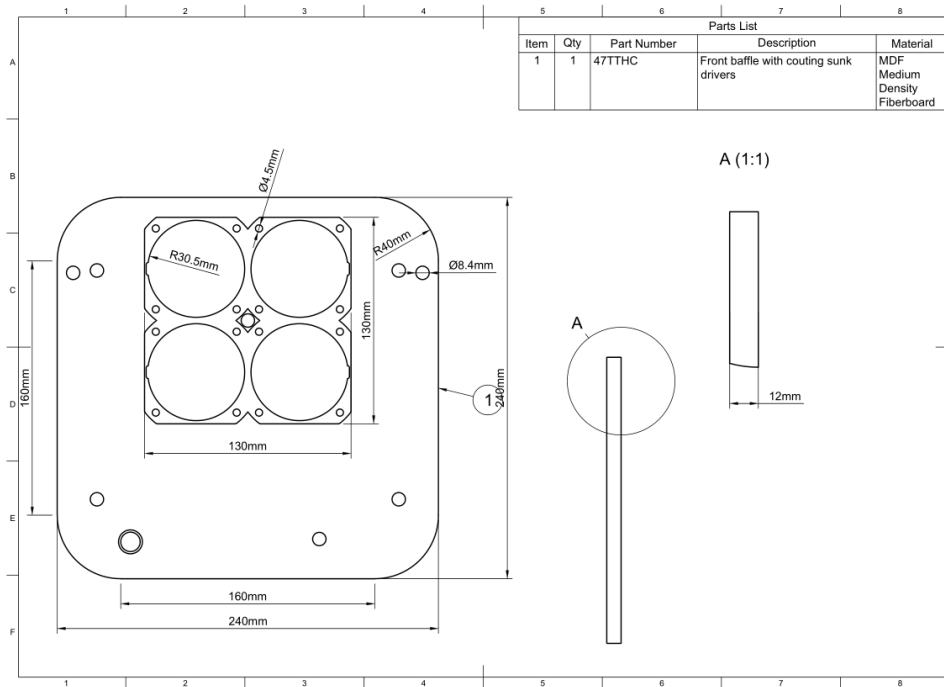
#### Part description

The baffle are where the speaker drivers are mounted. They are counting sunk into the baffle, so the top of the driver matches the top of the baffle. For each driver four screw holes are made to fasten the driver to the baffle.

Three assembly-guiding holes are also cut in to the baffle. This helps aligning the different layers with each other.

**See also:**

For further details about the assembly, take a closer look at the [assembly description](#).



**Todo:** Add feature to ensure proper mounting of the *soft top frame* to the baffle.

## Finish

The top of the baffle must be finished with a paint, complementary to the hue of the *soft top fabric*. If the fabric are of a light hue, then a white paint must be applied – [RAL9010](#) for instance – and when are darker hue of fabric are used, then a black finish must be applied – something like [RAL9005](#) will suffice.

The surface finish of the paint are allowed to be a rough and matte finish, as the top of baffle are covered by the soft top fabric under normal operation.

**Warning:** Depending on the requirements with regards to MDF degassing, this cabinet part only needs limited finishing, or a full pain job.

## Downloads

Download the drawing as a PDF [baffle-drawing.pdf](#).

Download the CAD file in .STEP format [baffle.step](#).

Fusion 360 Source Files

*The model is developed in Fusion 360. To access the original Fusion 360 source files, follow the link below.*

[Access source files](#)

### 5.1.4 Dowels

#### Parts information

See the below for a quick overview of the naming and ID information of this part.

**Part name:** *Dowels*

**Parts ID:** OOWEOE

**Material:** *8mm, wood*

When assembling the cabinet dowels are needed for easy alignment of the different layers.

#### Parts description

These woods dowels comes in many assortments, lengths and diameters. For this project the following dimensions dowels are needed:

Table 1: Physical requirements for dowels.

Material	Diameter	length
Wood	8mm	40mm

An example of such as dowel are this one from HABO: [63009](#).

### 5.1.5 Full Range Driver

#### Parts information

See the below for a quick overview of the naming and ID information of this part.

**Part name:** *Driver; SB65WBAC25-4*

**Manufacturer:** [SB Audience](#)

**Manufacturer ID:** SB65WBAC25-4

**Parts ID:** 7SQ7QH

**Product link:** [SB Audience SB65WBAC25-4](#)

### **Parts Description**

This is the full range driver used in this project. For each speaker a total of four drivers are needed.



These drivers are primarily chosen for their extremely small height – of only 38mm overall height – and for their relative

high power handling of 20W.

## Sourcing

**Todo:** sourcing of this module are still TBD.

## Downloads

Download the driver specification as a PDF 2.5in SB65WBAC25-4.pdf.

### 5.1.6 Cabinet Layer 1

#### Parts information

See the below for a quick overview of the naming and ID information of this part.

**Part name:** *Cabinet layer 1*

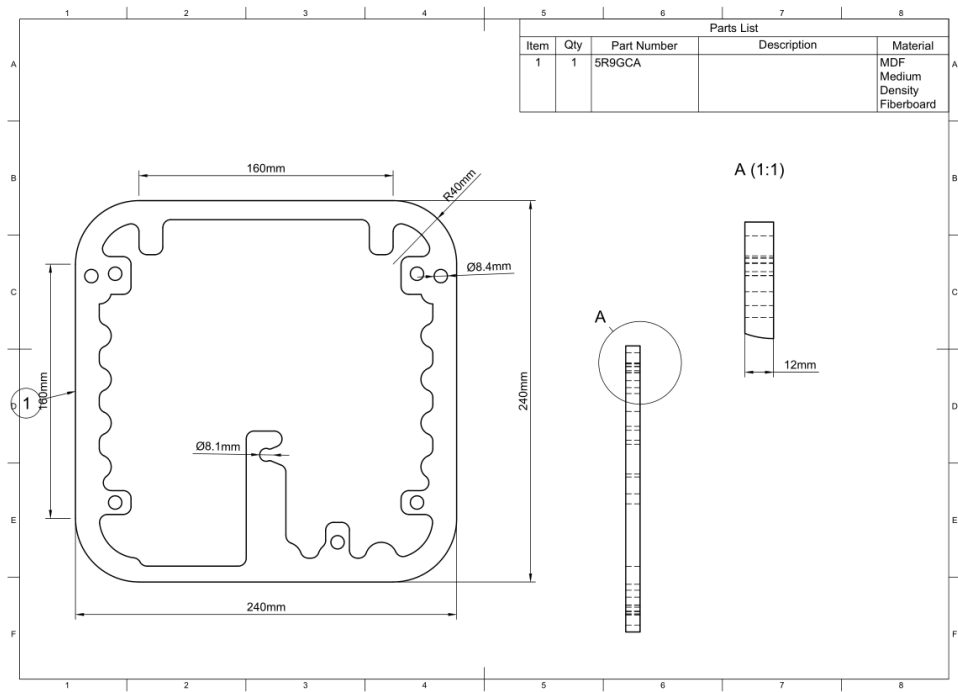
**Parts ID:** 5R9GCA

**Material:** 12mm, MDF

#### Part description

This is the first layer of the cabinet, connecting directly to the baffle. To make room for the DC barrel power plug and it's wires, a mounting hole and a tapering slot are cut. This helps guide the DC power cables from the DC socket.

The three larger holes (Ø8,4mm) are for dowels, used for aligning the three layers during cabinet assembly.



Finish

This part doesn't require any finish.

Downloads

Download the drawing as a PDF `cabinet-layer-1-drawing.pdf`.

Download the CAD file in .STEP format `cabinet-layer-1.step`.

Fusion 360 Source Files

The model is developed in Fusion 360. To access the original Fusion 360 source files, follow the link below.

[Access source files](#)

5.1.7 Cabinet Layer 2

Parts information

See the below for a quick overview of the naming and ID information of this part.

**Part name:** *Cabinet layer 1*

**Parts ID:** 5R9GCA

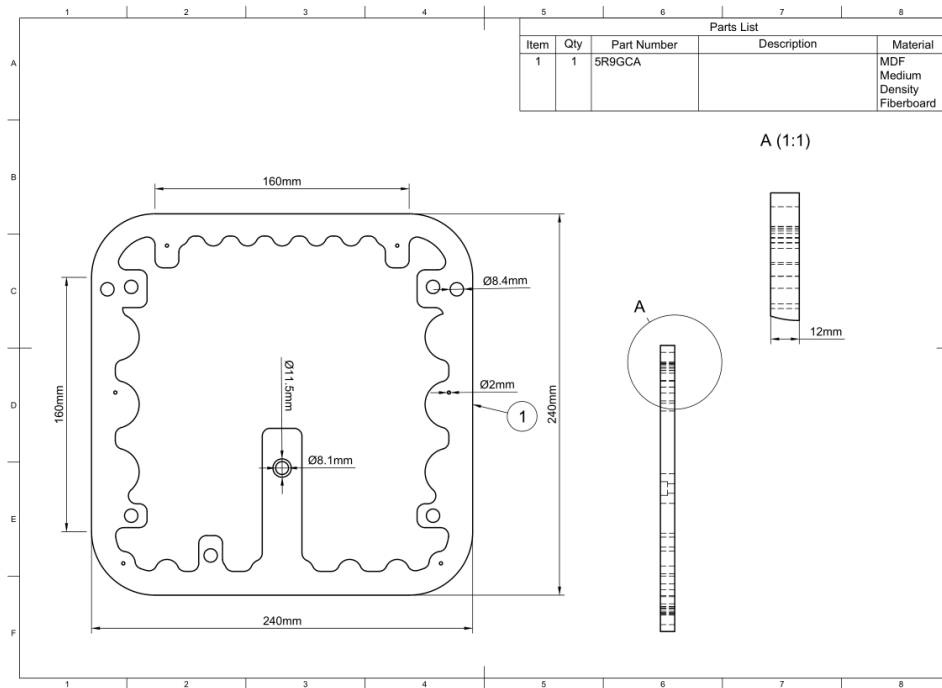
**Material:** 12mm, MDF



## Part description

This is the middle layer of the cabinet. To make room for the DC barrel power socket, a matching DC socket mounting hole is cutout. Half of this hole are counter sunk at a wider diameter (Ø11,5) to accommodate for the wider diameter of the DC plug itself - to ensure that this plugin can be fully consealed within the cabinet (for on wall placement).

The small holes (Ø2mm) are used when mounting the back plate to the main cabinet. The larger holes (Ø8,4mm) are for dowels, used for aligning the three layers during cabinet assembly.



## Finish

This part doesn't require any finish.

## Downloads

Download the drawing as a PDF [cabinet-layer-2-drawing.pdf](#).

Download the CAD file in .STEP format [cabinet-layer-2.step](#).

Fusion 360 Source Files

*The model is developed in Fusion 360. To access the original Fusion 360 source files, follow the link below.*

[Access source files](#)

5.1.8 Cabinet Layer 3

Parts information

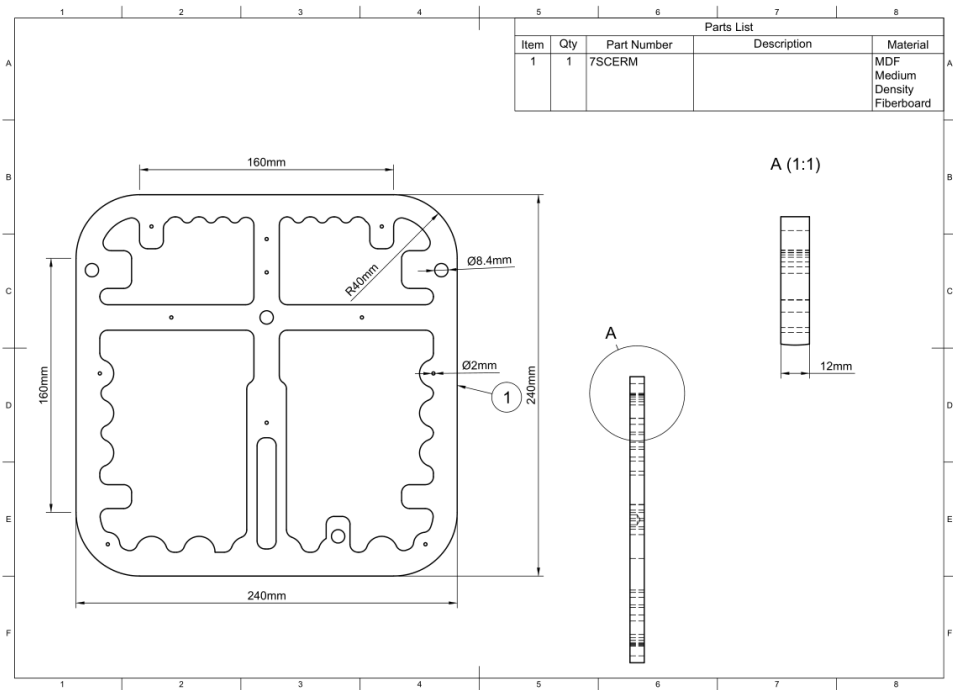
See the below for a quick overview of the naming and ID information of this part.

**Part name:** *Cabinet layer 1*  
**Parts ID:** 7SCERM  
**Material:** 12mm, MDF

Part description

This is the third layer of the cabinet - counting from the baffle. Here a large keyhole slot a cut to make room for the DC jack, an L-bracket adaptor and a little wire. All in all to make sure that the power connections are consealed when mounted to a wall.

The small holes (Ø2mm) are used when mounting the back plate to the main cabinet. The larger holes (Ø8,4mm) are for dowels, used for aligning the three layers during cabinet assembly.



## Finish

This part doesn't require any finish.

## Downloads

Download the drawing as a PDF `cabinet-layer-3-drawing.pdf`.

Download the CAD file in .STEP format `cabinet-layer-3.step`.

Fusion 360 Source Files

*The model is developed in Fusion 360. To access the original Fusion 360 source files, follow the link below.*

[Access source files](#)

## 5.1.9 Power Brick

### Parts information

See the below for a quick overview of the naming and ID information of this part.

**Part name:** *Power brick; GST60A18-P1J*

**Parts ID:** WVOAE2

**Product link:** [Mean Well GST60A18-P1J](#)

## Parts Description

When creating an active speaker, it will need power. For this project we have settled on a barrel styled *power plug*. These type of power supplies readable available are relatively inexpensive, but not any old power supply will do. There's are few requirements that is required to be met. Please see the tables below for further details.

Table 2: Electrical requirements for the power brick

Mains range	Output Voltage	Output Wattage
100V - 240V	18V	60W

Table 3: Physical requirements

Plug type	Plug dimensions	Cable length
Barrel, male	5,5mm x 2,1mm	>=1,5m

### Sourcing requirements

**Warning:** When sourcing a power brick (power supply), it is really important that set power supply is [CE](#) approved, as well as [RoHS](#) compliant. Therefore only approved power supplies must be used and supplied to the end customer.

Currently the only **approved** power supply is this one from Mean Well: [GST60A18-P1J](#).

### 5.1.10 DC Power Socket

#### Parts information

See the below for a quick overview of the naming and ID information of this part.

**Part name:** *DC power socket*

**Parts ID:** I6C3Q5

**Manufacturer:** [Tensility](#)

**Manufacturer ID:** 50-00541

**Product link:** [Tensility 50-00541](#)

#### Parts Description

In order to maintain an airtight cabinet we have taken a bit of a different approach to the DC socket. In fact this socket is a overmold jack. We are then using the cabinet as the overmold.



How this socket are integrated in the cabinet are described in detail in the *assembly description* as well as in the description of layer 2 and 3.

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**Todo:** the assembly section needs to be updated.

---

## Sourcing

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**Todo:** sourcing of this module are still TBD.

---

### Downloads

Download the specification as a PDF [50-00541.pdf](#).

Download the CAD file in .STEP format [50-00541.step](#).

### 5.1.11 Push Bottom

#### Parts information

See the below for a quick overview of the naming and ID information of this part.

**Part name:** *Push bottom*

**Parts ID:** PTRCO9

**Manufacturer:** [Funeton](#)

**Manufacturer ID:** FT12Q-D21

**Product link:** [Momentary push button](#)

### Parts Description

A push button is needed when interacting with the speaker directly. This is a momentary push button with an integrated LED ring (green).

There's sadly no specification available as a PDF, but the below diagram will also suffice.

---

**Todo:** This LED will likely be used for user feedback, but is currently TBD.

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### Downloads

Currently no downloads are available.

### 5.1.12 Soft Top Fabric

#### Parts information

See the below for a quick overview of the naming and ID information of this part.

**Part name:** *Soft top cloth*

**Parts ID:** 0NGII0**Material:** Jersey fabric

### 5.1.13 Soft Top Frame

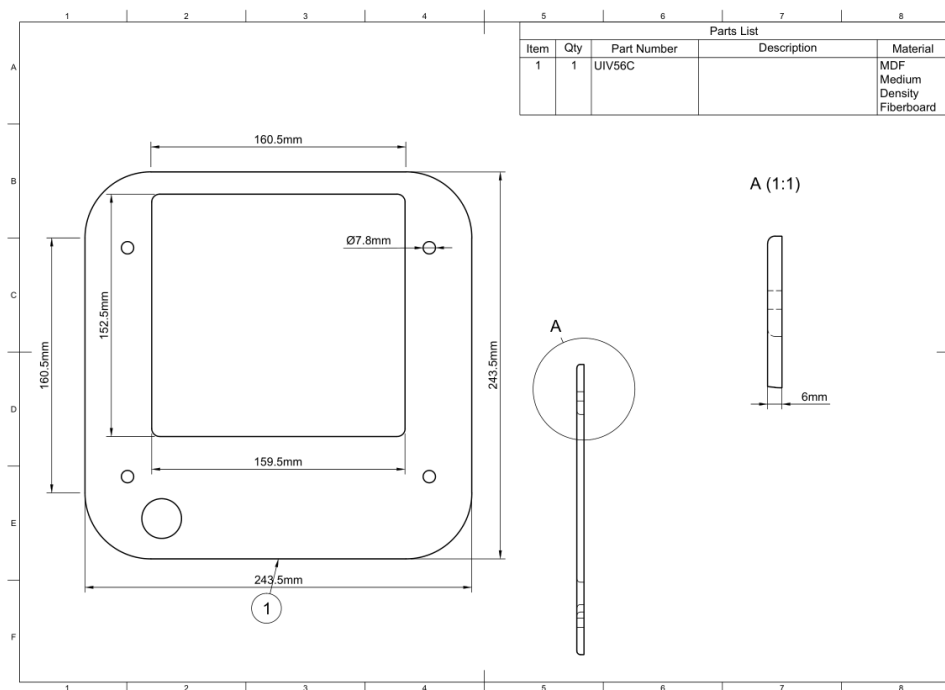
#### Parts information

See the below for a quick overview of the naming and ID information of this part.

**Part name:** *Soft top frame***Parts ID:** UIV56C**Material:** 6mm, MDF

#### Part description

The soft top frame holds the fabric that covers the drivers. This is a simple part. The soft top frame are friction fit to the pretuding dowels in the baffle of the main cabinet. This ensures a tight fit of the frame but at the same time allow for its removal in case of service or repair.



### Finish

This part is painted black to match the shadow created where the drivers are located. It is important to lightly sand this part after painting, as the raised grain can in fact tare any fragile fabric.

### Downloads

Download the drawing as a PDF `softtop-drawing.pdf`.

Download the CAD file in .STEP format `softtop.step`.

Fusion 360 Source Files

*The model is developed in Fusion 360. To access the original Fusion 360 source files, follow the link below.*

[Access source files](#)

### 5.1.14 Generate a parts ID when adding a new part

To generate a ID for a part, follow the below example. The following tool is used: [Short UUID](#).

```
suid -l 6 -d utils/uuid-dict.json
```

Please note that a simplified [dictionary](#) have been used to ensure only uppercase characters are used.

## 5.2 Cabinet Assembly

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**Todo:** Still missing these sections:

4. linoleum
  5. drivers
  6. back panel
  7. soft top
- 

### 5.2.1 Assembling the main cabinet

The main cabinet is assembled using the following 5 parts:

- [Cabinet Layer 1](#)
- [Cabinet Layer 2](#)
- [Cabinet Layer 3](#)
- [Dowels](#)
- [DC Power socket](#)



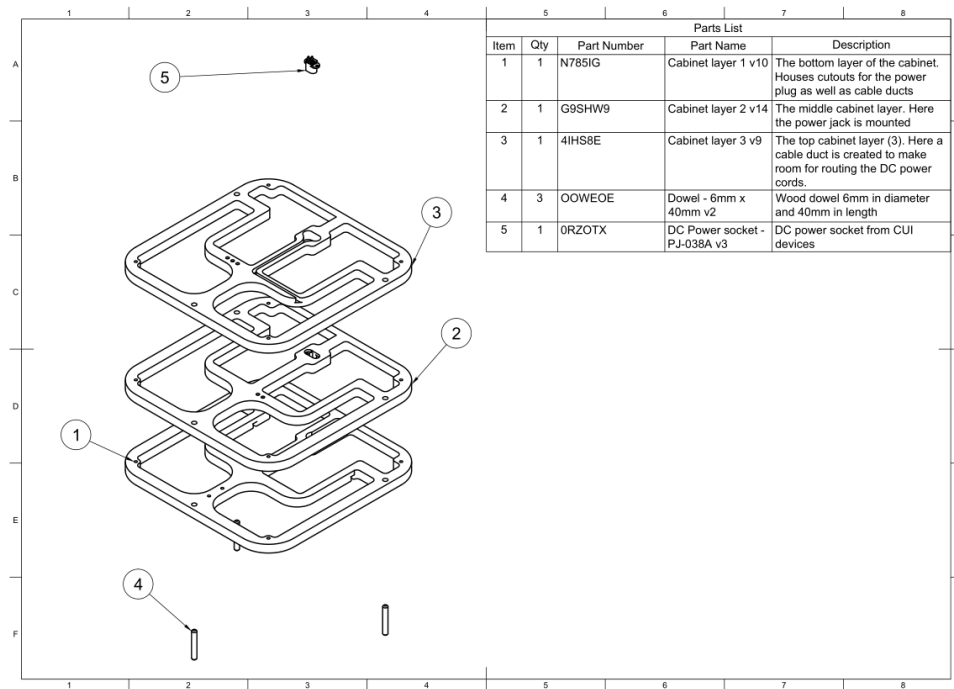


Fig. 1: Exploded view of all the parts needed to assemble the main cabinet.

Each of the three cabinet layers are glued together using standard indoor wood glue. To easily lineup the individual layers with each other, a set (3) of guide holes are bored in each layer. These are for the dowels.

Following the steps below to assemble the main cabinet.

1. Start with layer 1 and place it, so the cable ducts and layer numbering faces downwards
2. Add wood glue to the guide holes and mount the dowels inside them. Make sure that go all the way through, but do not protrude further than the face of this layer - otherwise the back panel can't be mounted correctly.
3. Now we are ready to add the second layer.
  - a. Apply glue to layer 1 in order to the second layer to adhere to it.
  - b. Now take layer two and ensure that the layer identification holes faces up.
  - c. Add glue to the guiding holes and place it over the dowels and press down. Make sure to press the layer all the way down so it mates with layer 1.
4. The third layer can now be mounted. This is done in the same way as in point 3 above.
5. Clamp all the layers firmly together and let the glue set.
6. Finally we can mount the DC power socket. This is down with a couple of screw.
  - a. Add some hot glue over the wires, to ensure they do not come off. We are encapsulating this socket inside the cabinet, so we do not want any faults.
  - b. Place the wire harness in the cable duct and secure it with hut glue.

The main cabinet are now ready for the next stage: *mounting the baffle*.

Assembly video

To make it more clear how all these parts comes together, a short video showing an exploded view of the speaker can be found below. This highlights how all the parts fit together with each other.

<https://youtu.be/-KRVnBKZZOo>

Downloads

Download the drawing as a PDF `main-cabinet-assembly.pdf`.

5.2.2 Mounting the baffle

The baffle and the main cabinet are now ready to be mated.

- [Baffle](#)
- [Main cabinet assembly](#)

The baffle needs to be mated to the main cabinet. This is a relatively simply process, but first it needs to finished.

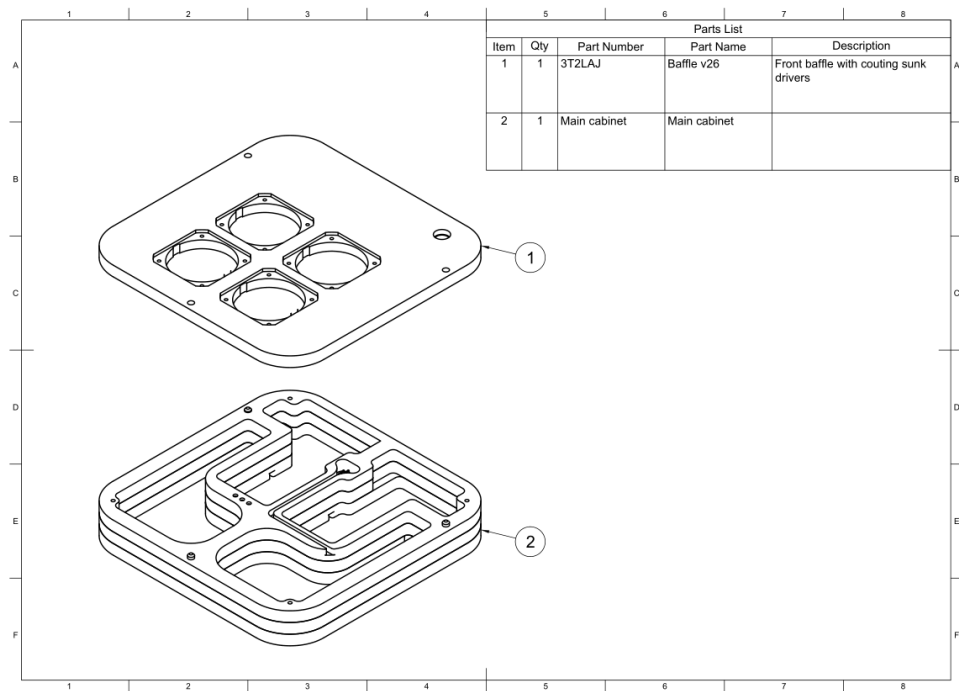


Fig. 2: Exploded view of all the parts needed to mount the baffle to the main cabinet.

Following the steps below to mount the baffle to the main cabinet.

1. Start by finishing the top of the baffle - see [parts description](#) for additional details.
2. Add glue to the main cabinet and place the baffle on the main cabinet, using the dowels guide holes for proper placement.
  - a. The top of the dowels should pertrude about 6mm out of the main cabinet. Enough to properly align the baffle on the cabinet.

3. Clamp down the parts while the glue sets.

### Assembly video

To make it more clear how all these parts comes together, a short video showing an exploded view of the speaker can be found below. This highlights how all the parts fit together with each other.

<https://youtu.be/6zH1YJoNRr8>

### Downloads

Download the drawing as a PDF `mounting-the-baffle.pdf`.

## 5.3 Cabinet construction

To ensure an easy assembly of the speaker cabinet, a sandwich construction is used. This makes it easy to construct the different layers and, at the same time, simplifying the construction of this semi complex cabinet. This also makes it possible to machine all the individual layers on a CNC. This comes in handy when utilizing [decentralized manufacturing](#).

Further details on the cabinet assembly can be found in the [assembly section](#).



## THE SOFTWARE PLATFORM

This speaker is capable of playing audio through *Bluetooth* and *Spotify Connect*, as well as other sources. All of this are handled by the software platform called *Euphonium*. This is a separate project on GitHub and it can be used for other types of platforms. Not just this ESP32 based setup. Read more in this projects documentation.

### 6.1 Bluetooth

*“A short-range wireless technology standard that is used for exchanging data between fixed and mobile devices over short distances”*

—Wikipedia

### 6.2 Over The Air (OTA) Updates

### 6.3 Spotify Connect

*“Listen on your speakers or TV, using the Spotify app as a remote.”*

—Spotify

### 6.4 Web Radio

There's integration to web radio playback, making it easy to select most online available web radios. Simply search in the UI, for your favorite station and select play.



## CONTRIBUTION GUIDELINE

The following document describes how to contribute to the STRØM 1.0 project.

### 7.1 Contributing to the STRØM project

:blush: I am honored that you are considering to contribute to this project. Thank you! :blush:

The following guidelines are created to make it easier to start contributing to the project, but they are not rules, merely guidelines. Use common sense and please feel free to update this document with a pull request.

#### 7.1.1 I just have a question. What do I do?

If you have a question or comment to an existing issue simply just ask it in a new comment on that specific issue.

Otherwise feel free to create a new discussion topic on the [discussion section](#).

#### 7.1.2 In what way can I contribute?

All and any contribution are welcome. A single comment on an existing issue can offer valuable insight into a specific topic, so don't hold back on comments on existing tasks and problems.

Other ways to contribute are, just to name a few, are:

- write better/more documentation
- improve the CAD design files for ease of production
- extend the software platform

There's many aspects of this project so chip in with your knowledge. That is the best contribution of all :muscle:

#### 7.1.3 Create a Pull Request (PR)

All changes to the code base or the documentation are handled through pull requests. This means that any contribution that consists of a change to the code based must be submitted as a PR. Please also link your PR to an existing issue or create a new one if needed.

Each PR will be reviewed by the code owner before it can merged.

### Suggest a missing feature

If you miss a specific feature or functionality, then create a new *feature request* issue, where you described the requested feature in detail.

### Something doesn't work

If you have found a bug, then please create a detailed bug report by creating a new issue of type *bug*.



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The STRØM 1.0 project consists of several open source projects. One for the software platform, one of the hardware (PCB) and this project.

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## TODO LIST

---

**Todo:** Still missing these sections:

4. linoleum
  5. drivers
  6. back panel
  7. soft top
- 

(The [original entry](#) is located in /home/docs/checkouts/readthedocs.org/user\_builds/stroem/checkouts/stable/docs/source/speaker/assembly/line 6.)

---

**Todo:** sourcing of this module are still TBD.

---

(The [original entry](#) is located in /home/docs/checkouts/readthedocs.org/user\_builds/stroem/checkouts/stable/docs/source/speaker/parts/back/module.rst, line 18.)

---

**Todo:** Add feature to ensure proper mounting of the *soft top frame* to the baffle.

---

(The [original entry](#) is located in /home/docs/checkouts/readthedocs.org/user\_builds/stroem/checkouts/stable/docs/source/speaker/parts/baffle/line 27.)

---

**Todo:** sourcing of this module are still TBD.

---

(The [original entry](#) is located in /home/docs/checkouts/readthedocs.org/user\_builds/stroem/checkouts/stable/docs/source/speaker/parts/drivers/line 25.)

---

**Todo:** the assembly section needs to be updated.

---

(The [original entry](#) is located in /home/docs/checkouts/readthedocs.org/user\_builds/stroem/checkouts/stable/docs/source/speaker/parts/pod/socket.rst, line 24.)

---

**Todo:** sourcing of this module are still TBD.

---

(The [original entry](#) is located in /home/docs/checkouts/readthedocs.org/user\_builds/stroem/checkouts/stable/docs/source/speaker/parts/psocket.rst, line 29.)

---

**Todo:** This LED will likely be used for user feedback, but is currently TBD.

---

(The [original entry](#) is located in /home/docs/checkouts/readthedocs.org/user\_builds/stroem/checkouts/stable/docs/source/speaker/parts/pbottom.rst, line 23.)

## CHANGELOG

### 10.1 v0.1: Working prototype

*Released on 2022-08-05 - [GitHub](#)*

Read on below to get a high level *Introduction to the project* as a whole.

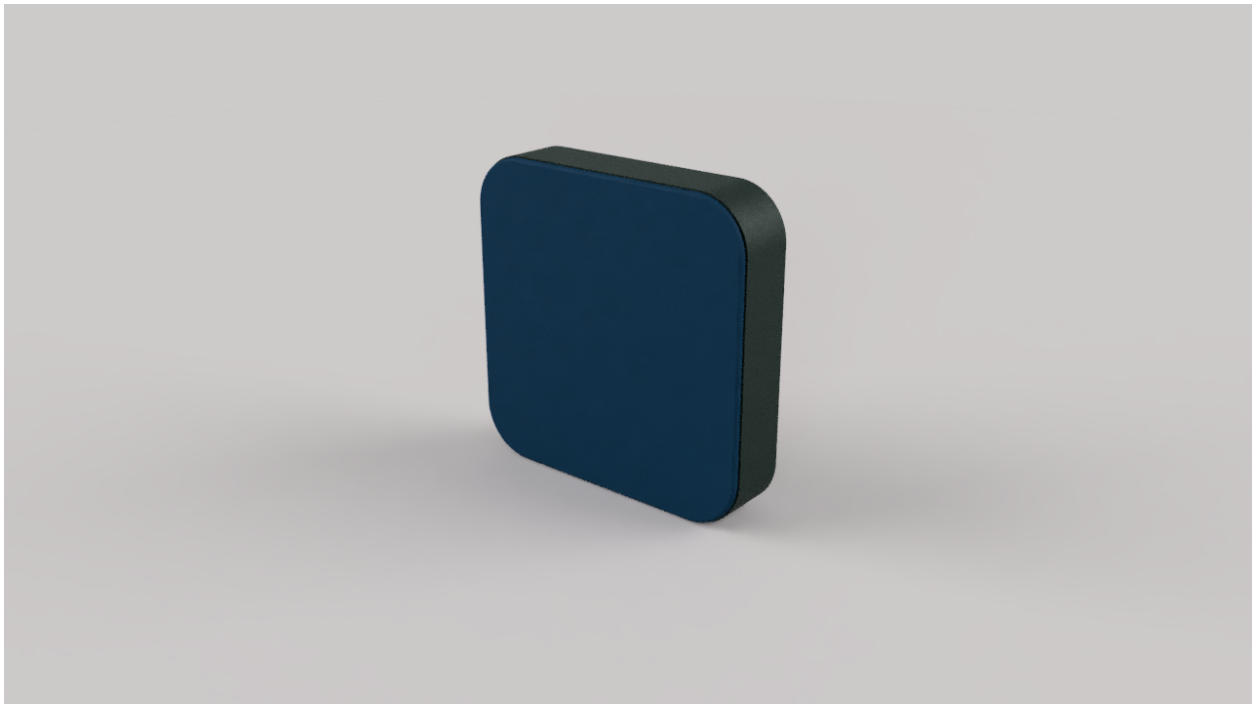


Fig. 1: Strøm speaker in conifer linoleum and blue fabric on the soft top.



## INTRODUCTION TO THE PROJECT

The primary features of the *Strøm* speaker are:

- Minimalistic design language
- Playback via Spotify Connect and Bluetooth
- Wall mountable
- Sustainable materials

Making it a modern, minimalistic and fully capable speaker.

### 11.1 Motivation for starting the STRØM 1.0 project

### 11.2 Project goals

### 11.3 Project history

Initially started as an OPEN!NEXT demonstrator project in December 2021. The project was started by Tue Dissing.

### 11.4 Contributing to the project

Interested in contributing to the project? Then please take a quick look at the contribution guideline beforehand. You find the contribution guide [here](#) and in the GitHub repo as well: [LydByDissing/stroem/CONTRIBUTING.md](#).

### 11.5 Last updated

The mainline documentation have last been updated at 2022-08-05.



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## CHAPTER TWELVE

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