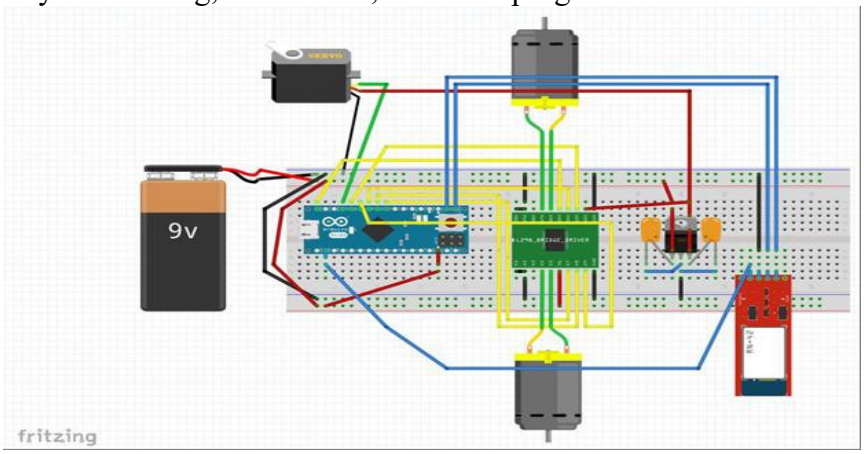
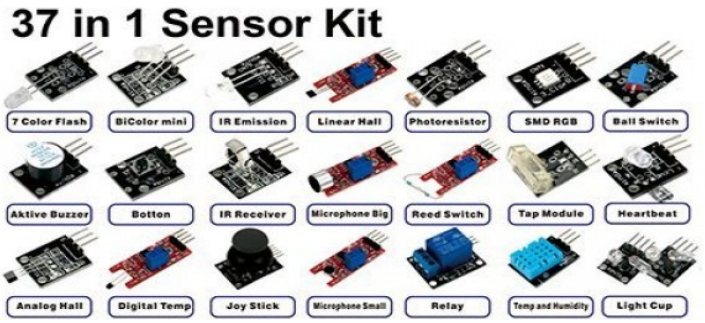
Premise

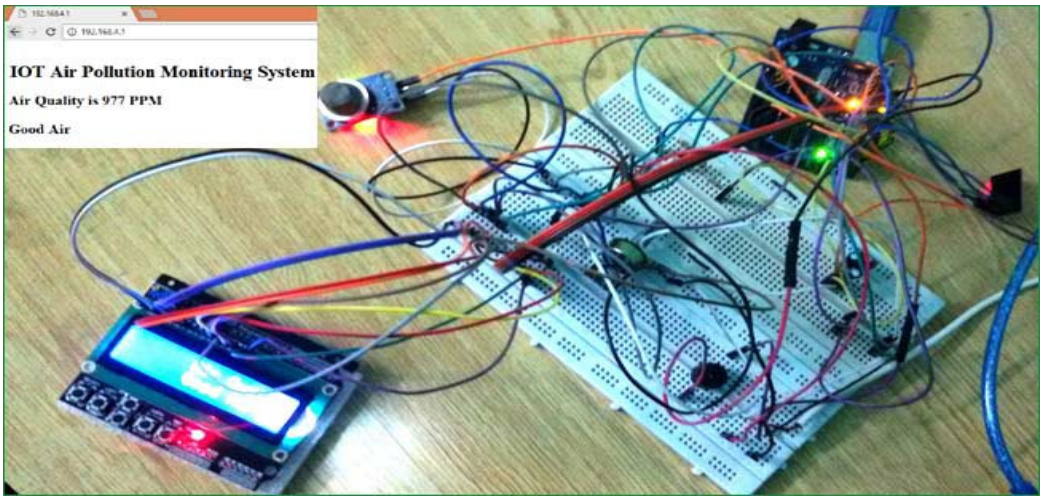
Currently the tools most used by the electronic hobbyist are not the welder and the transferable for printed circuits: they are Fritzing, breadboard, in-circuit programmers.



The development of the sm components, and the consequent increase of electronic modules, starting from the first Arduino to the current boards with ESP8266, passing from the "37 sensor", are all factors that have greatly contributed to the diffusion of DIY electronics.

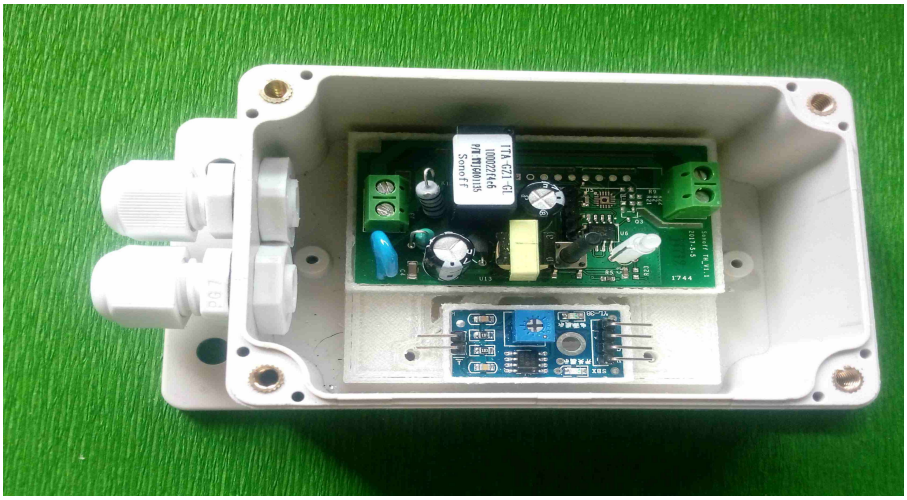


This evolution of the electronics from the single components to the macro-sets (boards and shields) was positive, allowing the rapid prototyping of complex projects until a few years ago unimaginable, thus bringing new audiences of enthusiasts to electronics.
Precisely, however, prototypes: 90 percent of the projects we find published consists of a tangle of wires on one or more breadboards.



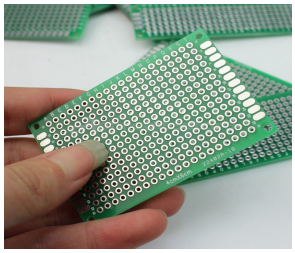
I want to present some ideas to move from an electronic 'prototype' to a more stable and usable realization, in a simple, quick and economical way.
With the use of a 3D printer and a series of OpenSCAD parametric libraries ready to use.
The use of the 3D printer allows to obtain tailor-made structures without the need of mechanical workshop machines for cutting, bending or drilling. Also many accessories (addon) such as terminals, connectors etc. can be inserted into the 3D project by simplifying assembly and wiring

1) integration - *shield boxes*

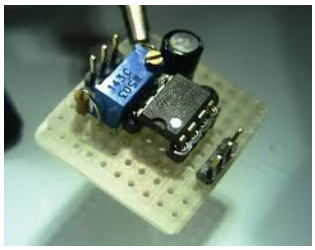


A project consisting of several modules can be organized on a flat base, locking each shield in a custom box with screws or with a hot wax gun.

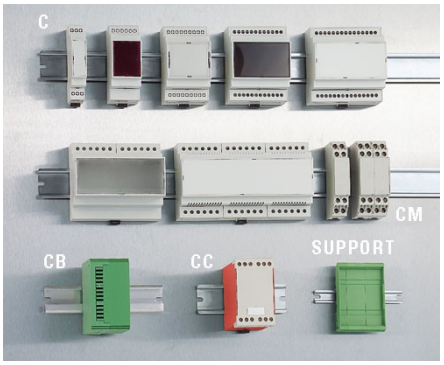
More bases can be stacked with suitable spacers. Connections can be made pin-to-pin with wires with terminals or welded. By printing in 3D the base you can add all the necessary accessories: connectors, spacers etc.
The base with the circuits thus assembled can be enclosed in a container.



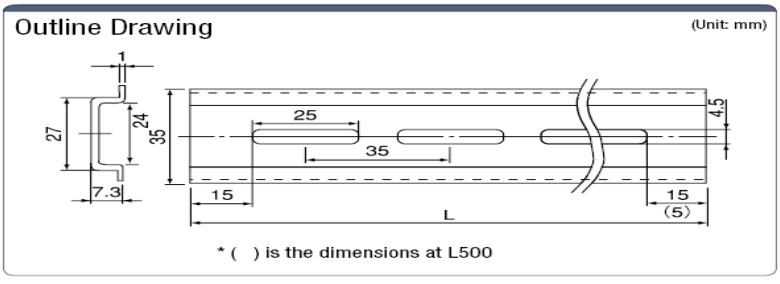
Prototype printed circuits are valuable for quickly creating prototypes of custom modules, but are no longer needed as the main design plate.



2) modularity - DIN *rail*



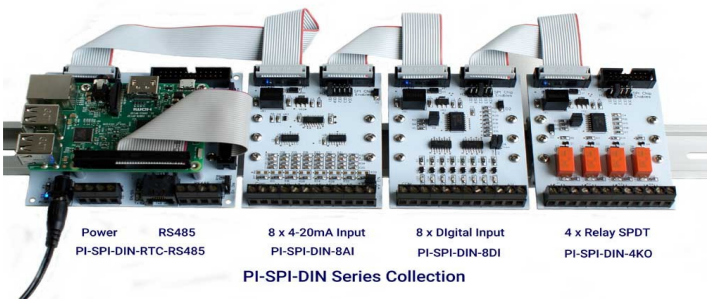
The DIN rail, which is very used in electrical distribution

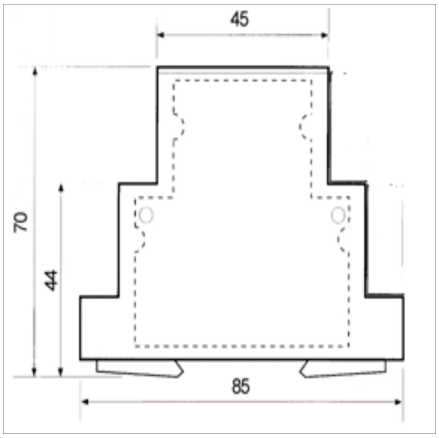


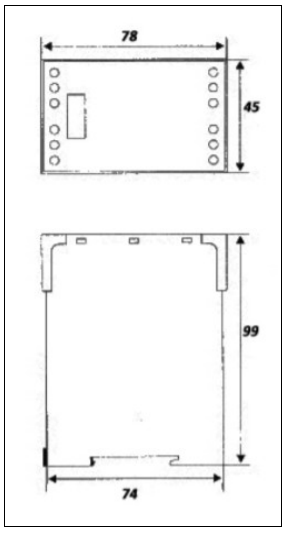
cabinets, is also very interesting for DIY electronics, especially in the domotics, control and IoT sectors. Its use has the following advantages:

- *Functional modularity*: a complex implementation can be decomposed into reusable modules. There are power supplies, interfaces, Arduino, ... etc on DIN rail. Why not even DIY electronics?
- The *control panels* also become modular, composed of single elements placed side by side on one or more rows. Simple solution to a long-standing problem.
- Possibility to mix *commercial modules* with custom DIN modules.
- In addition, factor not to be overlooked in the DIY field, there are on the market *containers with DIN rail* of all sizes, some very beautiful and professional, at a price often reasonable.

The dimensions of the standard DIN modules (see figure) are very elastic: horizontally you can have 85 mm (but also 90 mm and more) for any length, with a height of at least 44 mm.

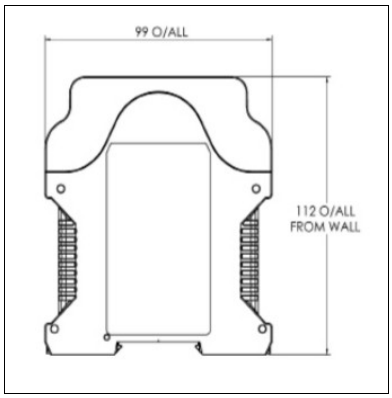






There are on the market modules with dimensions exceeding the standards, for example 45x78 height 99 mm, or 99 x 112 mm !! Much depends on the container you intend to use.

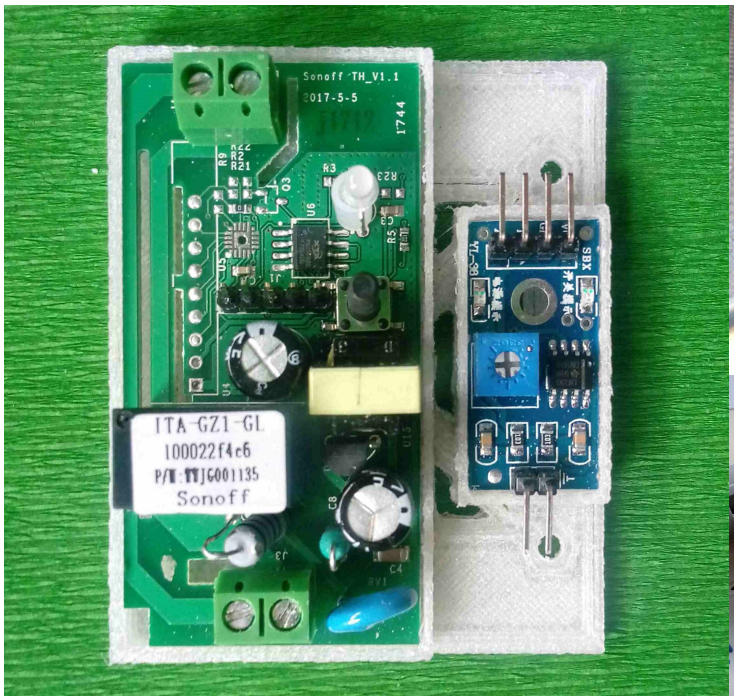
However the TOP, when destined to emerge and form the user interface, always has the standard measures indicated.

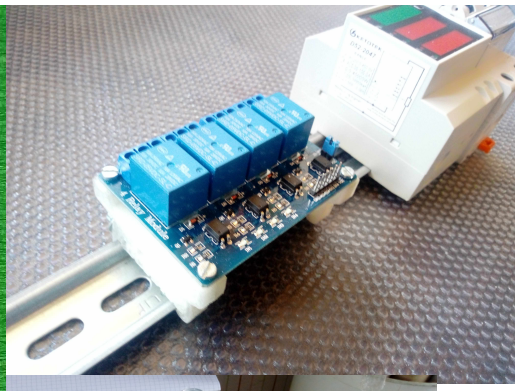


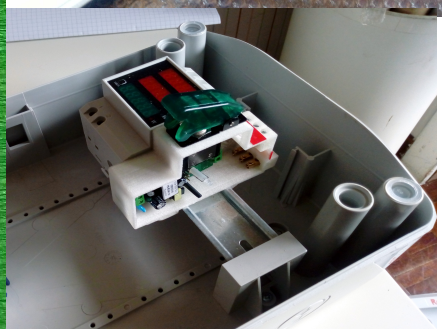
3) OpenSCAD parametric libraries

General notes

- *All libraries are designed to be easy to use: many parameters have 'reasonable' defaults, which can be used in most cases.*
- *Use insulating filament, with high operating temperature (for electronic applications) and certificate fire retardant.*



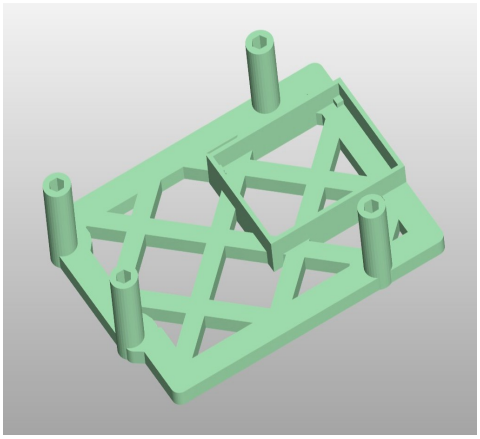


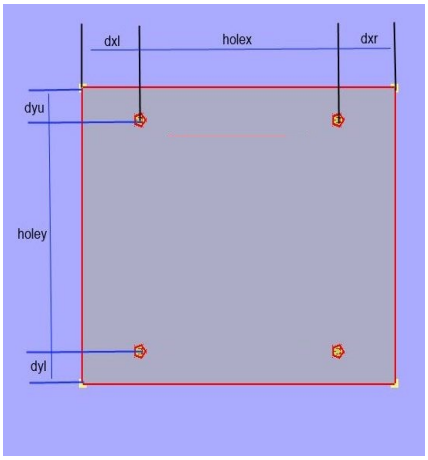


3.1 e3DHW_base_lib.scad

This basic library generates a solid or perforated plate of any shape, to be used as a structural support for modules and electronic devices.
A perforated base with a square grid pattern:

- ✔ uses less material
- ✔ allows air circulation



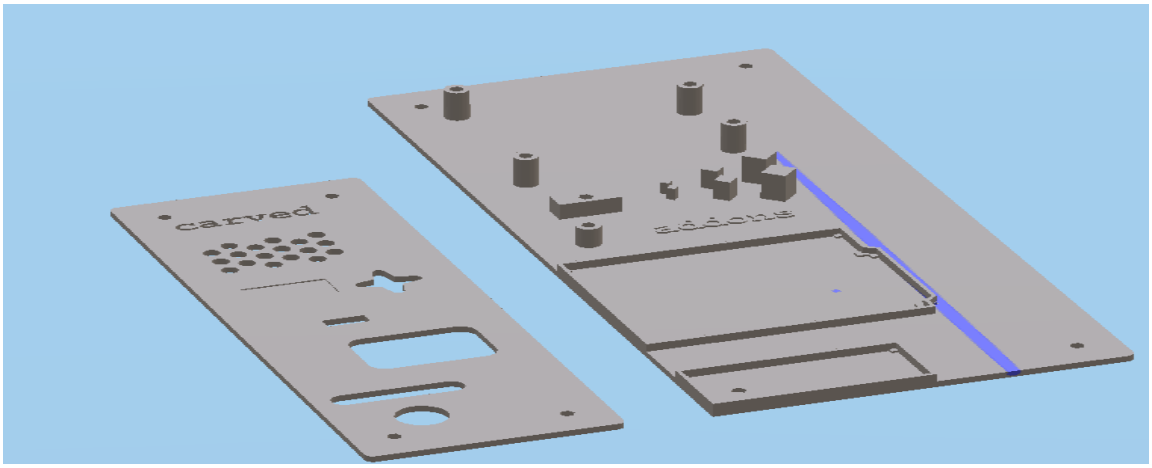


The base plate can be used alone to place many small PCBs in a container, or it can be used with DIN rail mounts or ... as you like.

In general, a plate is defined with an array of points (`vertex`) and another array defines the holes (`holes`) (see *e3DHW_pcb_board_data.scad*). In the simple rectangular case the plate can be defined alternatively with some measures (see `module rectangleBase`).

3.2 3DHW_addon_base.scad

This ADDON library contains useful things that can be added to a horizontal base. The addons are of two types: `ADD` or `CARVE`: the first ones add, the second ones remove.



Among the `ADD`: box for pcb (shield), spacers, cable clamps, text.
Among the `CARVE`: circular, rectangular, oblong holes, gratings, seats for Dymo 9 mm labels.

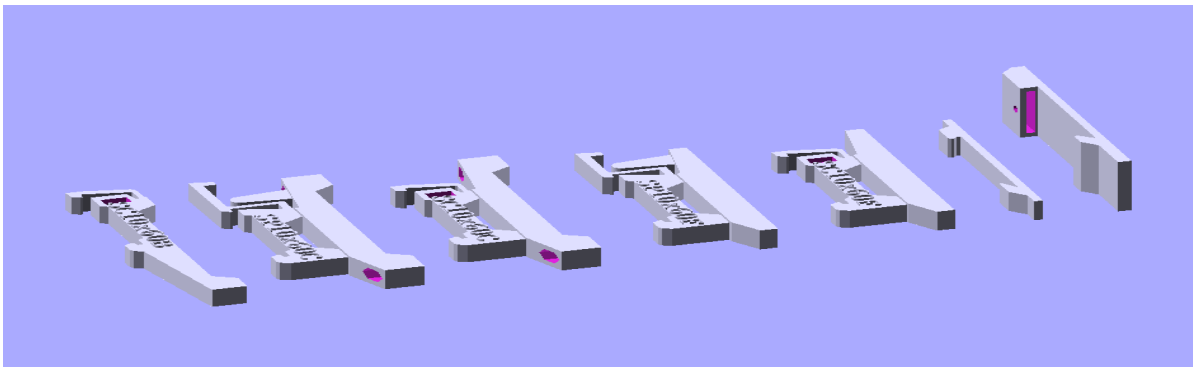
3.3 e3DHW_pcb_board_data.scad

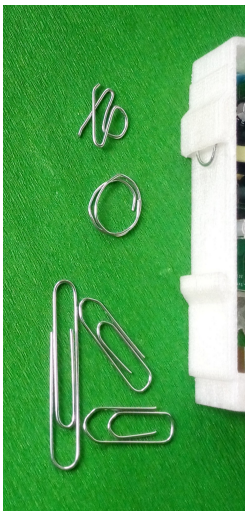
This data library is a collection of commercial PCB geometries.
Everyone can contribute by sending me new data: I will add them to the next version.

Example:

```
//Sonoff Basic
// description: cost effective WiFi smart switch (EPS8266)
// home: http://sonoff.itead.cc/en/products/sonoff/sonoff-basic
// contribution by m.s. (14/03/2018, marco.sillano<at>gmail.com)
 sonoffBasicVertex =[[0,0],[65,0],[65,34.1],[0,34.1]];
 sonoffBasicHoles =[];
```

3.4 e3DHW_DIN_rail_lib.scad



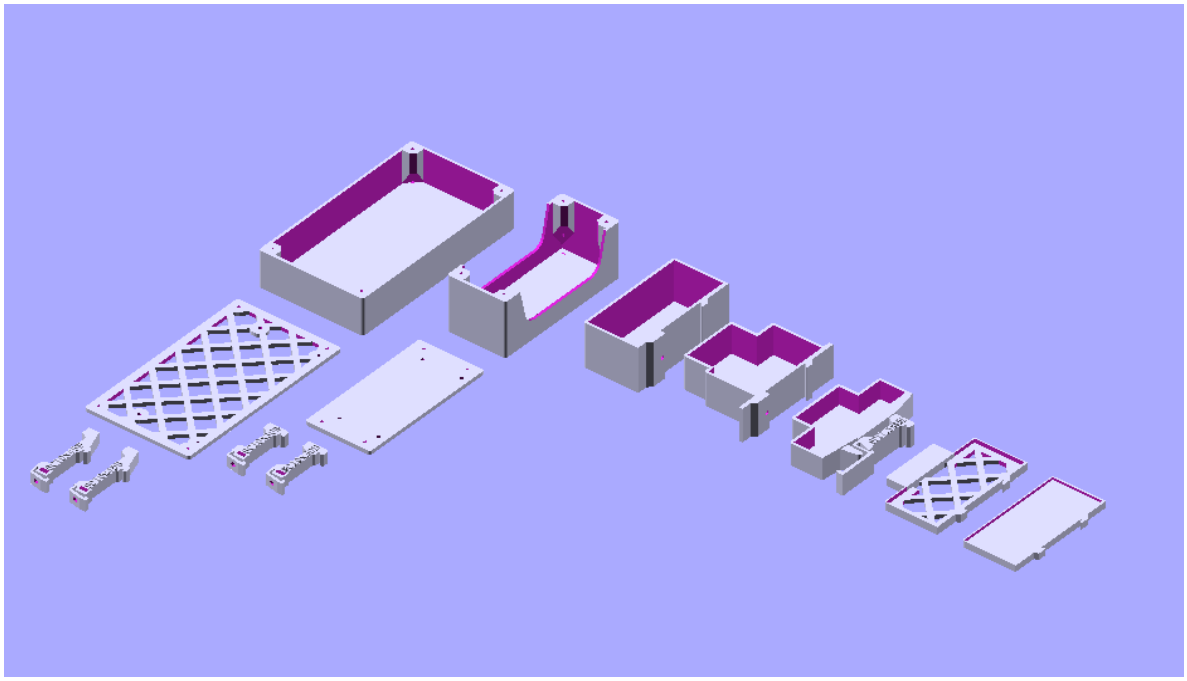


This library is a collection of parametric supports that are attached to the standard DIN rail (EN 50022, BS 5584, DIN 46277-3, TS35).
They are of different types: with spring, screw, with metal spring: some are usable directly, for example with pcb, others are intended to be used in more complex projects.

The `dinRailXStrong` model requires a metal spring, in harmonic steel or simply using paper clips in soft steel wire.

Where possible you will prefer the lower types, to gain space.

3.5 e3DHW_DIN_boxes_lib.scad



This library allows printing of separators and containers for DIN rail. The smaller boxes are monolithic, the larger containers must be assembled with self-tapping screws.

The highest part of a box (over 44 mm) is the TOP, which realizes the UI of the box. Note however that there are higher boxes on the market (up to 112 mm) without UI.

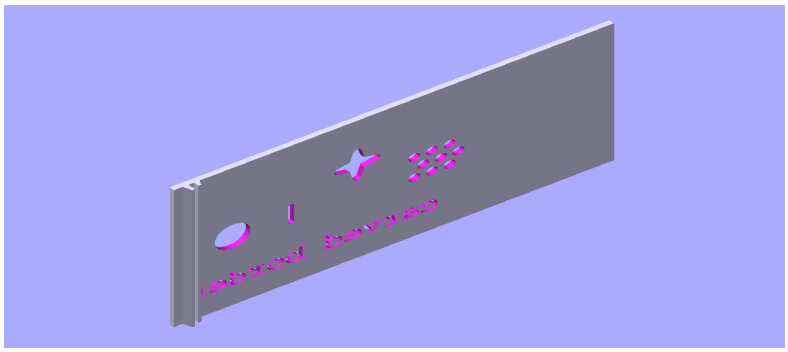
Obviously the bases and the tops (horizontal or vertical, depending on the model) can receive ADDONs, both the basic and the specific ones for the boxes.

In the picture a `simpleDinBox`, extended to the left (total: 100 mm), with 6 `half-CubeMammut` connectors, a box for Sonoff, two ventilation openings and a hole for the switch. (see file *example_DIN_DSP3.scad*)

3.6 e3DHW_addon_boxes.scad

The version for vertical edges of the ADDON.

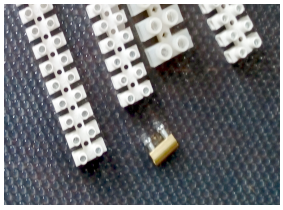
More: vertical guides for pcb, for example to place a pcb under the top panel (TOP) of a box, for LEDs or other elements of the UI .

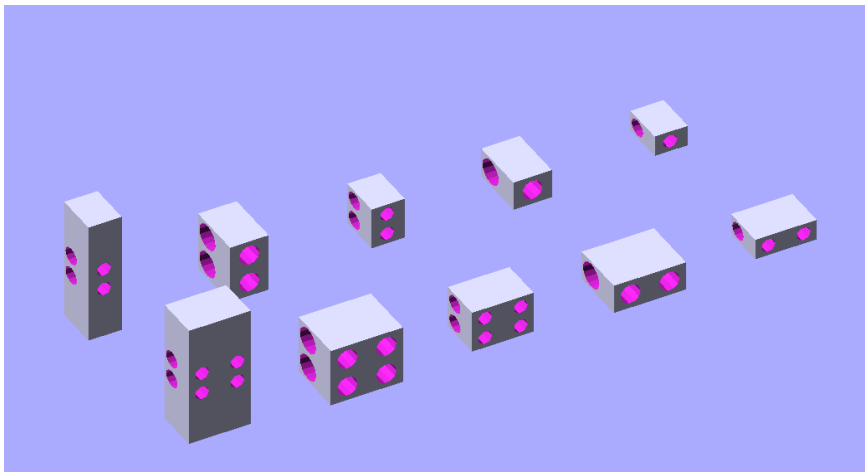


3.7 e3DHW_addon_terminal.scad

This library offers terminals and connectors to add to bases and boxes.

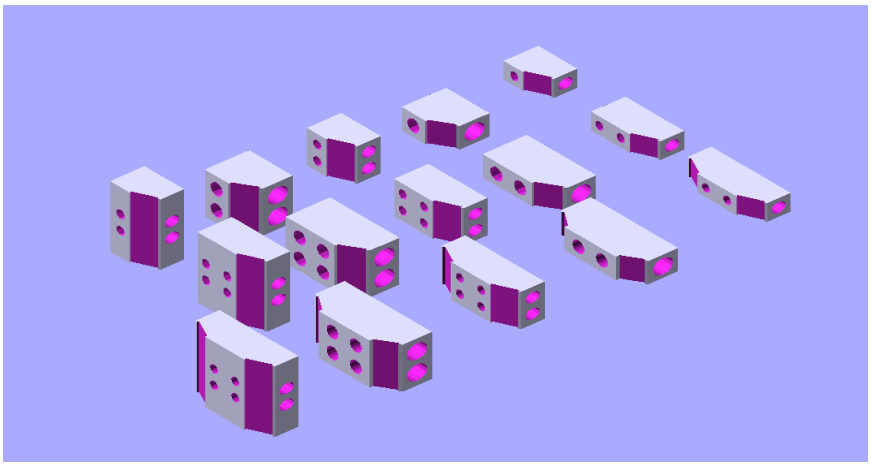
The Mammut series use the metallic interior of standard Mammut. The connectors are parameterized on the physical dimensions of the mammuts available.





CUBE
half cubeMammut
full cubeMammut

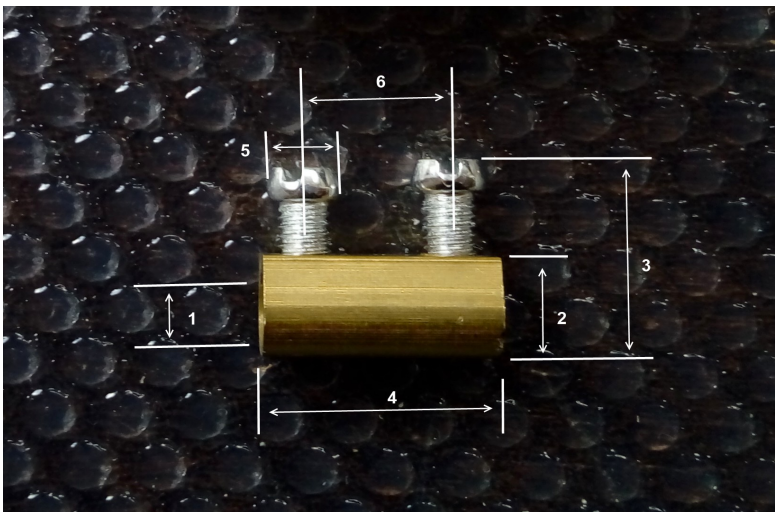
minimal

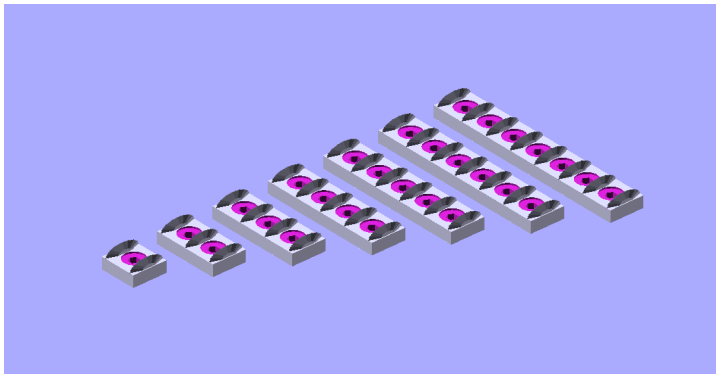


SIMPLE
half simpleMammut
full simpleMammut
double simpleMammut

mammut

You have to update the library with the exact dimensions of the mammuts that you intend to use.



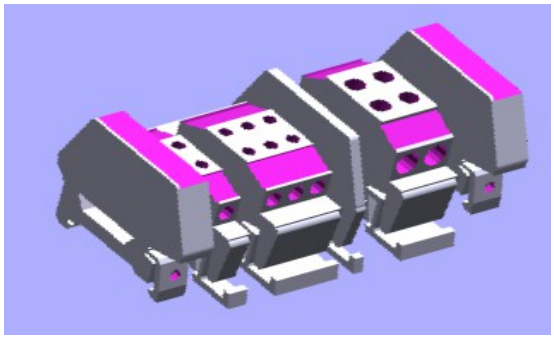


TERMINALS

simple M3 screw

3.8 e3DHW_DIN_modules_A.scad

After so many libraries, some DIN modules ready for use. Naturally parametric.



CONNECTORS
Basic serie (mammut)

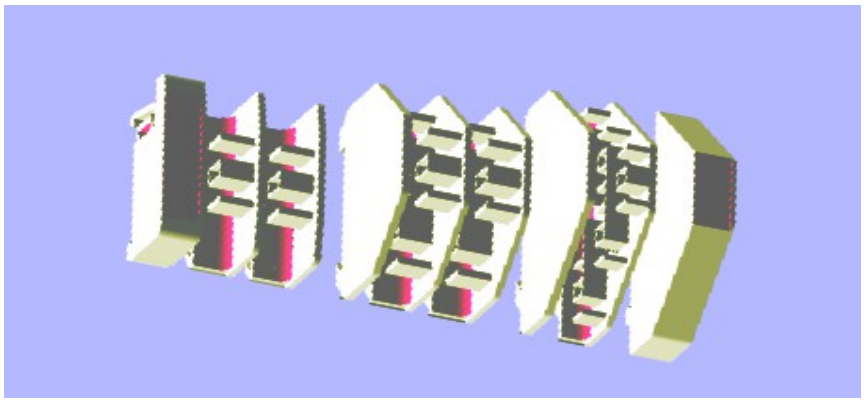
N x 2 connectors,
Plates, end brackets.

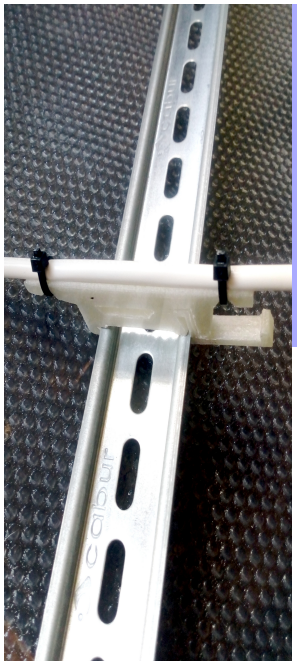
Massive and robust

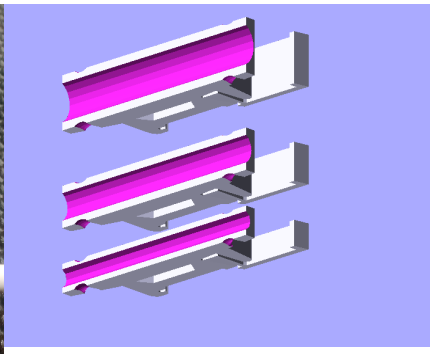
CONNECTORS
Tower serie (mammut)

2-6 terminal connectors
Plates, end brackets.

Space savers
Depending on the connections:
1x6, 1x2 + 1x4, 3x2
Quick and easy to print







STRAIN RELIEF

Cable: 3..22 mm

Use nylon tie straps to fix the cable

SUPPORT for

'wago compact connectors'