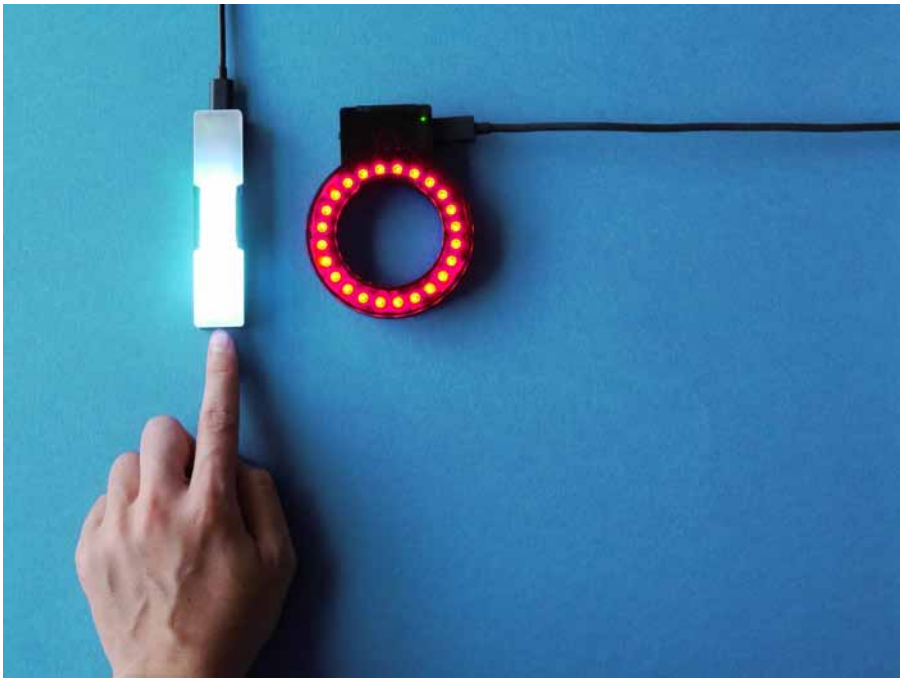
OPEN LIGHTS DIY INSTRUCTIONS FOR BUILDING ONE WHEELCHAIR LIGHTING

MADE FOR MY WHEELCHAIR

OVERVIEW



With this guide you can create two lights.
We call them I and O.
The components of I and O can be assembled without screws and adhesives. They can be attached to a wheelchair in different ways. But more about this later ...

1. Preparation

1.1 Materials and tools
1.2 Software and technology
1.3 Production data and licenses

2. 3D printing of the housing

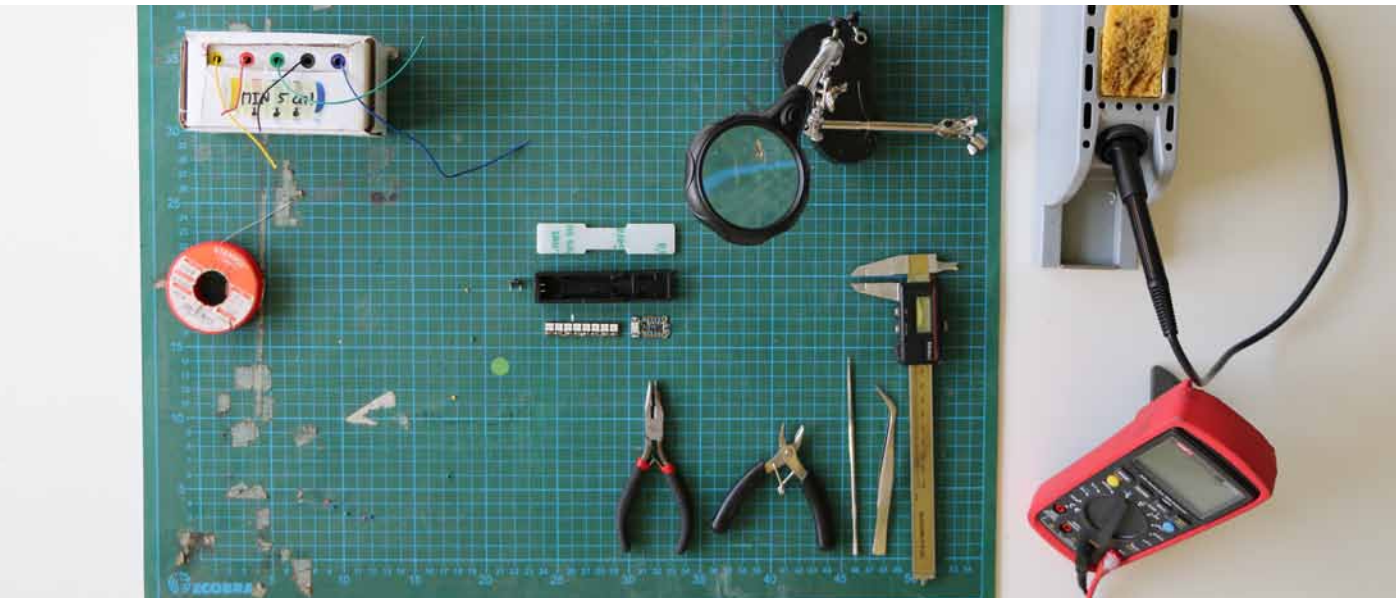
3. Laser cutting the cover

4. Electronics and assembly

5. Trinket and Arduino IDE

6. Attachment to a wheelchair

1. PREPARATION



1.1. Required Materials & Tools

a. Electronic soldering iron, Eg 30 watt, with soldering tip and soldering sponge
b a small side cutter
c. Spitz pliers
d. Third hand with magnifying glass

- Cable with three different colors for soldering
- Solder
- 3D printed housing (Filament PLA or ABS)
- acrylic cover (acrylic plate 3mm)
- For I: Adafruit NeoPixel Stick RGB LED 8 x WS2812
- For O: NeoPixel Ring RGB LED
- For each lighting an Adafruit Trinket, 5V Logic
- One push button T602 per lighting
- A power bank (we recommend at least 2200 mAh per lighting, for several lighting systems a stronger power bank with multi-USB port makes sense)
- One USB A to USB mini cable
(Should have the distance from the location where you locate the power bank)
- For attachment to the wheelchair you can choose cable ties, velcro fasteners, power-strips or Suguru dough

1.2. Required technology

For the manufacture of the housing you use best an FDM Desktop 3D printer with a heated platform.
The cover you cut at the laser cutter from a 3 mm acrylic plate.

1.3. production data and licenses

The following production data can be found at https://www.thingiverse.com/thing:2312153 download:
- stl files for I and O
3D model of housing for manufacture with a 3D printer
- svg file for I and O respectively
Vector to cut the cover with a laser cutter
- ino file
Program for light control to play onto the Trinket Microcontroller
- Soldering plan for I and O
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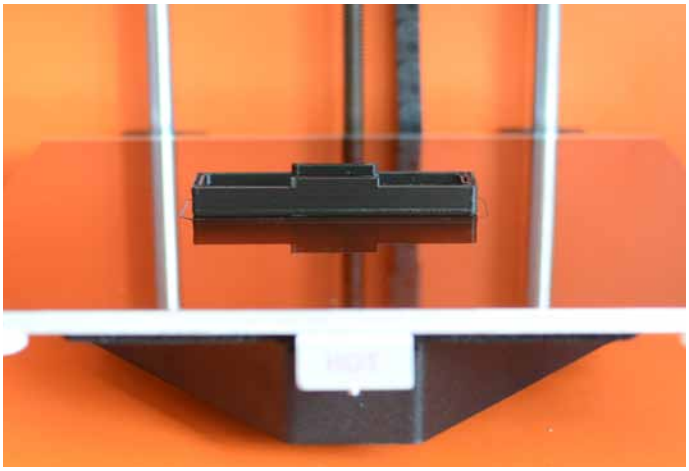
https://creativecommons.org/licenses/by-nc-sa/3.0 / deed.en

2. 3D printing of the housing

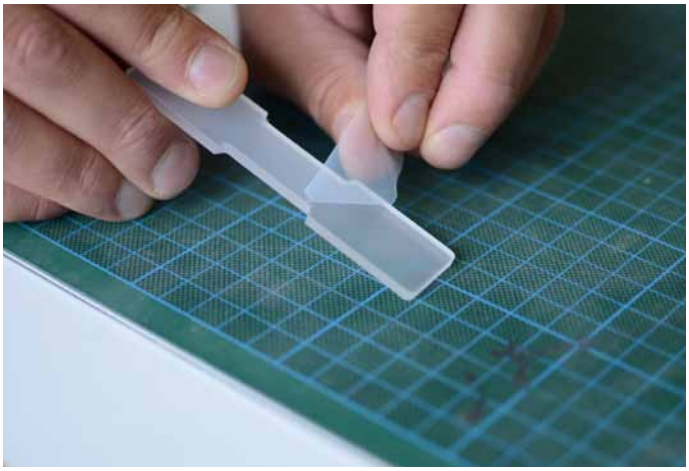


Print the housing with a resolution of 0.1 mm without support structures and base plate for best results.
In any case, a heated platform is suitable for the component to not deform during the printing process.

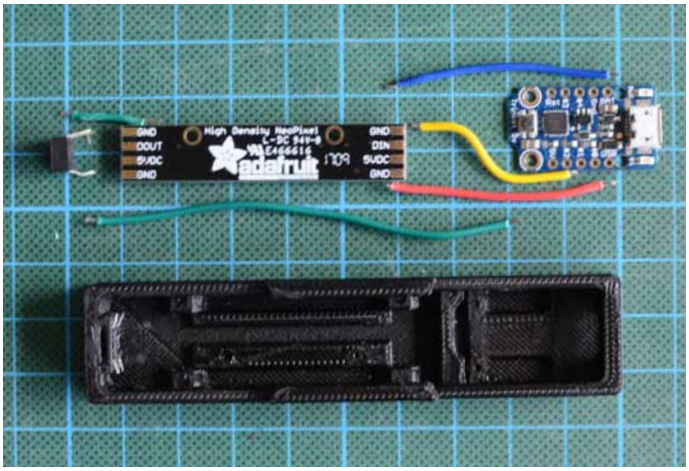
For the color choice we recomend black to bring the color of the acrylic into the foreground.

3. Lasercutting the cover

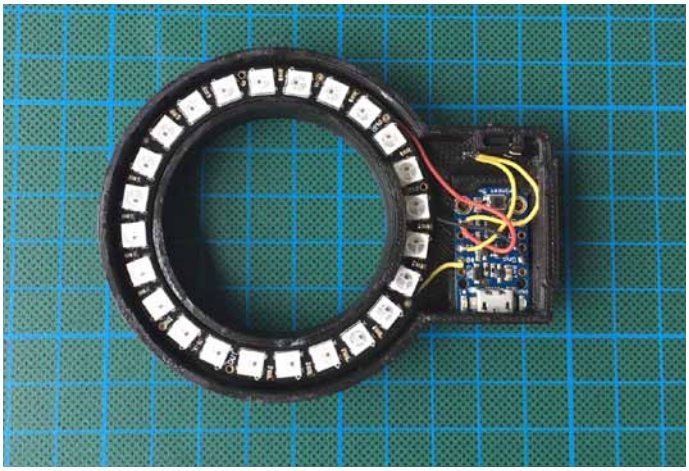
Use the appropriate settings for cutting 3mm acrylic plates of your local laser cutter. It's useful to leave the cover film on the plate to keep the edges clean.

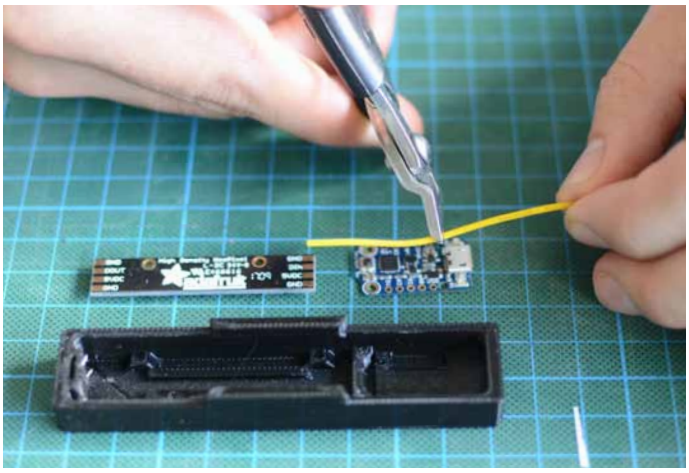


4. Electronics and assembly

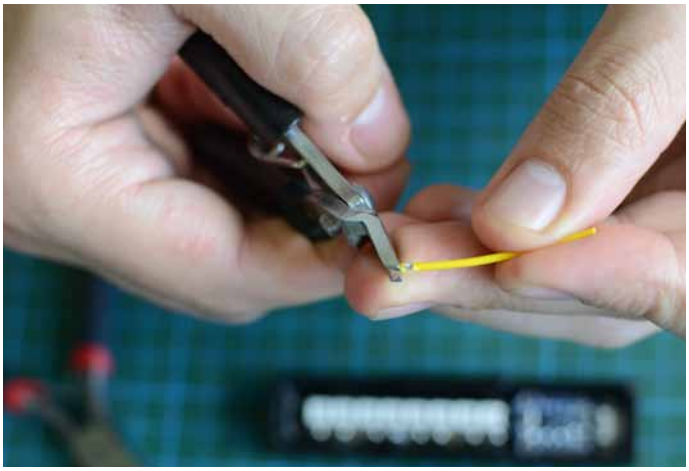


First you cut the cables.
In the picture on the left the components have about the length that they need to be mounted into the housing later. You can use this for orientation when cutting. For a better overview it is great if you can use cables with distinctive colors.
But it works with one color also.



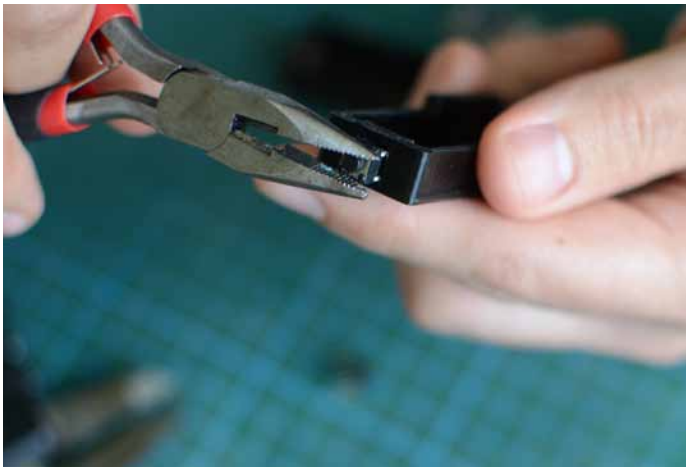


With the side cutter the cables can be easily cut.

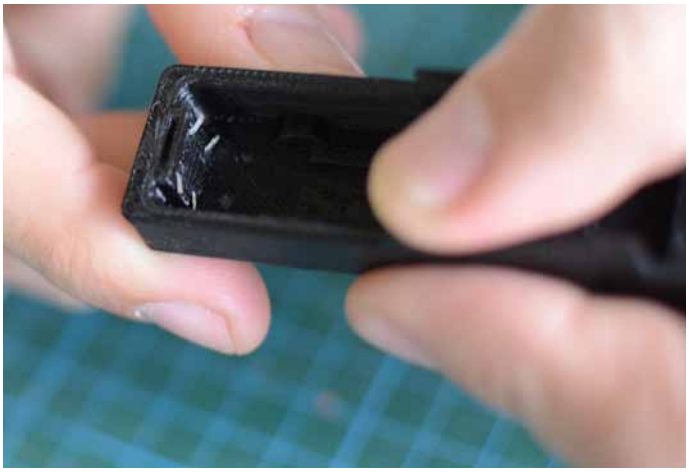


And you can also remove the covering at both ends of the cable over a length of 3 mm.

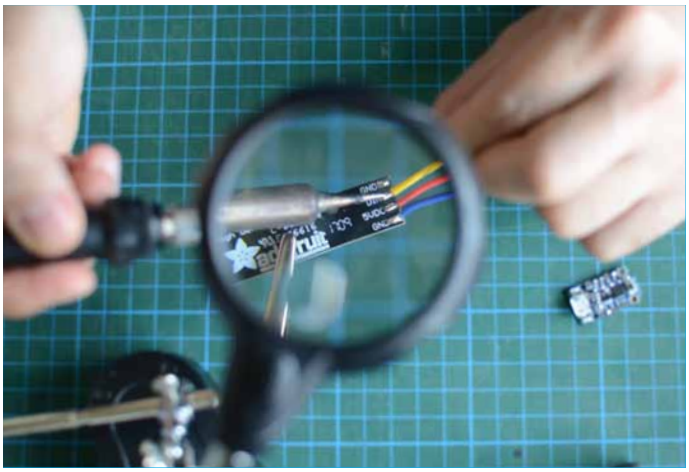
As I said, all the components can be plugged together.
Let's start with the push button.
First you have to bend the four little legs with the flat-nose pliers straight.



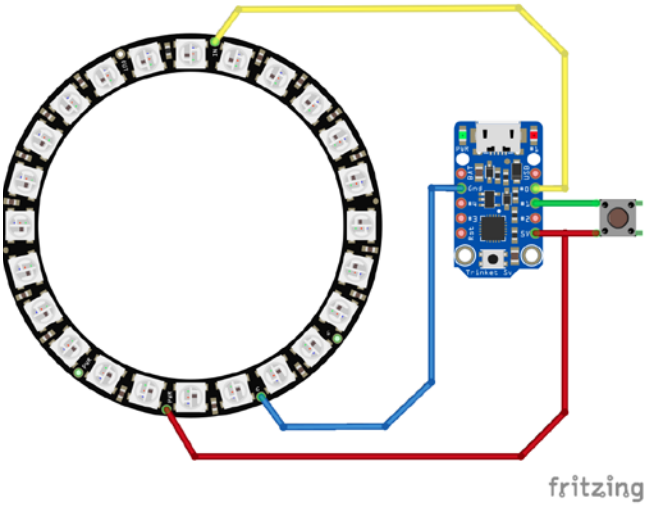
Then the component can be pushed with a little pressure into the opening on the front side.

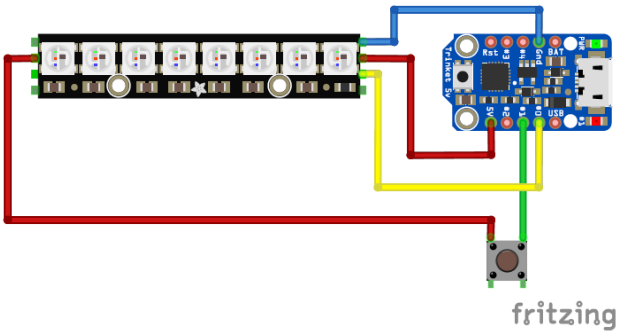


The four legs you have to fold inwards.
Fits!

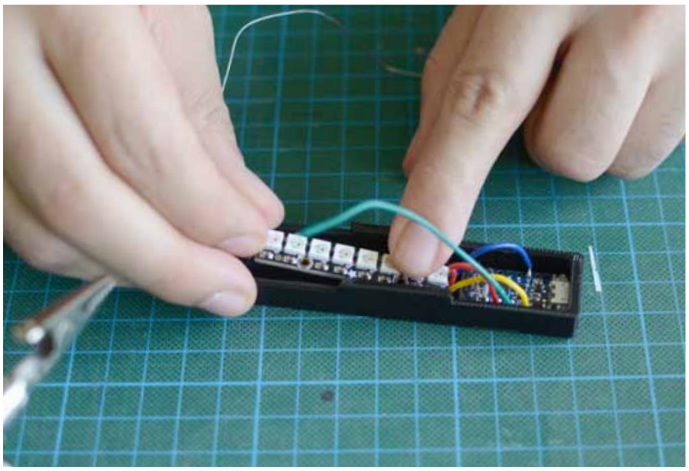


Before we can insert the Neopixel Stick or the Neopixel Ring and the Trinket, the components must be soldered together.
If soldering is a whole new territory for you, then take a look at this video and practice a bit.
https://www.youtube.com/watch?v=UpVx4wGukRc

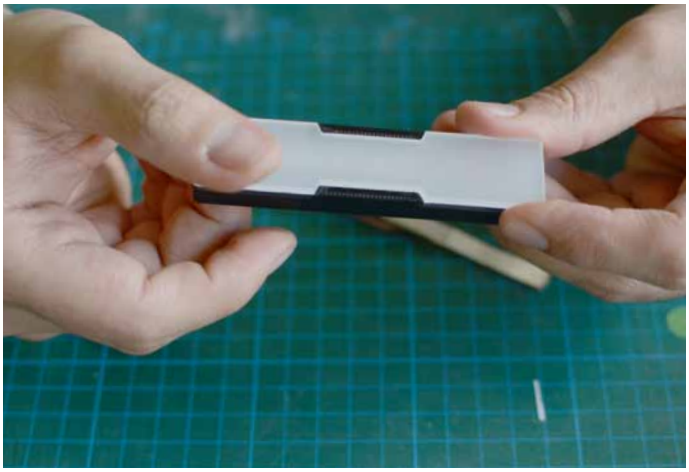




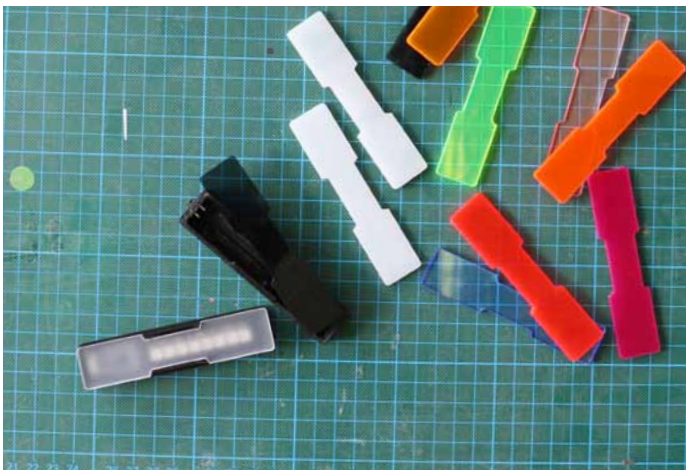
When soldering, you have to stick exactly to the soldering plan. Note that this is only about the soldering positions for the individual cables. The cable lengths and the Position of the components are not shown correctly.



When all connections are soldered, you can press the LED module and the Trinket into the designated pockets.
Make sure the cables lie under the LED module. If the housing is printed properly, the components should engage in their positions when light pressure is applied. If it does not fit 100% you can adjust the situation with an ordinary file or some sandingpaper.

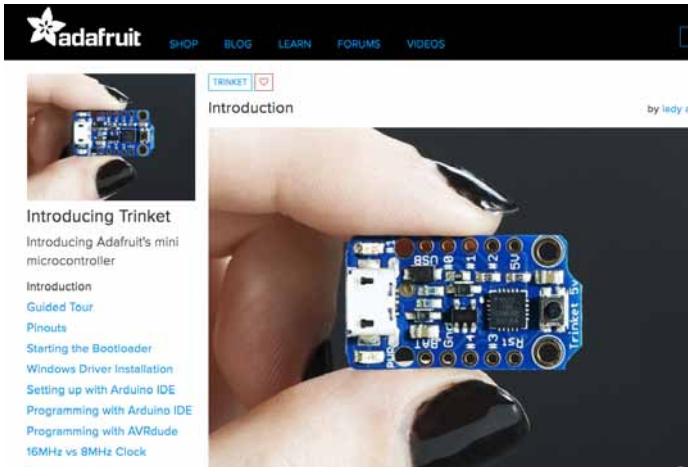


Also the cover fits between the clammy trapeze with light pressure.



Small tip:
There are also colored transparent acrylic panels. ;)

5. Trinket and Arduino IDE



The module looks great now.
For turning it into a lighting device you now load the ino file, a program that controls the LEDs, on the microcontroller.

A detailed introduction to the development platform Trinket, and everything you need to know about the program can be found here. https://learn.adafruit.com/introducing-trinket/introduction

When the battery is connected, you can turn on the module by pressing the button once.
Each time you press, you change the light effects. There are nine different effects pre-programmed between which you can switch.

You can of course also write your own code and develop your own light effects. A good introduction to the programming of Neopixel LEDs is available here: https://create.arduino.cc/projecthub/glowascii/neopixel-leds-arduino-basics-126d1a

6. Attachment to wheelchair

The housing offers different connection points on the bottomside for attachment to the wheelchair.
Cords can be pushed through the long holes.

On the surface, self-adhesive velcro tape or double-sided adhesive strips can be applied.

The notches in the surface are suitable for application with Sugru, an air-drying plasticine.
https://sugru.com/

Do not forget the cable and the battery. The battery should be reachable and accessible to the wheelchair user in any case. You can attach the cable to the wheelchair with the help of the cable ties.

Each wheelchair is adjusted to its user and there are countless models and possible mounting locations.
From our experience, three positions make sense.

1. Front lighting
2. Floor lighting
3. Back light

Enjoy the first night trip with your own lighting!