Instruction manual F1E-PS V2.0

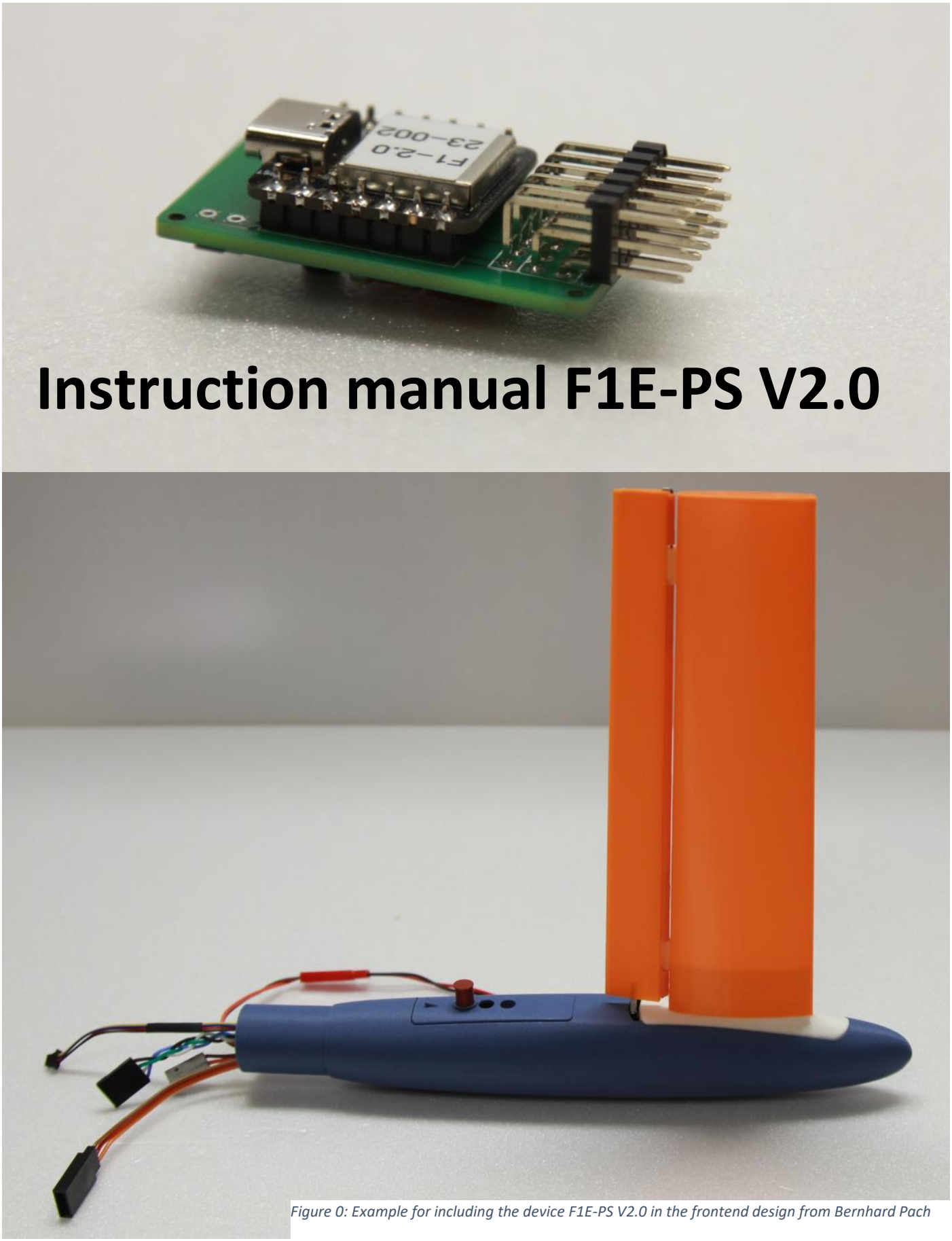

Figure 0: Example for including the device F1E-PS V2.0 in the frontend design from Bernhard Pach

Paul@Seren.de | https://www.flug-zeugs.de

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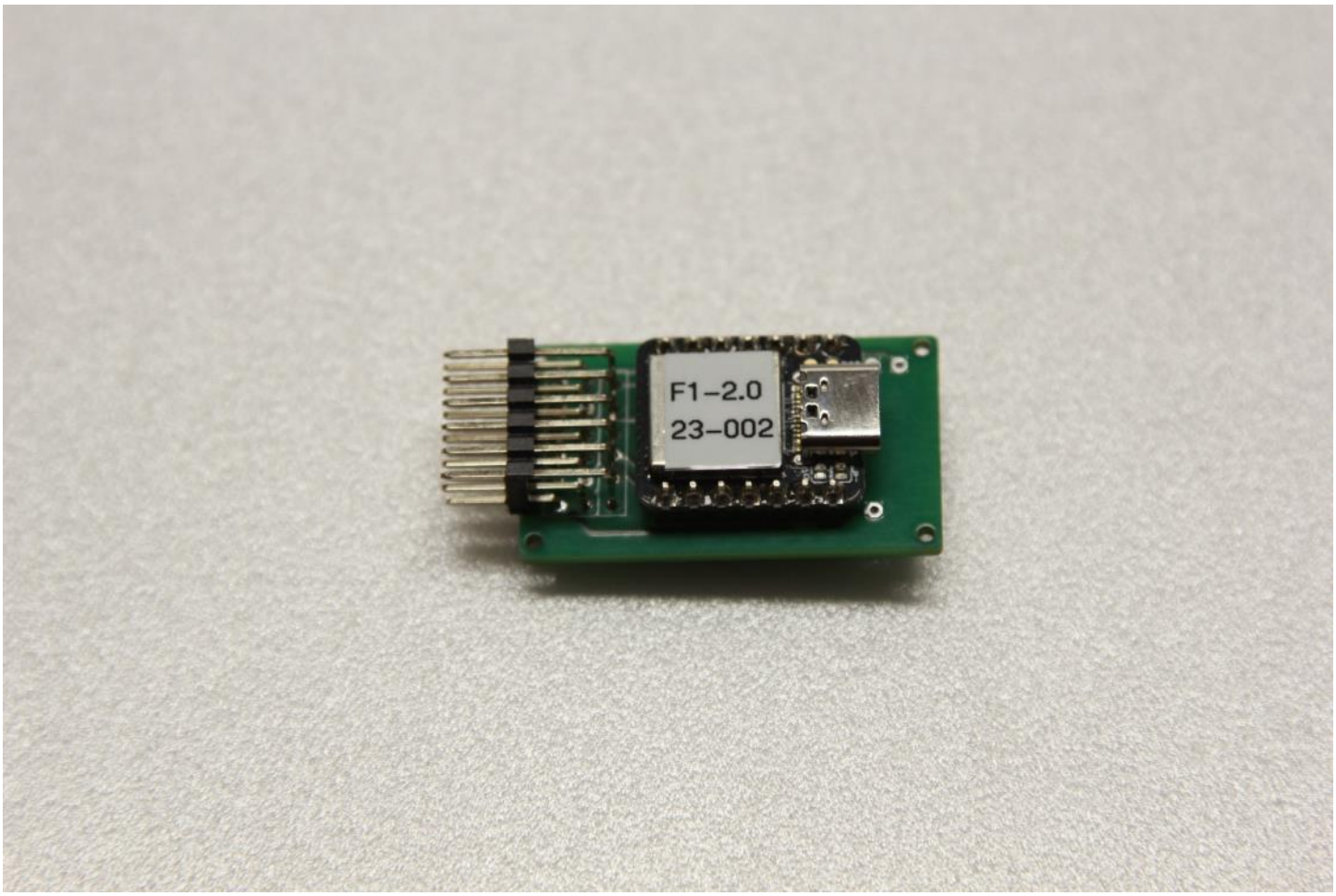

Figure 1

Overview

Version 2.0 of the F1E control system is the logical further development of the previous version 0.9. Valuable suggestions from the pilots have been incorporated into a revised software and a new circuit board layout.

Features

- Control of a directional servo via the earth's magnetic field.
- Directional control with the touch to a button.
- Head or tail rudder control possible (Servo reverse function/Jumper).
- Direction sensor and control unit can be installed separately.
- Very smart BNO055 direction sensor from Bosch/Adafruit.
- Power source e.g. Lipo 1S with 3.7 V recommended.
- Maximum input voltage 5.0 V
- Connection option for 2nd servo (RDT),
- Compatible with host RDT from Massimo Ursicino (Sidus RDT/ffelectronic.com).
- Enabling Circular flight function included.
- Circular flight: direction and deflection adjustable.
- Device can be operated without external programming device.
- Programming option via a serial interface on PC possible.
- Compatible fuselage head for head control (from Bernhard Pach) available.

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- Software and hardware design "open source" and available for reproduction via GitHub

Technical Data

F1E-PS V2.0 / 2 /1

- Size: 39x22.5x14mm
- Weight: 8.5 g
- Weight: together with BNO055-sensor and connection cable: 11 g
- Weight all together with Sidus RDT and 200 mm power/programming cable : 18 g
- Seeeduino Microprocessor Xiao / SAMD21
- Voltage: 1S Lipo 3.7V.
- **Max voltage 5V(!)**
- Designed for BNO055 9 axis magnetic heading sensor from Bosch/Adafruit
- Temperature: -10°C – 55°C
- Reverse onboard jumper bridge for changing servo direction
- Zero-position (middle/neutral) adjustable by onboard potentiometer
- Circle function, direction and elevation adjustable by onboard potentiometer
- Onboard button for direction control
- All parameters could be modified via serial port
- Pins/port for external input:
    - RDT
    - Circle
    - Programming

Device overview

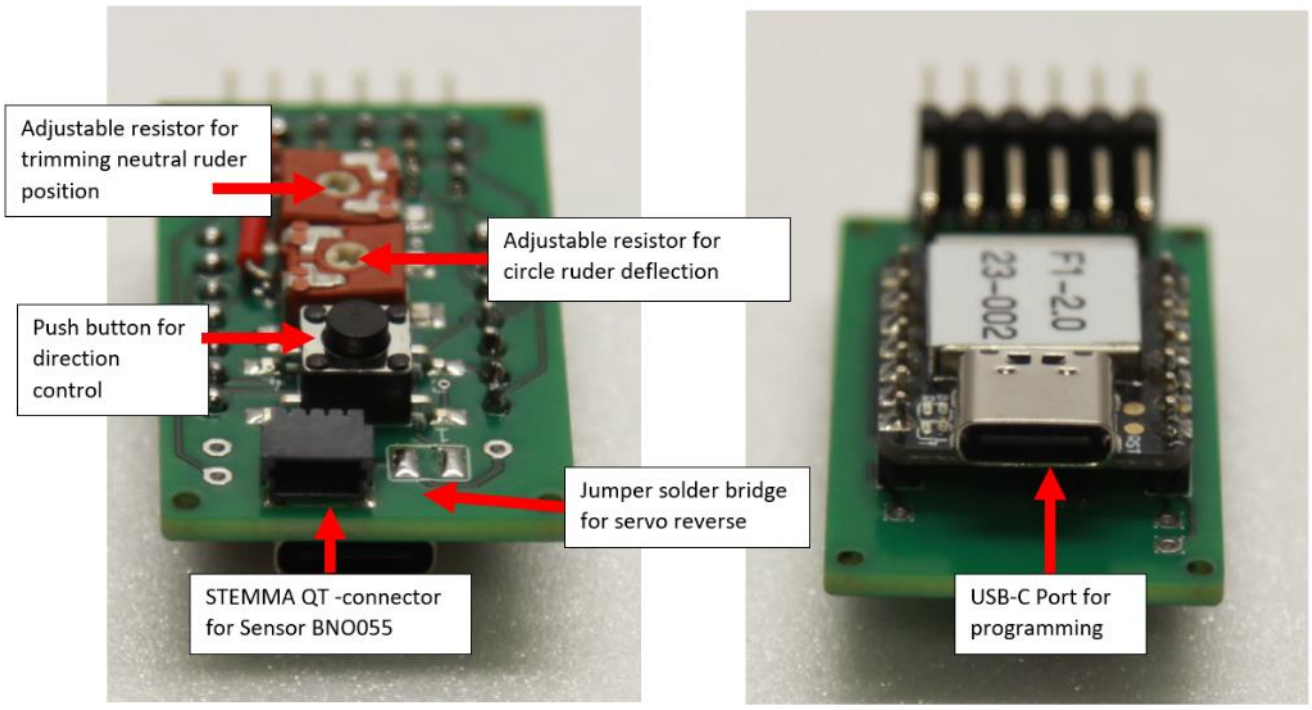

Figure 2: Main connectors and technical controls

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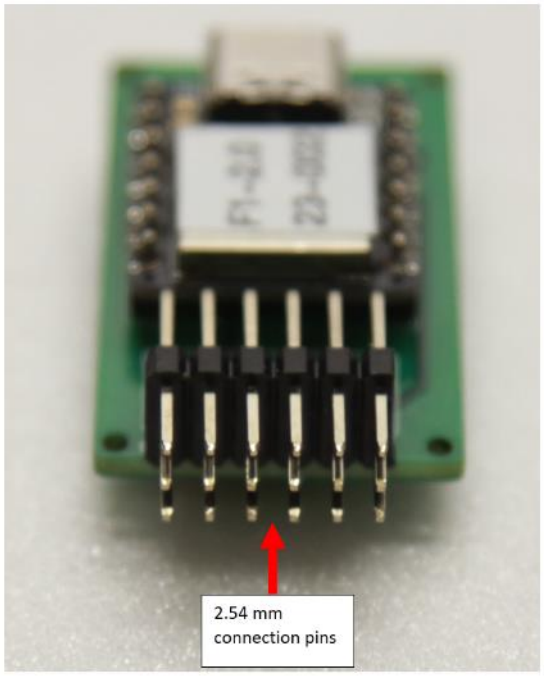

Figure 3: Main connectors and technical controls

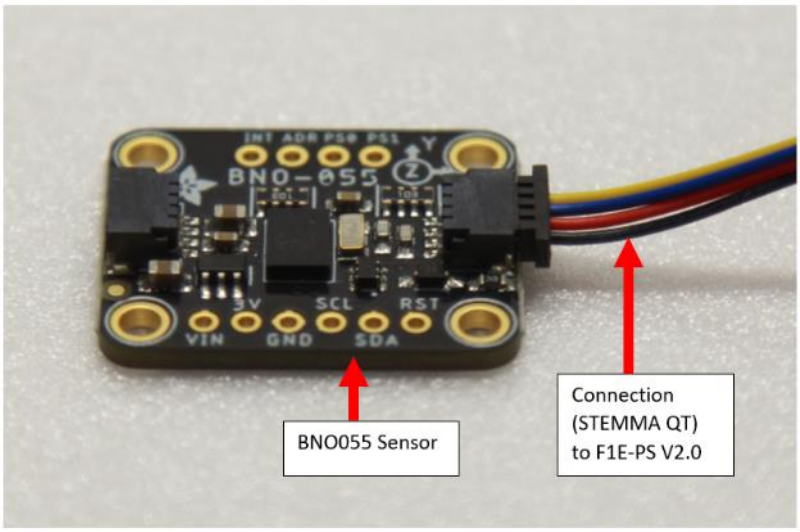

Figure 4: external sensor BNO055 and connection cable STEMMA QT

Wiring

Main wiring (Figure 5 + 6 + 7):

- Connect BNO055-Sensor to F1E-PS V2.0 device with a STEMMA QT – cable
- Connect Servo to F1E-Servo Pins
- Connect Power to power pins. **Take care for polarity and voltage!**

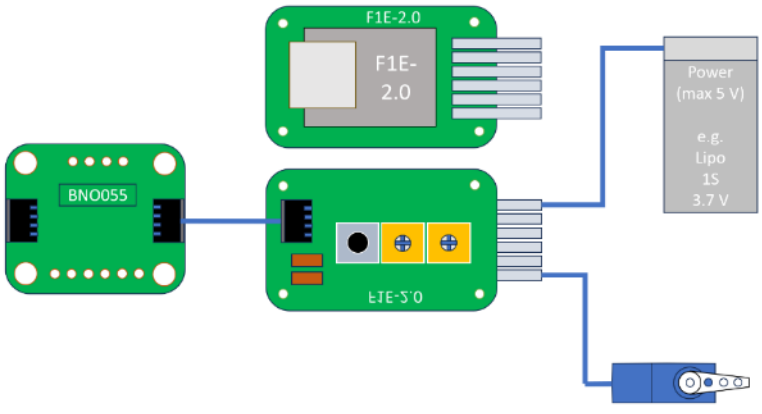

Figure 5: Main wiring for F1E

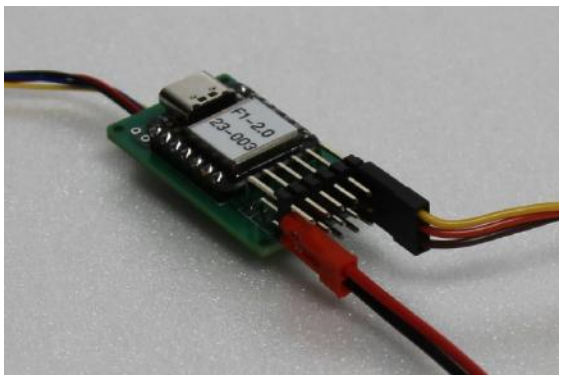

Figure 6: Plug view for main wiring

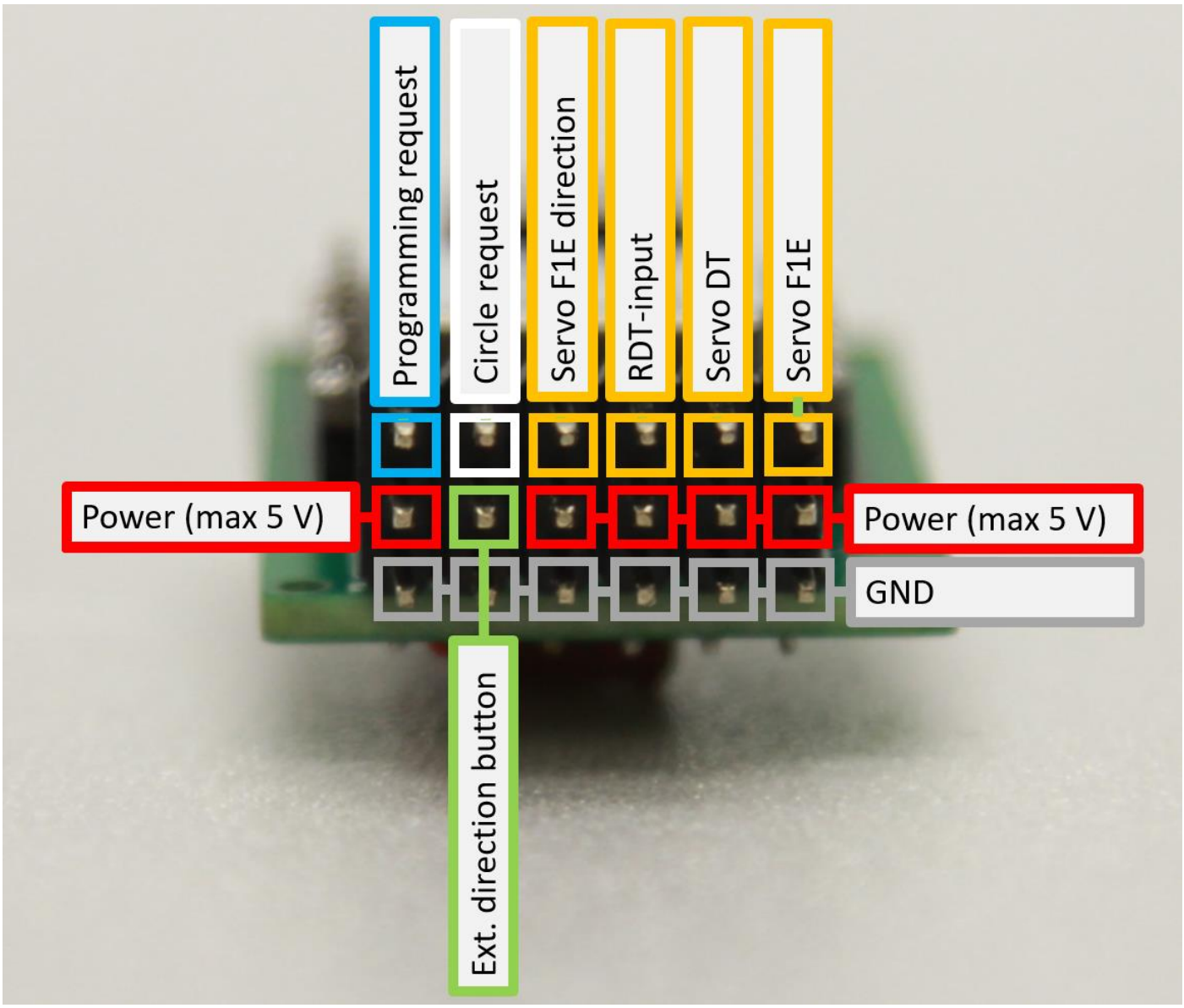

Figure 7: Overview connector pins

Additional wiring (Figure 7):

It is possible to add more components to the device:

- Servo F1E: Standard servo configuration for F1E-Steering with one steering servo
- Servo DT: DT servo connection for RDT-function released with RDT-Input
- RDT-Input: Connection for Host-RDT from Sidus or by setting pin to GND
- Servo F1E direction: Setting the pin to GND will change the servo direction (servo reverse)
- Ext. direction button: For direction choice you can use the onboard button or setting pin to GND
- Circle request: Move the F1E-servo to desired position by setting pin to GND
- Programming request: Setting pin to GND enables the program to change variables via serial USB-port
- Power (max. 5V): Power input for the device

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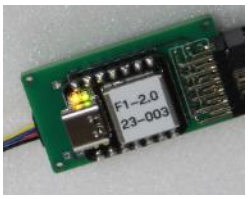
How to use the device

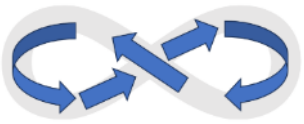
Detailed description

- **Connect all needed plugs to device:**
  - BNO055 sensor via STEMMA QT cable
  - F1E-Servo
  - Power (max. 5 V)

  additional:
  - DT-Servo
  - RDT-Receiver
  - Wiring for external input (direction button, circle button).
- **Power on / Boot**
  - *On the device: the yellow LED on the device will quickly blink 10 times: this indicates the proper work of the microprocessor.*
  - The F1E-Servo will move to the maximum elevation of one side: this indicates the start of the necessary calibration process.
  - A connected DT-Servo to the device will move to the DT position.
  - *On the device: the yellow LED on the device will blink slowly during the calibration process*.



- **Calibration**
  - **Step 1:**
    - **Now move the sensor/model in the air. Try to draw a "∞":**
      The magnetic calibration will be done.



  - **Step 2:**
    - **Lay down the sensor/model flat to the bottom. It is not necessary to have it accurately horizontal. But it is necessary that there is no movement: The gravity and acceleration will be done.**
  - Step 3:
    - Wait some seconds!
    - If Step 1 and Step 2 were successful:
      - **The F1E Servo will move to the adjusted middle position/neutral position**. This indicate the end of the successful calibration.
      - The DT Servo will move to the closed position: the F1E-Steering is now activated!
      - *On the device: the yellow LED now lights up permanently.*
    - **If Step 1 and Step 2 were not successful:**
      - The Servos will remain in the positions described in Step 2
      - **Repeat Step 1 and Step 2! :**
        Especially Step 2 is important: Windy conditions and a wobbly model aeroplane prevent or disturb calibration.
- **Fly:**
  - Hold the model in the direction in which you want to fly.
  - Set the F1E servo to the middle/neutral position by pressing the direction button (Figure 8).
  - Throw your model.
  - **Fly a max!**

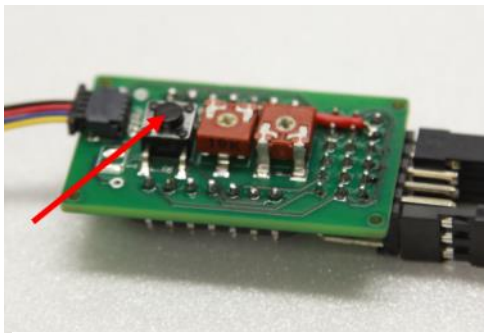


Figure 8: Direction button

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How to adjust the device

Trimming the middle/neutral position

- Do all steps like the description before.
- Press the direction button permanently.
- Turn the adjustable potentiometer (Figure 9) with a suitable screwdriver until the middle/neutral position is reached
- Release the direction button.

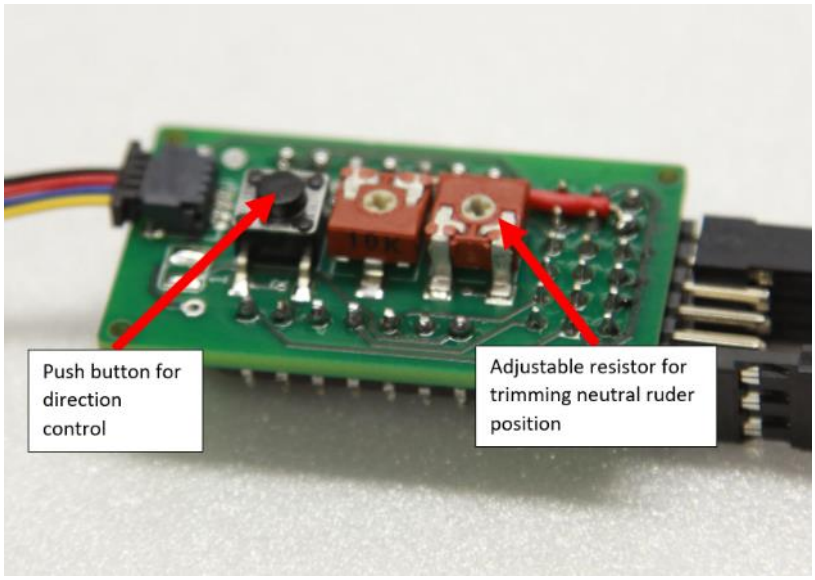

Figure 9: Trimming the Servo

Adjusting the circle position

- Do all steps like the description before.
- Connect the circle request pin (Figure 7) with GND.
- Turn the adjustable potentiometer (Figure 10) with a suitable screwdriver until desired position is reached

Usage:

- Release the circle request pin from GND:
  - the F1E-servo works again normal for heading / direction control.
- Connect circle request pin with GND:
  - The F1E-servo change to the desired circle position

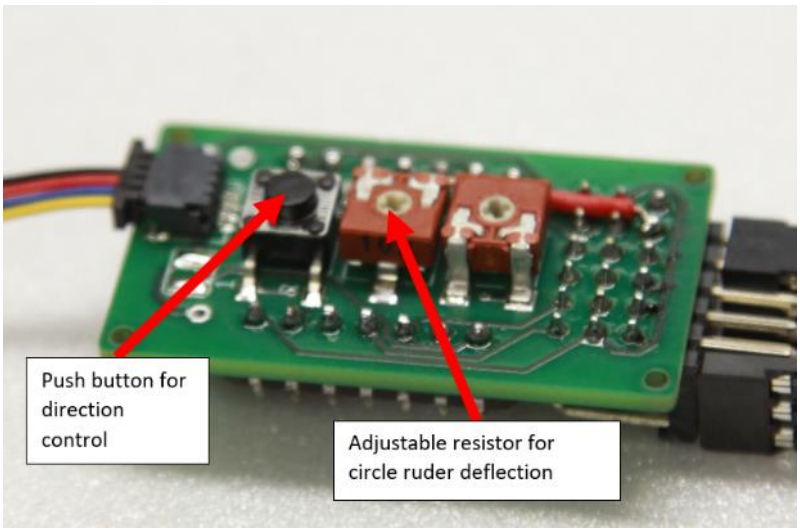

Figure 10: Trimming the Servo

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Additional Information

- The device could be placed at any position and orientation in your model.
- Only for the sensor BNO055 it is necessary to place it horizontally in the model.

Bernhard Pach from Germany has designed a special 3D print frontend for this device. For information about this frontend please have a look to my shop/page: https://www.flug-zeugs.de/shop/modellflug/

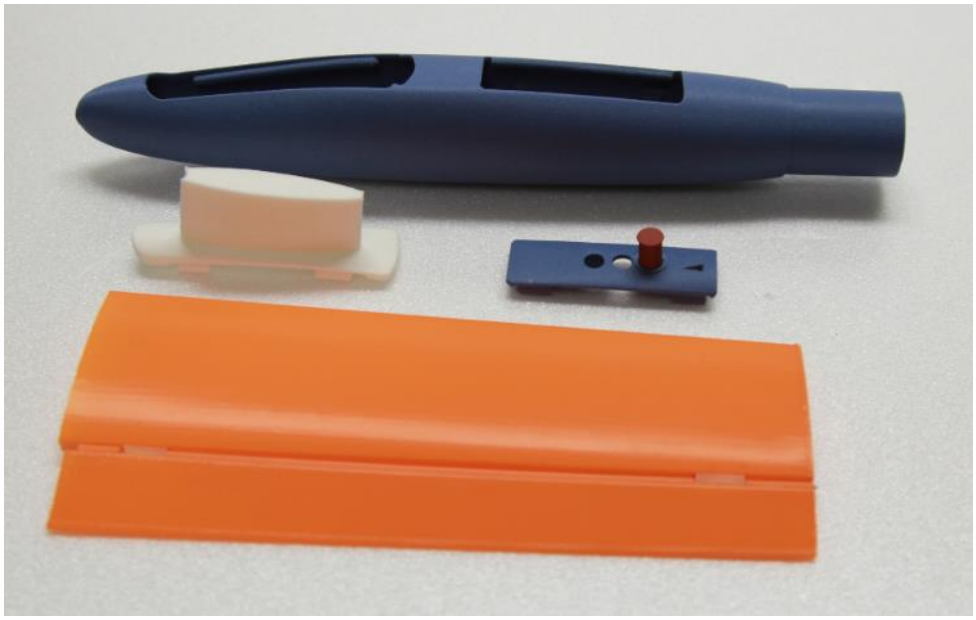

Figure 8: Frontend parts for the device (design Bernhard Pach)

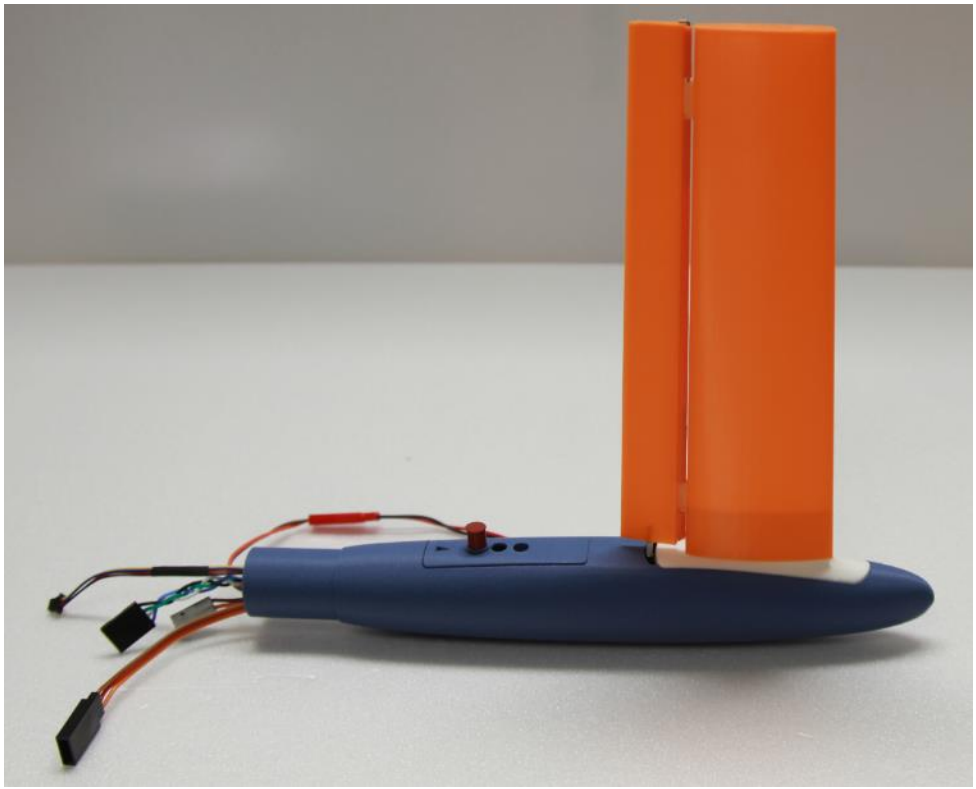

Figure 9: Frontend for the device (design Bernhard Pach)

More information will be updated…