en/heightsensor

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LotharF
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1 Function

Decreases with increasing height of the atmospheric air pressure. This is measured by the air pressure sensor. The output signal of the sensor is a DC voltage.

Examples:

Hight	Press. [hPa] (mbar)	Sensor Voltage [V]
0 m	1013,25	4.08
500 m	954,61	3.82
1000 m	898,76	3,57
1500 m	845,58	3,33
2000 m	794,98	3.1
2500 m	746,86	2,88
3000 m	701,12	2,68
3500 m	657,68	2,48
4000 m	616,45	2.3

See also: Wikipedia

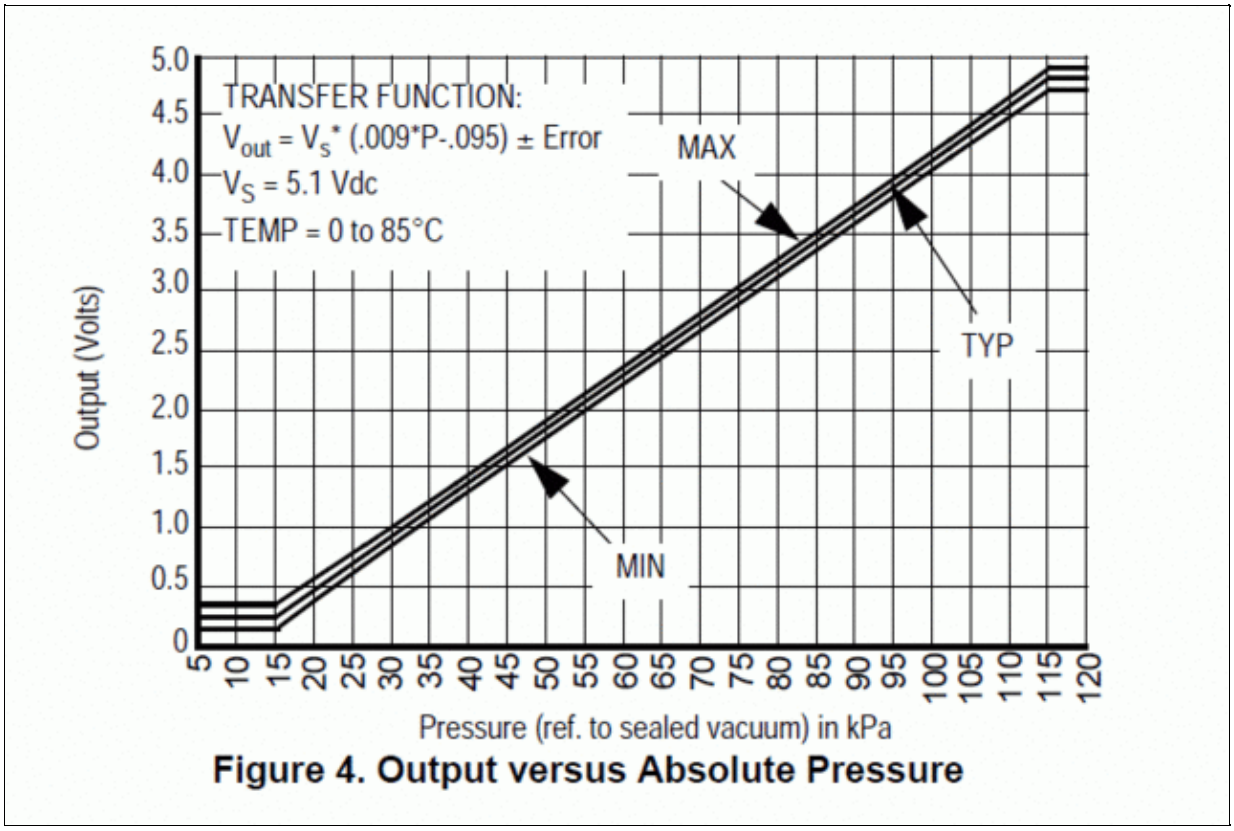


Figure 4. Output versus Absolute Pressure

(Here is 1000mBar = 100kPa)

2 MPX4115A Air pressure sensor

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2.1 Pin Assignment

- * 01 Vout (output signal) (Pin1 left has a mark)
- * 02 GND (Ground)
- * 03 Vs (operating voltage)
- * 04 NC (no connect)
- * 05 NC (no connect)
- * 06 NC (no connect)

/!\It is essential to ensure that no UV radiation can occur through the sensor hole - this can lead to malfunction!Caution!!! A side-inverted installation can damage the sensor !

Attention: Different built-form "Case 482" or Case 482A"

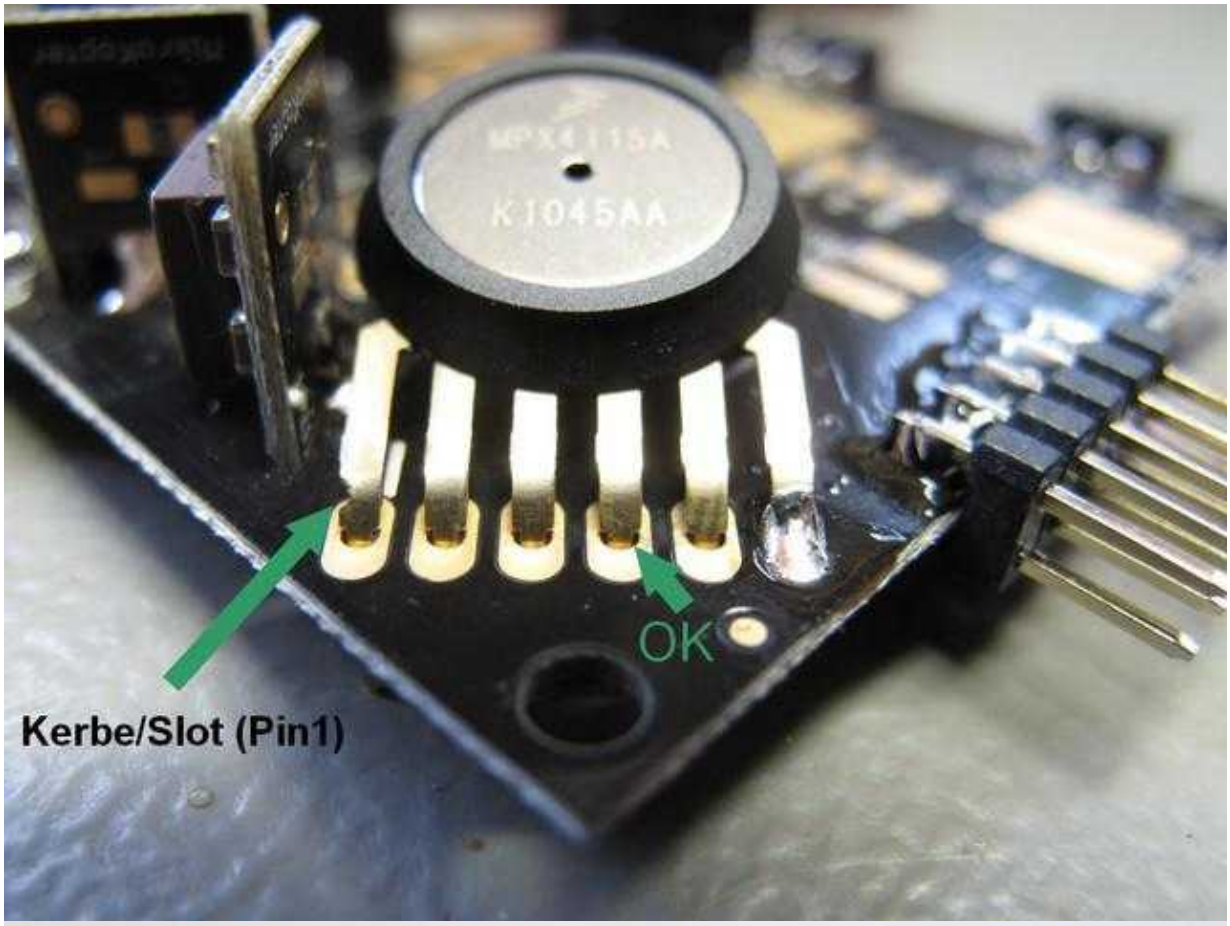
2.2 Technical Datas

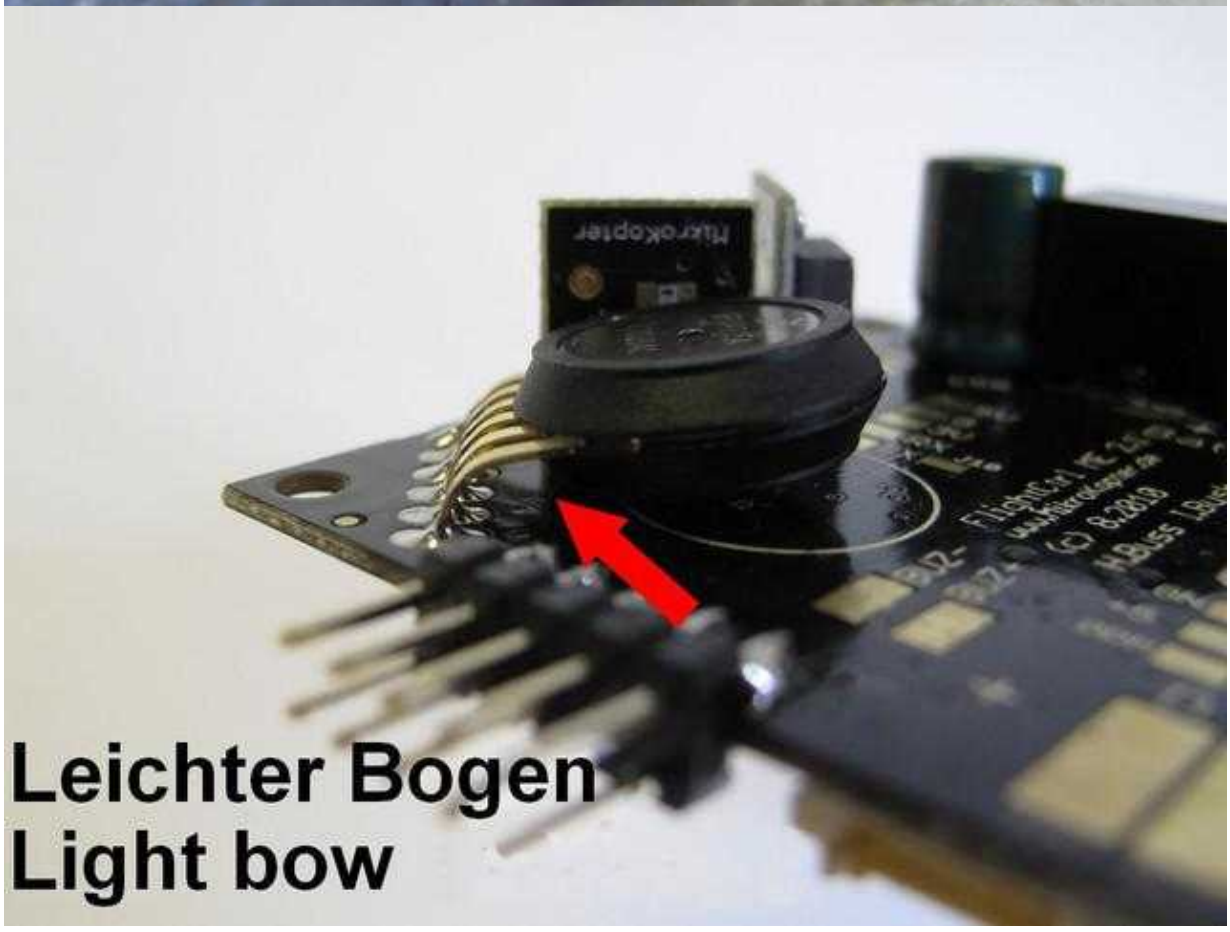
- * Operating voltage: 4.85V - 5.35 V (Vdc)
- * Power: 7mA - 10mA
- * Temperature range: -40°C - 125°C
- * MPX 4115 Datasheet

2.3 Installation

The connections of the sensor should be, like seen in the figure below, carried out completely and soldered on both sides of the board.
Pin 4,5,6 must not be soldered. But throughout vibrations during a flight all pins should be soldered.

The connecting leg with the notch (pin 1) is pointing away from the 10-pin FC-connector.


MPX4115A
KJ045AA
OK
Kerbe/Slot (Pin1)


Leichter Bogen
Light bow

Installation on other Flight-Ctrl. versions

2.4 wrong installation

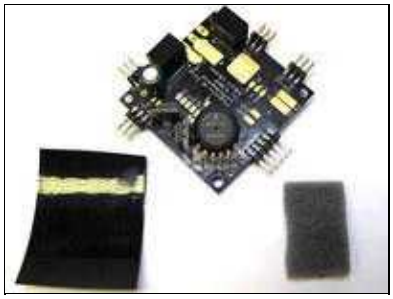
Here the pins were broken, because they were wrong bent and not deep enough in the holes:



3 Packing the air pressure sensor

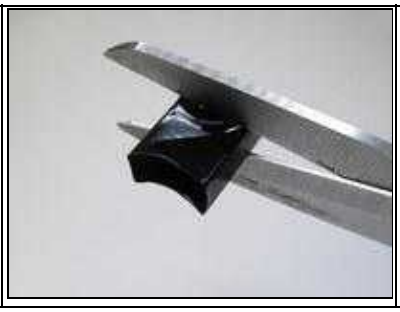
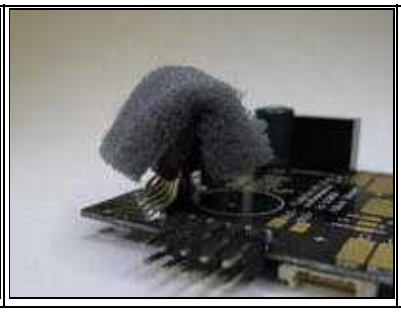
When installed in the MikroKopter - care should be taken that the sensor is protected from direct sunlight and airflow.
Is a set used from our shop the electronic system is protected through a hood, a packing of the height sensor is not essential.
The transparent cover of the copter, however, should be (to protect against the sun) lacquered or sprayed!

The packing of the sensor is quite simple.
What is needed is a piece of foam (~ 30x20x5mm) and a piece of shrink tubing (~ 3-4cm long).



In four steps you can pack the sensor:

- The (~ 3-4cm long) shrink tubing can now, for example, be pushed and shrink-wrapped over a wooden folding rule .
- Cut down the shrink tubing to approx. ~1,5cm.
- The foan can now be set over the sensor...
- ...and now you slide the shrink tubing over it.


The sensor can now be pushed down slightly on the board. The shrink tube is fitting now tight to the foam above the air pressure sensor. This attachment is sufficient and must not be shrunk any further.

4 Air pressure sensor as altitute meter (Altimeter)

The atmospheric air pressure P increases steadily due to gravity decreases with increasing height h. The relationship is approximately described by the barometric height formula.

P(h)[kPa] = 101.325 kPa * EXP(-1.29 kg/m^3 * 9.81m/s^2 * h[m] /101.325kPa / 1000)

This allows the measurement of air pressure a translation into a height above sea level N.N. From sea level to 1500 meters this formula can linearize very well and receives a decrease in air pressure of 1.2kPa/100 m.

The FC uses the effect of a relative height measurement with respect to the starting height. The scale is as follows:

In the data sheet of the MPXAZ4115A sensitivity 46 mV / kPa is specified. On the FC between the output of the sensor and the input of the ADC is a non-inverting operational amplifier with a gain of 1 + 18k * (1/6k8 +1 / 680) up = 30.12. The offset of the amplifier can be achieved by changing the Atmega644, so that the output voltage of the amplifier can be pushed in the range of the ADC from 0 to 3V. The ADC Atmega644 use of an external reference voltage of 3 V with 10 bit resolution which are steps of 0.3413 / mV.

All together it has a sensitivity of 0.3413 Steps / * 30.12 * 46 mV mV / kPa = 472.84 steps / kPa.

The software of the FC converter value is added and averaged, so that there is a scaling factor for the internal air pressure value of 18 and you get 472.84 steps / kPa = 8511.12 * 18 Steps / kPa. Taking into account the height dependence of air pressure is then a scaling value for the amount of 8511.12 Steps / kPa * 1.2kPa / 100 m = 102.13 steps / m corresponding to an incredible resolution of 0.98 cm per step.

The internal values of the FC continued to be divided in the menu and to NC by the factor of 5. Thus, the scaling factor Steps 20:43 / m.

5 Function of the height control with switch

The level controller acts as a roof. If you put the reference to a switch the spark that is flipping the switch on the assumed value of the current level as reference. The treble control acts as a slowdown in the gas value is set to the spark when the MK exceeds the nominal value. If the value of the gas spark higher than the gas suspension, so keep the level of MK. It always comes down, by drawing the gas at the spark in the gas suspension. Upper limit to the amount of control the gas. One must therefore give more gas than is necessary without height control to maintain the height.

If you flip the switch back, so the copter shoots up. (In contrast, helps to shake up the channel switching in the transmitter with 10% gas.)

6 Configuration of the height control

You activate the height control in the Kopter-Tool. Set a hook at **"Altitude control"** to enable.

When you turn the control amount to**"Vario altitude control"** (vario-height) of the copter may still vary in height. This often occurs with greater overall weight of the copter.
Even under the function**"Height limitation control"** (height limit) the Kopter can rise by several meters until it considers the height.
This can be set individually.

(Thread im Forum http://forum.mikrokopter.de/topic-post29606.html#post29606)

Who has only one poti on the transmitter can, of course, set only one value on the poti and have the values one after another set up.

To get the settings out of a flight, proceed as follows:

- (Altitude)P and (barometric) D-term put POTI on each one (ideally ACC) (See also SettingsErfliegen)
- leave the default value from the Z-ACC.
- D component of the potentiometer are low (about 10)
- P component with the potentiometer set starting from the default value so that the MK is hoovering in about 20....25 meter evenly up and down.
- decrease commuting with increase of D until commuting of aggressive rest nascent remains.
- calm down with increase of ACC. The ACC value is almost the fine tuning for soft snap it into the desired height. At very restless height control (wild-hopping), you can also set the value to 0 to try again. .
- Configuration: see also MK-Parameter/Altitude

Note: You must make the effort and standardize the pots / sliders on the transmitter, so you do not fish in the dark. Tape next to the poti / slides one adhesive with a scale that goes to the MK tool and transmit the value range.
Scale range? Sure, that one 0...250. It marked the scale with natural sense of values that are expected (not over 100). The slides are labeled with D, P and optionally with ACC (taking three pots). Why? It is hectic, when flying is hardly the right shifter ... If you are the rest yourselve, you have "parameters treble controls" in general, the hurdle is long behind you.

7 Testing the height sensor

To test the height sensor proceed as follows:

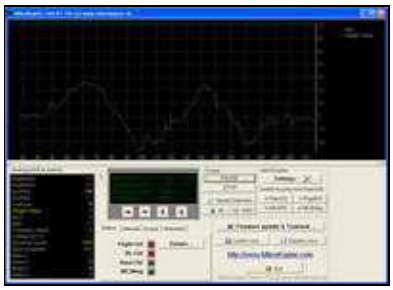
1.Transmitters and Mikrokopter on and connect with the MK-tool, the sensor must be activated as described above. The switch for the amount remains in the OFF. (If you do not know which switch position is the -> first not so important)

2.In the Scope MK-tool set so that only gas and altitude are displayed. Start now Scope. No matter what value of the height sensor now, it must result in a swinging line. An absolutely straight line means the sensor is not activated or not properly connected or defective.

3.Now, after a few seconds are gone (the air pressure is always changing something) initialize remote control. It is seen that the gas goes up and down (yes we move the stick) and soon after a jump in the height sensor line. Whether the jump up or down, is actually dependent on the weather.

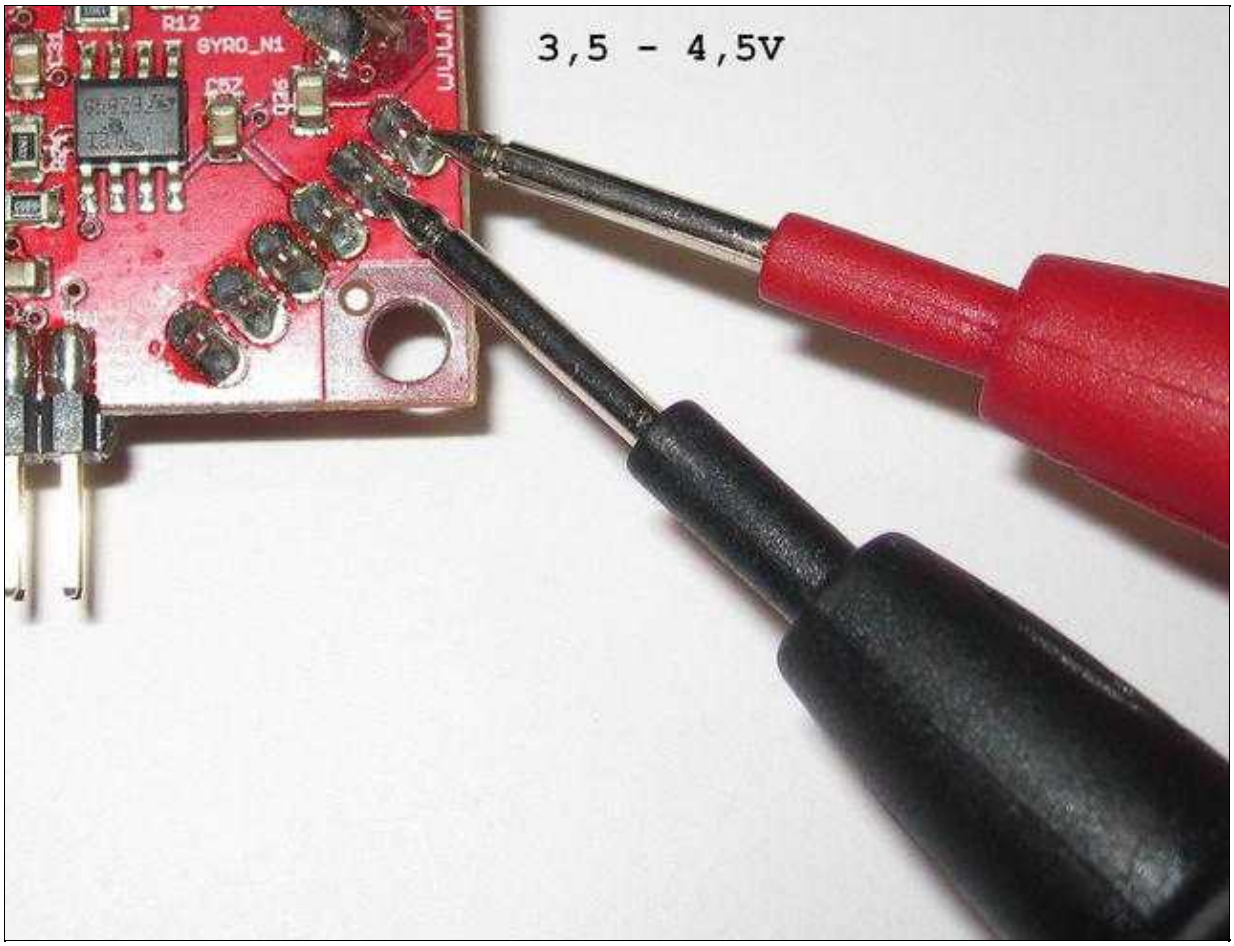


4.Now make the Mikrokopter as far as possible and repeatedly move up and down. A height difference of min. 2m is ideal. As a result you see in the Scope, a sine curve, which oscillates at about 0.



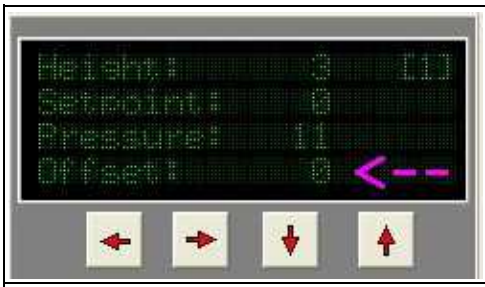
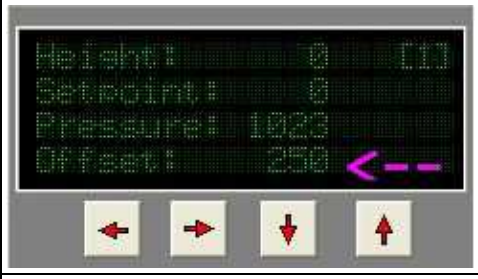
Another quick test is that you open and close the door abruptly (window closed). The pressure changes are clearly visible as peaks.

8 Measuring the output voltage of the sensor



With a multimeter you can check the output voltage of the sensor slightly.

The value must be between 3.5 and 4.5 V are. At greater heights, this value is lower. Who in example lives 1000m above sealevel will be able to expect values of 3.8 volts. **The offset into the virtual menu must be between 0-245**

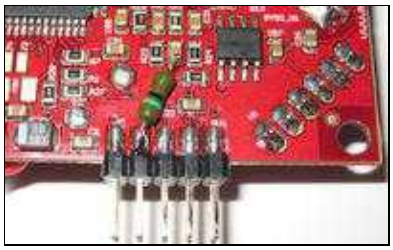
	
Sensorspannung zu klein	Sensorspannung zu hoch

Note: who, who would like to use the MK**>1500m above sea level**, needs a FC 2.1, because it has an extended measuring range.

8.1 Expanding range at> 1500m

In a flight control up to V2.0, you can adjust the range of the air pressure sensor to a greater height by the FC for a further resistor R21 resistance of 1.5 ohm (1.5 k to 2.7 k) in parallel.

If you have only one leaded resistor:



The range of a FC2.1 is already adjusted to up to 3000m

9 Acoustic signal (buzzer, beeping)

- The FC can be configured to deliver information about the height measurements during the flight with beeps.

  ToDo: Hier sollte bitte jemand die Pieptöne erklären. Ich hab sie bisher nur gehört, aber weiß nicht, wie sie zu interpretieren sind.

- KategorieSensor