

**en/MK3Mag**

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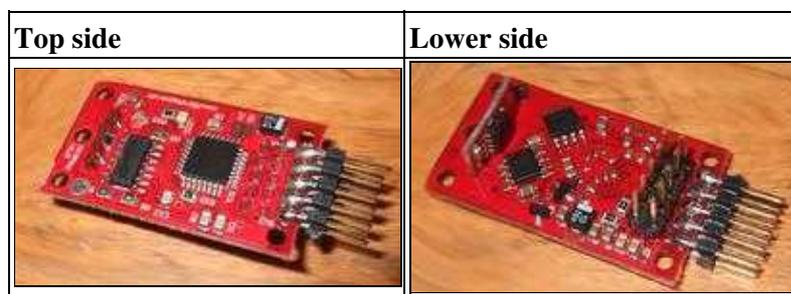
LotharF  
MikroKopter.de

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# 1 MK3Mag

This is a 3-axis magnetic field sensor. Using the current attitude data it forms a tilt compensated compass. The MK3Mag can be used on its own, together with the Flight Ctrl to stabilise yaw control or in combination with the [NaviCtrl](#). The MK3Mag is supported by the [FlightCtrl](#) from software version 0.69K upwards.



 [Instruction for MK3Mag for self assembly \(Green PCB's\)... see here \[MK3MagAufbau\]\(#\)](#)

## 2 General Points

⚠ For use of the MK3Mag it is essential that the distance between compass and Buzzer minimum 10cm. It is best to mount the buzzer on the outer end of one of the frame arms.

The highest **Interfering Magnetic field is generated by:** Buzzer, Motors, Power Cables and Metal Parts (in approx. this order).

If problems with the MK3Mag are only noticable at higher throttle, it is likely that the interfering magnetic field is generated by power lines. Ideally the individual DC-lines should have very few bends and Plus/Minus should be routed parallel as their magnetic fields are then compensated by each other ([Tips and Video](#)).

<http://www.mikrokooper.com/files/KompassDreht.wmv>

### 2.1 Connection without NaviControl

Usually the MK3Mag is used on a [NaviControl](#). In case you don't want the GPS-features, you can connect the [Mk3Mag](#) directly onto the FC.

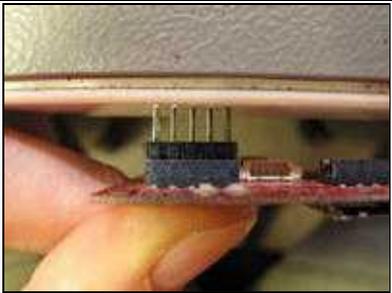
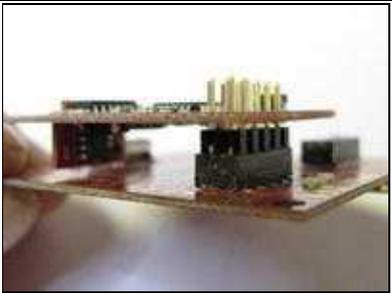
Attach (solder) the 10 pole pin row onto the **SIDE** of the MK3Mag and connect to the [FlightCtrl](#) using a 1:1 Ribbon Cable. To see the FC and Compass together on the Kopter tool, press a Pin Header (Reichelt Electronics: PFL10SK) onto the cable.

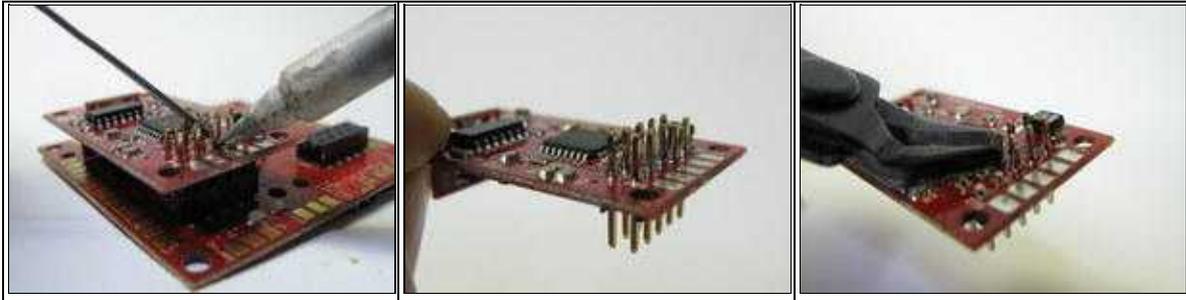
- **Instalment direction:** Processor pointing up and outer pin row pointing towards the 10 pole pin row on the [FlightCtrl](#)

Special attention should be taken to ensure that the MK3Mag is **Level** (i.e.: parallel towards the FC). An angle of 5° for example would have the effect of an error of >5°.

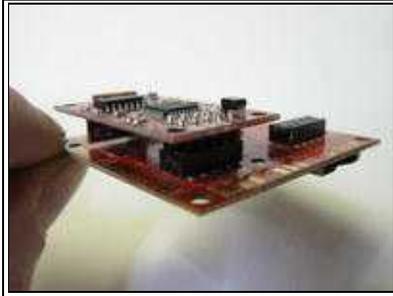
### 2.2 connection to the NaviCtrl

To connect the MK3Mag to the [NaviControl](#), a 10-pin connector must be installed:

|   |   |   |
|---|---|---|
| insert pins   | press a little to a tabe to align the pins  | install <a href="#">Mk3Mag</a> and align even   |
|  |  |  |
| Solder the pins   | ready solderd   | Cut with a sharp tool   |



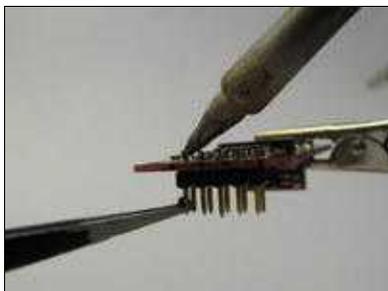
Ready



**⚠ Installation:** Use two plastic screws to fasten the MK3mag and avoid contact loss. In case of a bad contact, the GPS navigation could stop or the [MikroKopter](#) could fly into the wrong direction. Never use screws made of material that can become magnetic. When this screw becomes magnetic due to the engines, the compass function will get an offset, you will see this as a rotating Mikrokofter, directly after lift-off.

| mechanical attachment | in detail | Soldered pins |
|-----------------------|-----------|---------------|
| .                     | .         | .             |

In case that the pins must be replaced:



## 3 Trim the Yaw of the RC-Transmitter to Zero

 Attention: Yaw must be zero in case of using the compass.

You can check these values in the Koptertool

# 4 Calibration

## 4.1 Calibration of the compass

 Important: When first operated, the MK3Mag needs to be correctly calibrated! Otherwise the NaviBoard will show you "Err:6 bad compass value".

Now it is (since Version FC:0.84) very easy to calibrate the compass with a "clicking sound" . This method has the advantage that you doesn't have to hold the Kopter "perfect" horizontally.

### IMPORTANT

The Nick- and Roll axis refers to the [FlightCtrl](#), and **not** on the Mixer you use! The arrow of the [FlightCtrl](#) shows the Nick axis!

### The Kopter should be calibrated outside, away from magnetic influences!

So please **do not** calibrate the Kopter directly next to a house, near power poles or metallic / magnetic surfaces.

Also, please take your cell etc. out of your pocket.

 The earth's magnetic field is not the same everywhere. That's the reason why you should calibrate the compass new if you change the place where you fly.  
(e.g. from Germany to USA or from north to south America)

The calibration will be done in several steps:

| Step  | Function   | Example View / Function                                      |
|---|--|--|
| <b>Step 1</b><br>Initiate<br>compass<br>calibration | <b>Nick down</b><br><br>then<br><br><b>Throttle<br/>up + Yaw<br/>left</b><br><br>(The<br>Kopter<br>beeps 1x) | On a transmitter in <b>MODE 2</b> it lokks like in that way: |



**Step 2**  
Start  
Calibration

**Pull Nick**  
**down 1x**

(The  
Kopter  
beeps 2x  
and the  
clicking  
starts  
begins)



|   |   |   |
|---|---|---|
| <p>Calibration of the <b>X-Axis</b> (Nick-Axis)</p> | <p>The Kopter with the front (Arrow direction of the <a href="#">FlightCtrl</a>) pointing to the South or North.</p> <p>Then rotate the Kopter a couple times over the Nick-Axis until the buzzer stops with the clicking starts.</p> |  <p>The diagram shows a black drone with four propellers. A circular marker with the letter 'N' is positioned at the bottom left, and a circular marker with the letter 'S' is at the top right. The drone is oriented with its front (indicated by a red arm) pointing towards the 'S' marker.</p>                                     |
| <p>Calibration of the <b>Y-Axis</b> (Roll-Axis)</p> | <p><b>Rotate the Kopter by 90°</b></p> <p>The clicking starts again.</p> <p>Rotate the Kopter a couple times over the Roll-Axis until the buzzer stops with the clicking starts.</p>  |  <p>The diagram shows the same drone as in the first image, but rotated 90 degrees around its vertical axis. A blue curved arrow above the drone indicates a 90-degree rotation. The 'N' marker is now at the bottom left, and the 'S' marker is at the top right. The drone's front (red arm) now points towards the 'N' marker.</p> |

**Step 3**  
 Finish the calibration of the X and Y-Axis  
**Pull Nick 1x down**  
 (The Kopter beeps 3x)



**Step 4**  
 Start calibration of the Z-Axis  
**Pull Nick 1x down**  
 (The Kopter beeps 4x and the clicking starts begin again)



Calibration of the **Z-Axis** (Yaw-Axis)

INFO:  
Here it doesn't matter if the Kopter shows with the X or Y-Axis towards South (North).  
  
Rotate the Kopter a few times over the Roll- or Nick-Axis until the buzzer stops with the clicking starts.



**Step 5**  
Finish the calibration of the Z-Axis.

**Pull Nick 1x down**  
  
The Kopter confirms it with 2 beeps



### 3. Now that the Kopter "beeped" 2x after a successful calibration that part is done.

- If everything is OK the red LED stops lighting after a few seconds on the NaviCtrl V2.0 with integrated compass.  
If you use a NaviCtrl V1.1 with MK3Mag the red LED on the MK3Mag lights permanently.

**DONE!**

## 4.2 Videos

(German version)

(English version)

If the calibration fails (compass still reports "invalid compass value"), you can take a look here: [MagnetError](#)

The process also works in older firmware versions, but then without the clicking sound.

Note: if you use the MK3Mag directly on the FC, it will not make the clicking sound. This calibration method will work nevertheless.

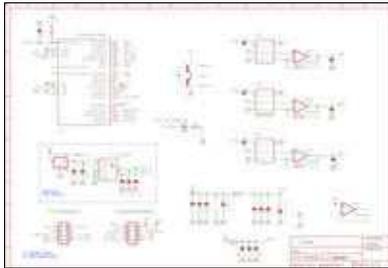
## 5 MK3Mag and MK-Tool

To activate the Compass use the Kopter tool (connected to FC) and under Settings->Configuration place a tick on Kompass (Compass).

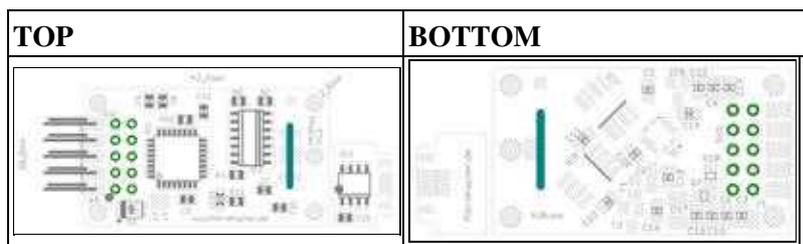
The [KopterTool](#) can also be used to **verify the Calibration**. To do this set the scope to display the values: [KompassValue](#), Ersatzkompass and MK3MagCalState and turn the Kopter slowly. The angle change should be displayed proportional to the rotation of the Mikrokofter.

 A Digital Compass value is also available in the LC-Display under [2] (See Picture)

## 6 Circuit Diagram



## 7 Assembly Scheme



**i** A detailed assembly instruction (currently in German) can be found here [hier](#).

Italic displayed parts are on the lower side

| Quantity                                       | Component           | Notes                            | Part              | Name                             |
|--|---------------------|----------------------------------|-------------------|----------------------------------|
| 1  | Atmega168-20AU      | note markings, Use Flux!         | Controller        | IC1                              |
| 3  | KMZ51               | note markings, Use Flux          | Hall sensor       | IC3, IC5, <i>IC7</i>             |
| 1  | LM324D              | note markings                    | Quad OP Amp       | IC2                              |
| 1  | FM717               | NPN-SOT23                        | Transistor        | T1                               |
| 1  | FM717               | PNP-SOT23                        | Transistor        | T3                               |
| 1  | SMD-LED Grün        | note direction                   | CHIPLED           | LED1                             |
| 1  | 1k SMD-0805         |                                  | Resistor          | R33                              |
| 1  | 18k SMD-0805        |                                  | Resistor          | R10                              |
| 3  | X7R-G0805 22pF      |                                  | Resistor          | C8, C9, C12                      |
| 2  | 47R SMD-0805        |                                  | Resistor          | R7, R32                          |
| 3  | 270k SMD-0805       |                                  | Resistor          | R1, R3, R5                       |
| 6  | X7R-G0805 100nF     |                                  | Capacitor         | C3, C5, C6, C7, C11, C15         |
| 7  | X7R-G0805 1µF       | (available as 1000nF at Farnell) | Capacitor         | C2, C16, C18, C19, C20, C21, C22 |
| 2  | SMD Tantal 10µF/10V | Type B, note direction!          | Capacitor         | C1, C17                          |
| <b>Optional (not required for use with MK)</b> |                     |                                  |                   |                                  |
| 1  | LIS344AHL           | noe poles                        | ACC-Sensor        | IC4                              |
| 1  | MCP1700T-3002E/TT   |                                  | Voltage Regulator | IC8                              |
| 1  | X7R-G0805 1 µF      |                                  | Capacitor         | C23                              |
| 4  | X7R-G0805 100nF     |                                  | Capacitor         | C4, C10, C13, C14                |

## 8 Installing new software

On preassembled (red) boards, the bootloader is already programmed and doesn't have to be updated.

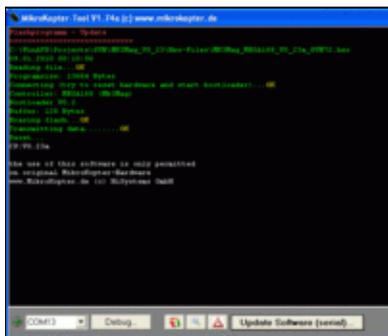
### 8.1 Showing the actual firmware-version



Switch to MK3Mag in the [KopterTool](#)

**⚠ Attention:** if the actual firmware is already V0.23a, please do not perform a further update. There is no update since 02.2010.

**i** In the [NaviControl](#) V2.0 you can't switch the communication to the internal compass.



### 8.2 Flashing new firmware through the NaviControl

- Remove jumper of the MKUSB
- The MK3Mag remains on the [NaviControl](#).
- The MKUSB is connected to the NC
- Switch on the [MikroKopter](#)
- Click to 'Firmware Update and Terminal' in the [KopterTool](#) to open the terminal window
- Select actual HEX-File for the MK3Mag
- Programming starts. At the end the MK3Mag shows its actual version

## 8.3 Firmware flashing without NaviControl

- Remove Jumper on the MKUSB
- Connect the MK3Mag on the connector on the side of the MKUSB.
- Use the connector on the lower side of the MK3Mag (the same you would connect to the NC)
- Click to 'Firmware Update and Terminal' in the [KopterTool](#) to open the terminal window
- Select actual HEX-File for the MK3Mag
- Install the Jumper into the MKUSB to supply the MK3Mag
- Programming starts. At the end the MK3Mag shows its actual version

## 9 Software

Here you can download the latest software:

MK3Mag Software: [Download](#)

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[KategorieHardware](#) [KategorieEnglish](#)