

en/NaviCtrl_1.1

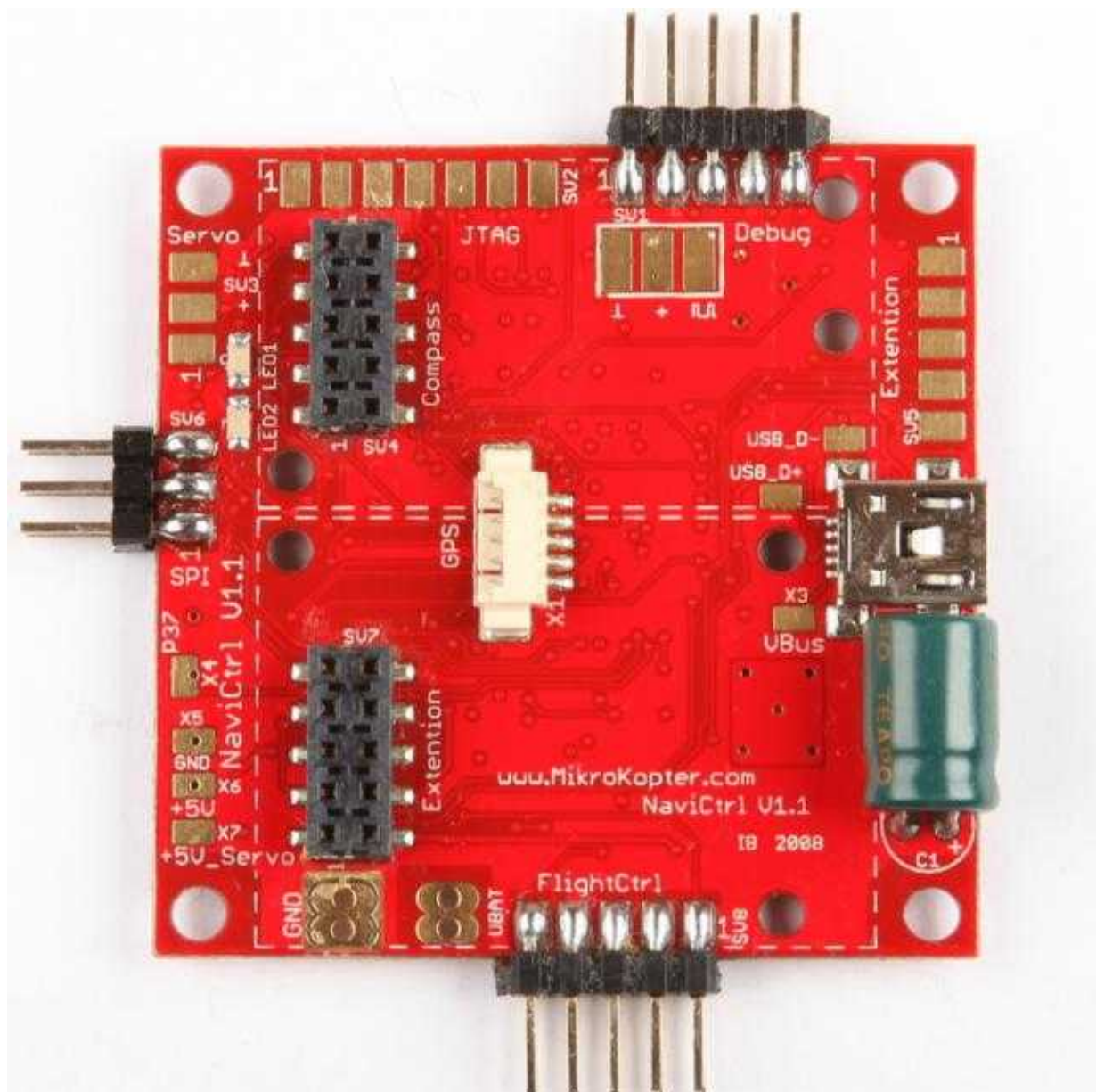
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Inhaltsverzeichnis

<u>1 General</u>	1/32
<u>2 Connections</u>	3/32
<u>3 Placement</u>	5/32
<u>4 Connection MK3Mag and MKGPS</u>	6/32
<u>5 Settings</u>	7/32
<u>5.1 Activate the GPS-System and assign channel</u>	7/32
<u>5.2 Activate CareFree and assign channel</u>	7/32
<u>6 GPS-Mode control</u>	9/32
<u>6.1 Dynamic PositionHold</u>	10/32
<u>7 Signal beeps</u>	11/32
<u>8 LED-indication</u>	12/32
<u>9 Functional test</u>	13/32
<u>10 How do you start?</u>	15/32
<u>10.1 Calibration of the compass</u>	15/32
<u>10.2 Videos</u>	20/32
<u>10.3 First Start</u>	20/32
<u>11 MicroSD-Card</u>	22/32
<u>11.1 SETTINGS.INI</u>	23/32
<u>11.2 stored data - folder "LOG"</u>	26/32
<u>11.3 Presentation of the flight data in Google Earth</u>	27/32
<u>12 Parameter</u>	28/32
<u>13 Debug-Interface</u>	29/32
<u>13.1 NMEA</u>	29/32
<u>14 Upgrading software</u>	30/32
<u>15 Error Codes</u>	31/32
<u>16 Schematic Version 1.1</u>	32/32

1 General



The [NaviCtrl V1.1](#) expands with the compass module **MK3Mag** and the **MKGPS** the ability of the MikroKopter
Throughout the use of those modules you will get a powerful **GPS-System**.

With this **GPS-System** you can use the function like **PositionHold**, **ComingHome**, **CareFree** the **Waypoint-flight** as well as the [FollowMe](#)-function.

For the waypoint-flight you can set up to 30 waypoints in the [OSD](#) KopterTool.
The waypoint-flight (and that of the [FollowMe](#)) is than in a **Radius of 250mtr. around the startpoint** of the Kopter possible.
Users with a commercial license can also use a bigger range.
(Questions about the license please wrote to: [HiSystem](#))

💡 All other functions (PositionHold, ComingHome, CareFree, etc.) are usable in the full range of the transmitter / receiver.

(The NaviCtrl could be also used individually with the compass (MK3Mag) and the FlightCtrl. But here would be only the function "[CareFree](#)" possible.)

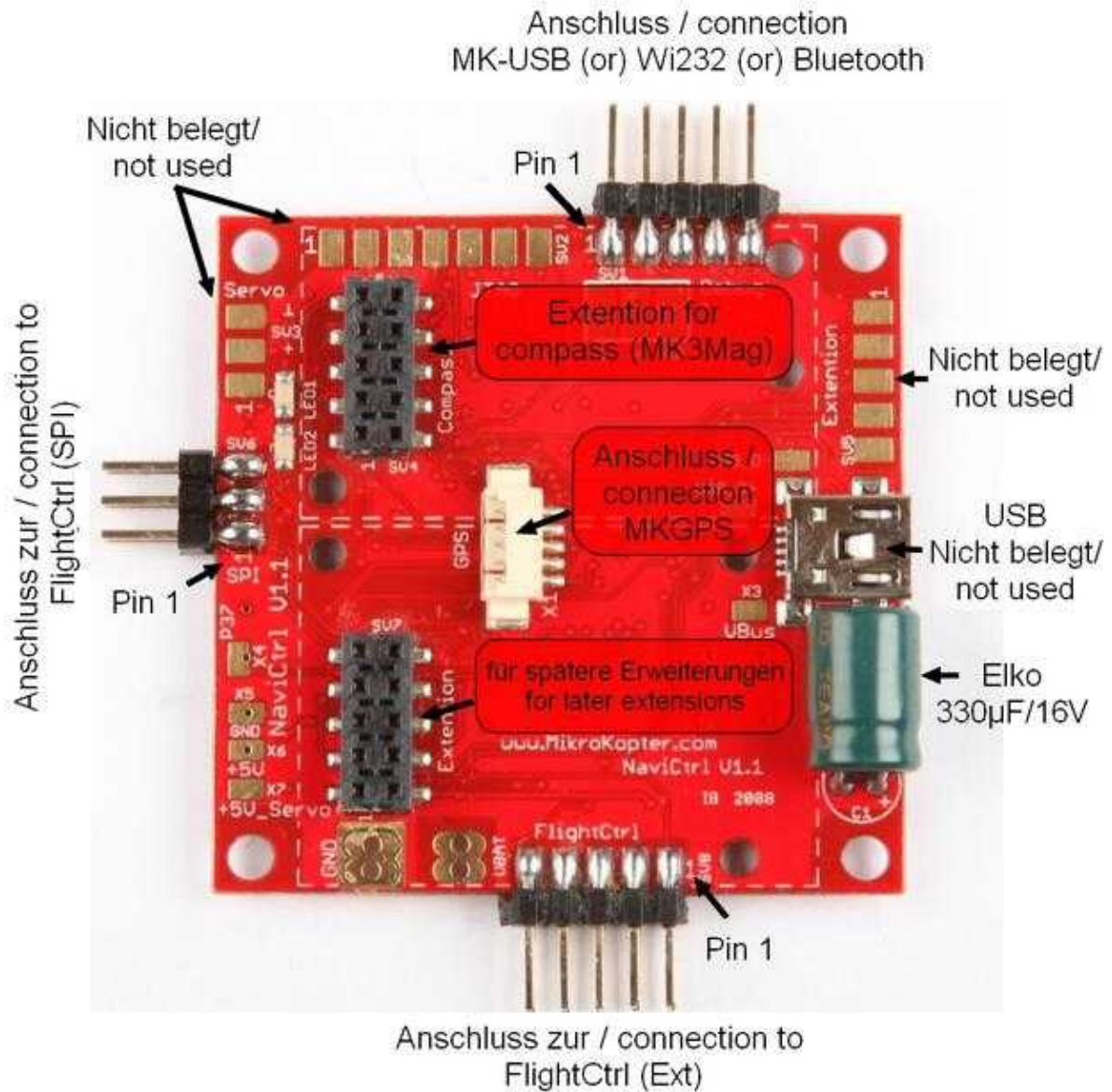
The NaviCtrl-PCB has got besides the ARM9-Micro-Controller and the Micro-SD-Card-Socket two additional extension plugs.
The first extension plug is used on the NaviCtrl V1.1 for the compass module **MK3Mag**, the second one is free usable for future developments.

You can use also the NaviCtrl in connection with the MKGPS as a separate **FollowMe-Transmitter**. This is explained here: [FollowMe](#)

2 Connections

NaviCtrl V1.1 - Top-Side

NaviCtrl V1.



3 Placement

On the NaviCtrl V1.1 you necessarily need to solder a pin-header to the interfaces of the **FlightCtrl**, **SPI** and **Debug**.

In addition you need to solder a capacitor / Elko (330 μ F/16V) to the solder spot **C1**.

4 Connection MK3Mag and MKGPS

For the installation of the MK3Mag and the MKGPS please note the information under [MK3Mag](#) and [MKGPS](#).

How to connect the [NaviCtrl](#), the [MK3Mag](#) and the [MKGPS](#) with the [FlightCtrl](#) you can find here:
[MK-Tower](#)

5 Settings

5.1 Activate the GPS-System and assign channel

To use the NaviCtrl with the compass module MK3Mag and the MKGPS you must activate the function **GPS** in your settings.

In addition you need to have a channel for the mode control to switch between the functions (Free, PositionHold, ComingHome)

(pre-set is Poti2 => channel6). This channel must be assigned to a 3-way switch at the transmitter.

(How a channel at the transmitter will be assigned to a switch you will find in the appropriate instruction manual of the transmitter.)

5.2 Activate CareFree and assign channel

If the function [CareFree](#) is used you must assign an additional channel to that function.

This function is set up to "0" = Deactivated by default.

If here an appropriate channel is set you must assign a switch at the transmitter.

(How a channel at the transmitter will be assigned to a switch you will find in the appropriate instruction manual of the transmitter.)



How the function **CareFree** and the additional activated **Teachable CareFree** can be used, you can find here: [CareFree](#)

The easiest way to set up/activate the functions is over the menu-point [EasySetup](#).

Here you can activate the **GPS** and set up the channels to switch for GPS/CareFree.

Pre-set is already **POTI2 => channel6** for the function of the GPS. CareFree is in the pre-settings on "0" = OFF.

Settings in [EasySetup](#)

INFO

On the page [EasySetup](#) all important settings are summerized.

All settings made here are automatically transferred to the corresponding sub-sites.

The settings in [EasySetup](#) can be made directly in the different sub-sites.

The **GPS** can be switched ON/OFF in the tab **Configuration**:



If you use only the NaviCtrl with the compass module (MK3Mag) it can be activated here individually.

An additional function like **Fixed alignment** can be given. Is that function activated you can yaw the Kopter during the flight

If you release the yaw-stick the Kopter automatically aligns itself into the direction in which the Kopter was at the start.

In the tab **Navi-Ctrl** you can switch also the **GPS ON-** and **OFF**.

Also, you can set up here the **channel** to switch the function:

Under the tab **Misc** you can set up the **CareFree** control and the **Teachable CareFree**:

6 GPS-Mode control

A total of three modes can be switched with the **GPS mode control**.

Those functions are:

- GPS_MODE_Free (**Free**)
- GPS_MODE_Position Hold (**PH**)
- GPS_MODE_Coming Home (**CH**)

As described is this function already pre-set on **Channel 6 (POTI2)**. This channel can also be changed as desired.

- 💡 To use the function a 3-way switch of the transmitter should be set to that channel and also been used.
- 💡 The [Height switch](#) should be switched ON while using this function.

💡 TIPP:

- The height switch i.e. can be set to the same channel like the **GPS Mode Control**. This saves you not only a channel-switch on the transmitter. As soon as the function **PH** or **CH** is switched ON automatically the function to keep the height is switched ON.

Expert function:

The functions are active at a certain value. Those are as follows:

- GPS_MODE_Free => Value <20
- GPS_MODE_Position Hold => Value between 20 and 200
- GPS_MODE_Coming Home => Value >200

Info

For the function of PH/CH a Sat-Fix is **mandatory** necessary.

- ⚠️ If this is not there it can be selected via a switch, but has no function. You must still manually control the Kopter.

In the function PositionHold (**PH**) the Kopter remains with the support of the GPS on that position at which the function was activated.

If you switch to the function ComingHome (**CH**) the [MikroKopter](#) returns automatically back to the start point with the support of the GPS.

A switch-back to **Free** turns the functions off.

Tipp:

- If the Kopter circles in PH Mode around the activation point (a small radius is pretty much normal) a new calibration of the compass can help.
Also to determine a better and more accurate position the mount of the GPS-Shield1.1 to the MKGPS helps alot.

6.1 Dynamic PositionHold

Either in the [EasySetup](#) (see picture above) or under the tab **Navi-Ctrl2** the function **Dynamic PositionHold** can be activated.

The function of the mode PositionHold (**PH**) is different if **Dynamic PositionHold** is enabled or disabled :

- Function **OFF**:

- ◆ The Kopter will be throughout moving the Nick- / Rollstick directly controlled.
The function PositionHold (PH) will be switched off if you move the sticks.
At the new position and after you release the sticks the function PH will be switched on again.

Function **ON**:

- ◆ Also here you can fly the Kopter through moves with the Nick- / Rollstick to a new position.
In that way PH will be not disabled/enabled but the nominal values of the GPS-coordinates will be moved.
An more accurate and exact positioning of the Kopter is possible even in windy conditions.
The Kopter will fly a little bit slower to the position, moves more sluggish.

7 Signal beeps

If the NaviCtrl (with Compass/MKGPS) is properly connected the FlightCtrl beeps more often. The beeps tell you as follows:

- If the switch for the GPS function will be switched from **free** to GPS_MODE_**PositionHold** or GPS_MODE_**ComingHome** and there is **no** Sat-Fix (LED on the MK-GPS is not flashing) it will beep 1 time per second. The Kopter beeps as long as a minimum number of satellites was found and a Sat-Fix was reached. (See also Paramter "Min Sat").

Exception: The beeping will be more quiet if a Sat-Fix is available but a sufficient number of satellites wasn't found.

Notes:

- ◆ This beep takes place even if GPS is disabled.
(If GPS is deactivated set also the value for "GPS Mode Control" to Zero (0).)
- 1x beep *beep* - when changing the GPS-Modes (free - PH - CH)
- 1x beep *beep* - when logging new target-coordinates

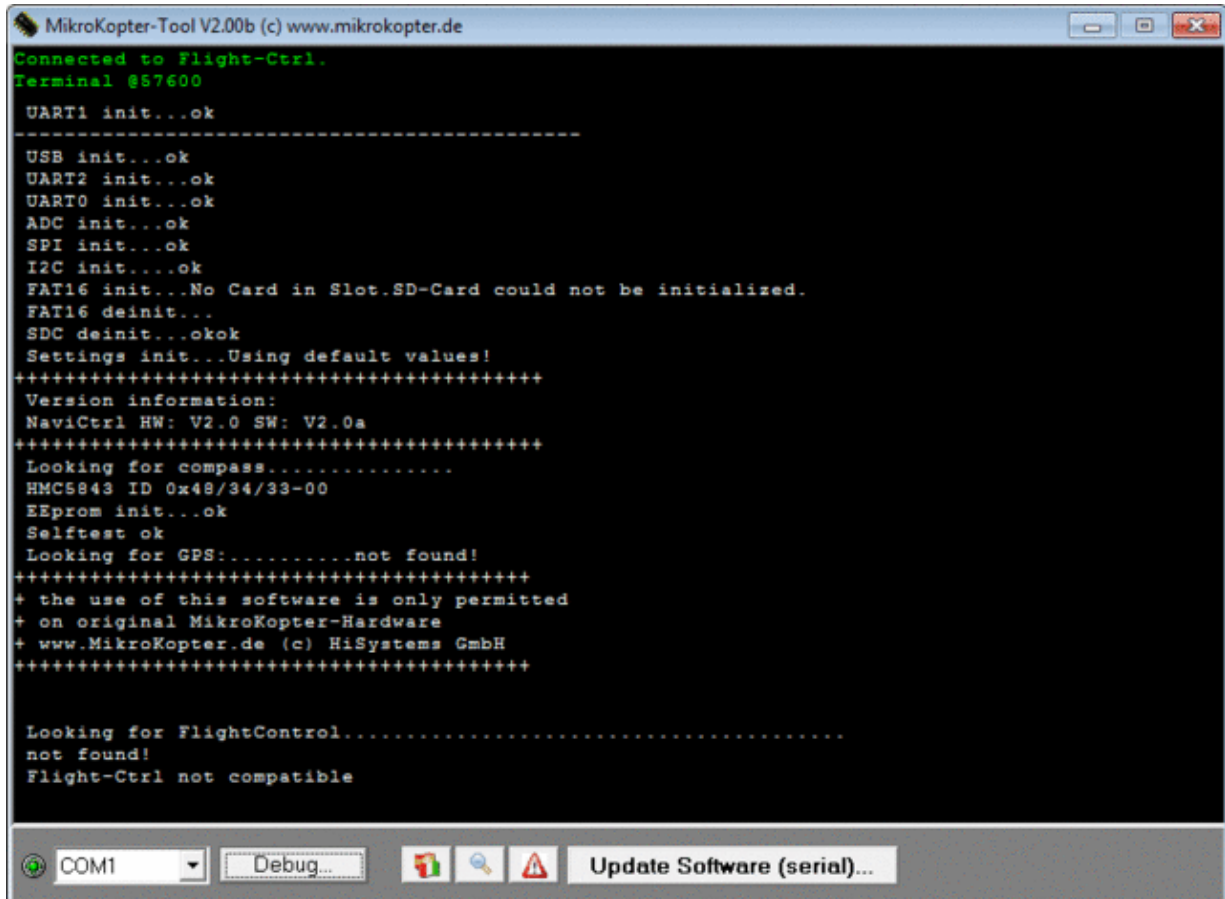
8 LED-indication

On the [NaviCtrl](#) you can find 2 LEDs, 1x red and 1x green. The red LED indicates you a failure. To show you the respective failures the [NaviCtrl](#) **must** be hooked up to the MK-Tool. The failure will be shown there.

💡 The red LED stays on also if the compass is not calibrated! A failure message is displayed as "error6".

9 Functional test

Here you need to open the Terminal Window in the [KopterTool](#). If the [NaviCtrl](#) is hooked up single over the connector **Debug** and connected with the MK-USB and a closed jumper on the MK-USB you should see the following initializing sequence of the [NaviCtrl](#):



```
MikroKopter-Tool V2.00b (c) www.mikrokopter.de
Connected to Flight-Ctrl.
Terminal @87600

UART1 init...ok
-----
USB init...ok
UART2 init...ok
UART0 init...ok
ADC init...ok
SPI init...ok
I2C init...ok
FAT16 init...No Card in Slot.SD-Card could not be initialized.
FAT16 deinit...
SDC deinit...okok
Settings init...Using default values!
+++++
Version information:
NaviCtrl HW: V2.0 SW: V2.0a
+++++
Looking for compass.....
HMC5843 ID 0x48/34/33-00
EEProm init...ok
Selftest ok
Looking for GPS:.....not found!
+++++
+ the use of this software is only permitted
+ on original MikroKopter-Hardware
+ www.MikroKopter.de (c) HiSystems GmbH
+++++

Looking for FlightControl.....
not found!
Flight-Ctrl not compatible
```

COM1 Debug... Update Software (serial)...


TIPP

Is the NaviCtrl on the Kopter mounted with the FlightCtrl, the MK3Mag and the MKGPS, those assemblies should be also seen during initializing.

Here the jumper shouldn't be on the MK-USB and the Kopter should be supplied with power over a Lipo or an external power-supply.

10 How do you start?

10.1 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
Step 1 Initiate compass calibration	Nick down then Throttle up + Yaw left (The Kopter beeps 1x)	On a transmitter in MODE 2 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 X-Axis (Nick-Axis)</p>	<p>The Kopter with the front (Arrow direction of the FlightCtrl) 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>Calibration of the Y-Axis (Roll-Axis)</p>	<p>Rotate the Kopter by 90°</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>	

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)	<p>INFO: Here it doesn't matter if the Kopter shows with the X or Y-Axis towards South (North).</p> <p>Rotate the Kopter a few times over the Roll- or Nick-Axis until the buzzer stops with the clicking starts.</p>	
Step 5 Finish the calibration of the Z-Axis.	<p>Pull Nick 1x down</p> <p>The Kopter confirms it with 2 beeps</p>	

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!

10.2 Videos

(German version)

(English version)

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

10.3 First Start

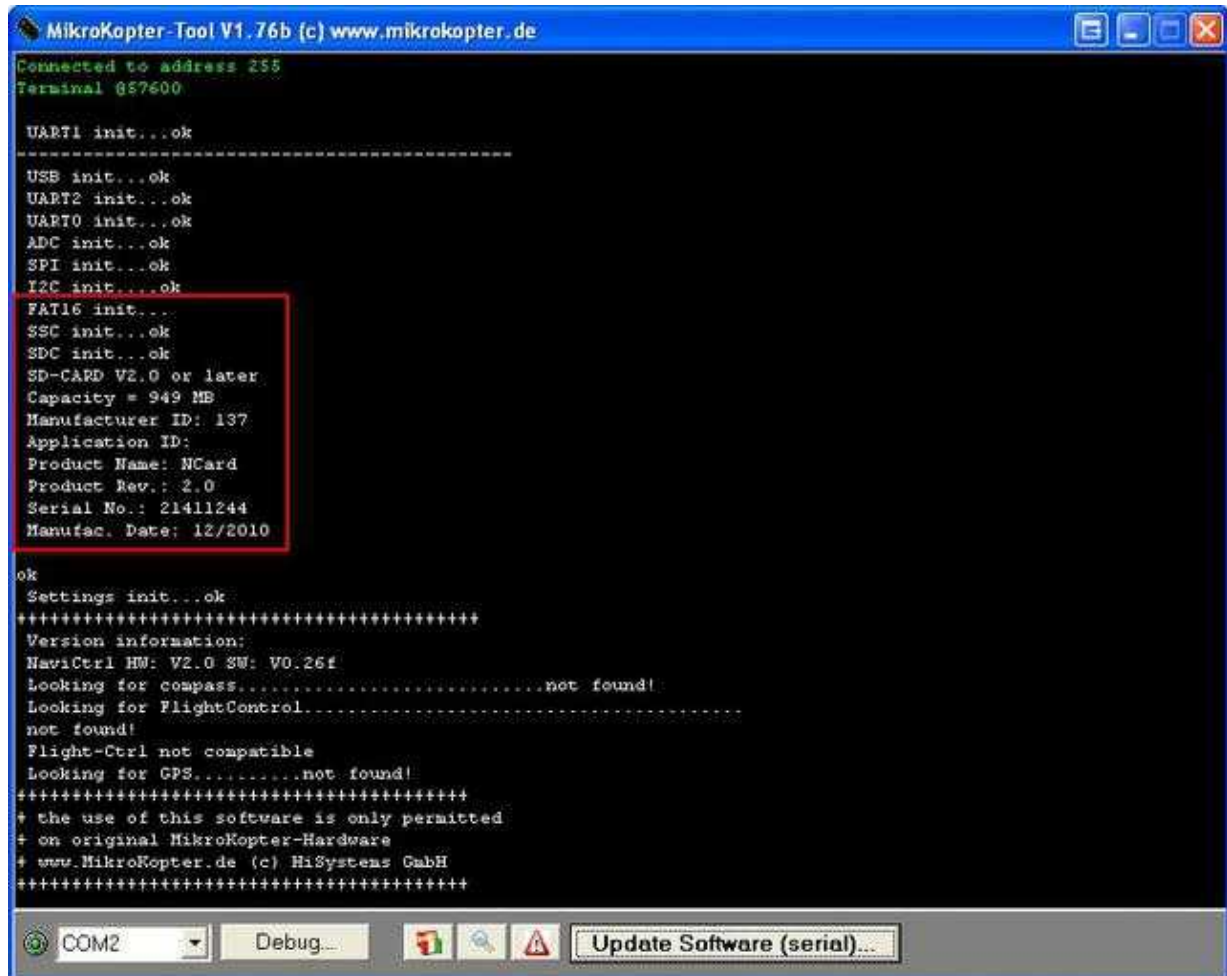
If you want to try out those functions you need to have a lot of space and a bunch of open sky.

1. As discribed above activate the GPS-Function (and [CareFree](#)) and assign the switch(es) at the transmitter.
2. Switch ON the MikroKopter and ensure a radio contact between transmitter and receiver.
3. Wait for the first Sat-Fix.
 - ◆ LED at the MKGPS glows as long as there is no Sat-Fix and **flashes** if a Sat-Fix is available.
 - ◆ If the GPS-Switch on the transmitter is on PH or CH the Kopter beeps as long as required in a tact of a second until the minimum of numbers of satellites has been found.
 - ◆ Beeps are more quiet if the Fix is there but not all 6 satellites were found.
 - ◆ With a confirmation beep the beeping stops as soon as the Sat-Fix is there.
4. Control of the communication between NaviCtrl and FlightCtrl.
 - ◆ The Kopter beeps in intervals as long as the GPS has no Fix (*it beeps only if you are on **PH** or **CH**, in the **FREE-Mode** it will not beep*).
 - ◆ if the GPS-Switch at the transmitter will be switched it must beep short each time.
5. Wait until the GPS has a Sat-Fix and the LED on the MKGPS flashes.
6. Switch to **GPS_MODE_Free!**
7. Start engines.
 - ◆ Hover some seconds and (if necessary) fine-adjust the [MikroKopter](#) at the transmitter so that the Kopter can hold the position by itself.
 - ◆ Now bring the Kopter into your desired height and activate the height control.
8. Switch to the GPS_MODE **PositionHold (PH)**.
 - ◆ Position will be logged (*will be acknowleged through a beep*).

- ◆ GPS should work now and the Kopter should hover with a difference of a few meter on its position.

11 MicroSD-Card

Into the [NaviCtrl](#) you can place a **Micro SD-Card** in the size up to **2GB** (in **FAT16** formatted). Here you can save the flight-route and other datas of the Kopter in KML-Format and GPS-Format. The SD-Card will be plugged in as you can find under **Connections** into the [NaviCtrl](#). A detected and initialized Micro SD-Card you can see in the initialization of the [NaviCtrl](#).



```
MikroKopter-Tool V1.76b (c) www.mikrokopter.de
Connected to address 255
Terminal 0857600

UART1 init...ok
-----
USB init...ok
UART2 init...ok
UART0 init...ok
ADC init...ok
SPI init...ok
I2C init...ok
FAT16 init...
SSC init...ok
SDC init...ok
SD-CARD V2.0 or later
Capacity = 949 MB
Manufacturer ID: 137
Application ID:
Product Name: NCard
Product Rev.: 2.0
Serial No.: 21411244
Manufac. Date: 12/2010

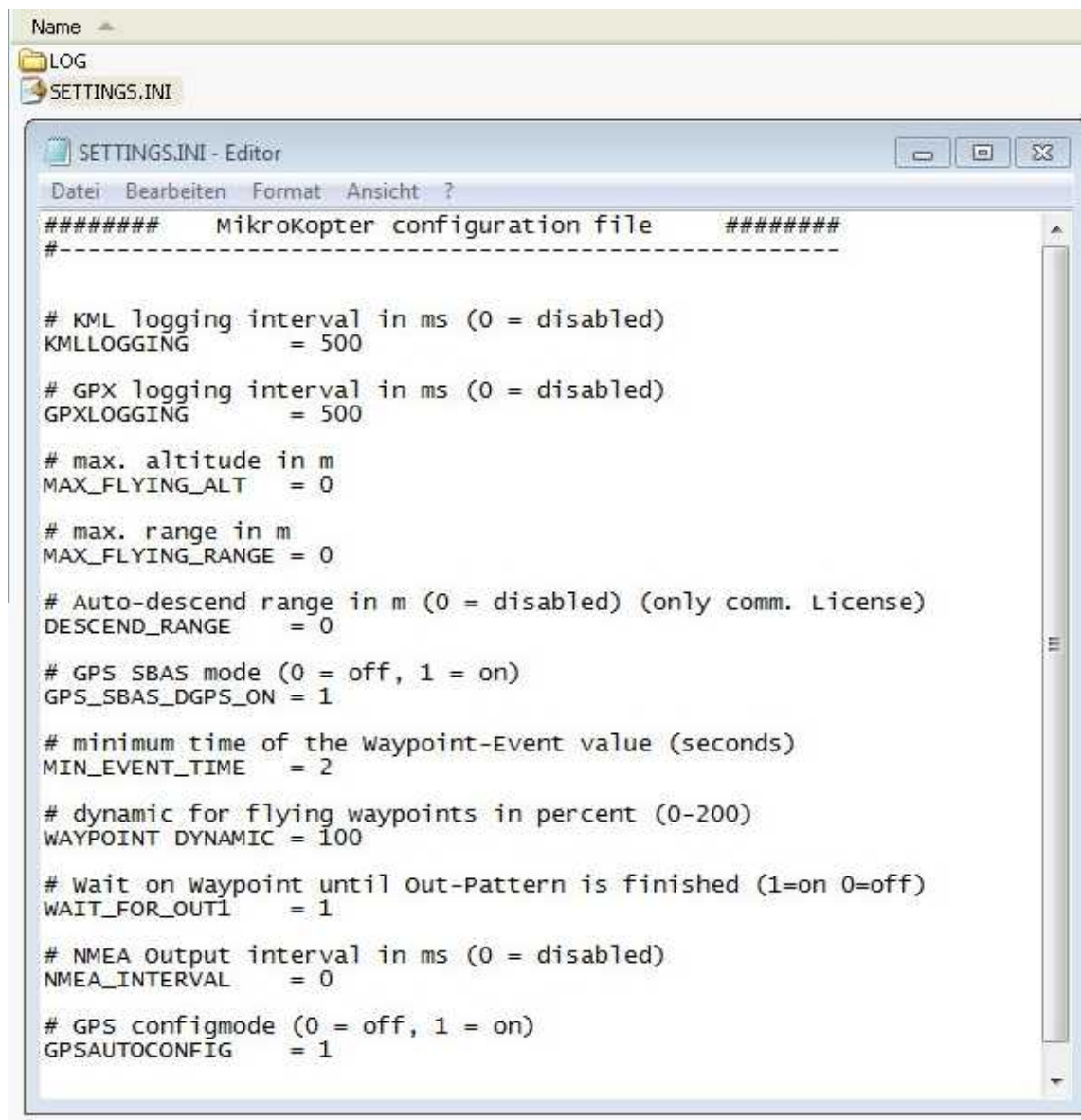
ok
Settings init...ok
+++++
Version information:
NaviCtrl HW: V2.0 SW: V0.26f
Looking for compass.....not found!
Looking for FlightControl.....
not found!
Flight-Ctrl not compatible
Looking for GPS.....not found!
+++++
+ the use of this software is only permitted
+ on original MikroKopter-Hardware
+ www.MikroKopter.de (c) HiSystems GmbH
+++++

COM2 Debug... Update Software (serial)...
```


If you want to read or change the data on the Micro SD-card, it must be removed from the [NaviCtrl](#) and plugged into an appropriate card slot on the PC.

11.1 SETTINGS.INI

On the SD-Card from the [NaviCtrl](#) there will be automatically a file generated named **Settings.ini** with the following content:



The screenshot shows a file explorer window with a 'Name' column. It contains a folder named 'LOG' and a file named 'SETTINGS.INI'. Below the explorer, a window titled 'SETTINGS.INI - Editor' is open, displaying the contents of the file. The file is a MikroKopter configuration file with various settings and comments.

```
##### MikroKopter configuration file #####
#-----

# KML logging interval in ms (0 = disabled)
KMLLOGGING      = 500

# GPX logging interval in ms (0 = disabled)
GPXLOGGING      = 500

# max. altitude in m
MAX_FLYING_ALT   = 0

# max. range in m
MAX_FLYING_RANGE = 0

# Auto-descend range in m (0 = disabled) (only comm. License)
DESCEND_RANGE    = 0

# GPS SBAS mode (0 = off, 1 = on)
GPS_SBAS_DGPS_ON = 1

# minimum time of the waypoint-Event value (seconds)
MIN_EVENT_TIME   = 2

# dynamic for flying waypoints in percent (0-200)
WAYPOINT_DYNAMIC = 100

# wait on waypoint until Out-Pattern is finished (1=on 0=off)
WAIT_FOR_OUT1    = 1

# NMEA Output interval in ms (0 = disabled)
NMEA_INTERVAL    = 0

# GPS configmode (0 = off, 1 = on)
GPSAUTOCONFIG    = 1
```

- **KMLLOGGING = 500** (Interval (in ms) the logging of the KML-Datas. Default = 500.)
- **GPXLOGGING = 1000** (Interval (in ms) the logging of the GPX-Datas. Default = 1000.)
- **MAX_FLYING_ALT = 0** (Input of the max. flight-altitude. Default = 0. **See INFO**)
- **MAX_FLYING_RANGE = 0** (Input of the max. flight-radius. Default = 0. **See INFO**)
- **DESCEND_RANGE = 0** (Input of the safety-radius for the max flying range. Default = 0. **See INFO**)
- **GPS_SBAS_DGPS_ON = 1** (Switch on/off DGPS receiving. Default = 0.)
- **MIN_EVENT_TIME = 2** (Adjustable trigger. See: [Delay Time](#))
- **GPSAUTOCONFIG = 1** (1 = the NC writes its own GPS-Configuration (temporary) into the MKGPS. Default = 1.)

INFO

Important settings for license user!

MAX_FLYING_ALT Here you can enter a maximum altitude which is required for i.e. a special license for the commercial use.

If the Kopter reaches that set up altitude message 29 "ERR:Max Altitude" appears over the telemetry display.

If you do not react to this message and you climb further up, 10mtr. above the set up max. altitude the Kopter will switch automatically to the set emergency-throttle/gas [Link](#) and sink.

After reaching the regular set up altitude again the Kopter will switch automatically back from emergency-throttle/gas to normal operation.

User without a license get also after reaching the max. altitude the same message but they are able to climb further up.

More informations about this you will find here: [Max.Altitude - Example](#)


MAX_FLYING_RANGE Here you can enter a max. flight-radius which is required for the special license and commercial use.

INFO: This value should be smaller as the under "DESCEND_RANGE" entered radius!!!

If the Kopter reaches this radius GPS will be automatically activated. The Kopter will be flown back automatically over the function "ComingHome" into the set up flight-radius.

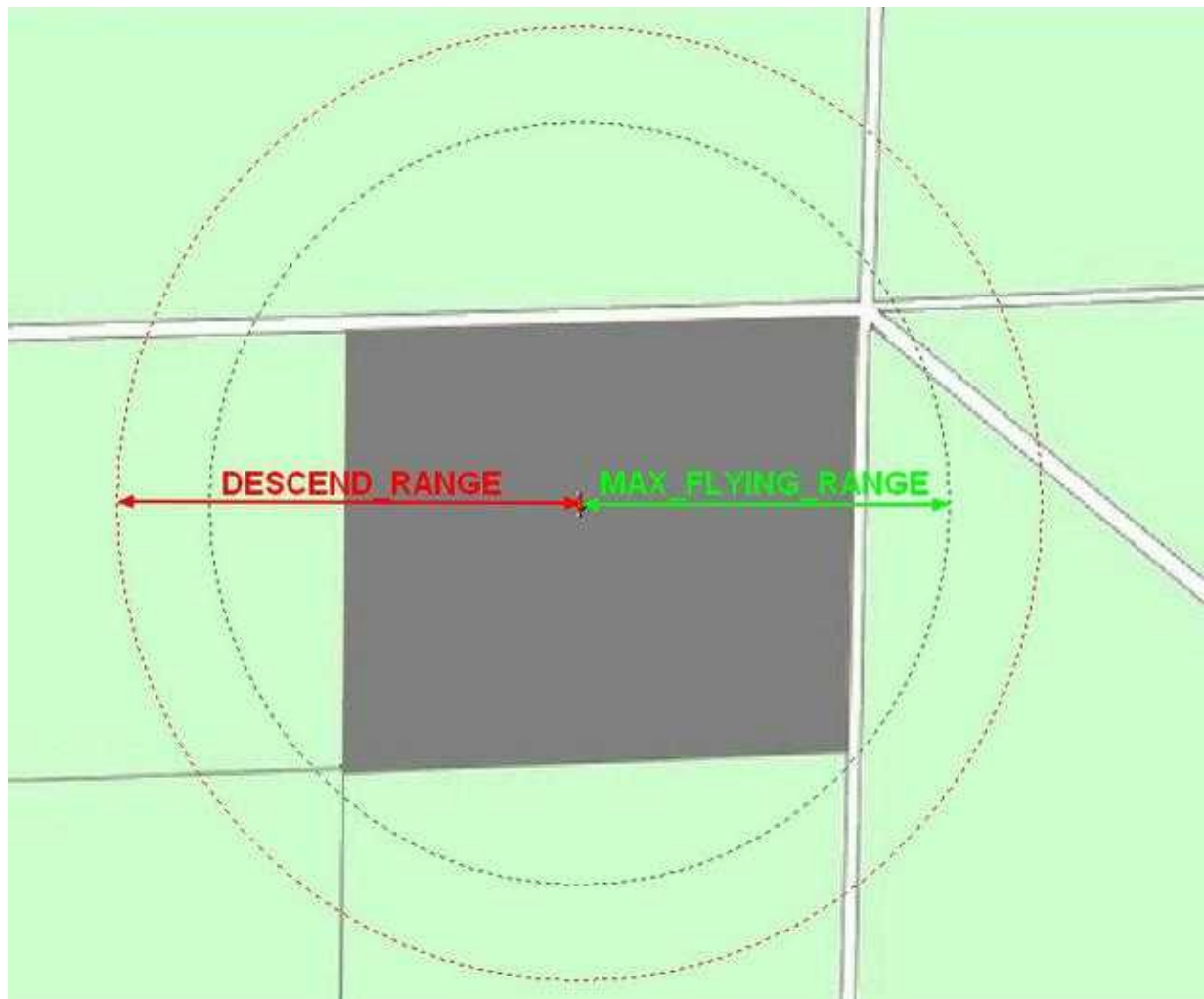
Here you will see an appropriate message over the telemetry display.


DESCEND_RANGE Here byou can enter a max. flight-radius which is required for the special license and commercial use.

 If the Kopter is leaving this radius it will turn automatically with 80% hovering-throttle/gas into a descent flight.

INFO:

The Kopter should not reach that radius with a small set up "MAX_FLYING_RANGE" under normal circumstances.



 For user without a license is the setting "DESCEND_RANGE" with no function.

TIP: To change those values you should insert and open the SD-Card directly in an appropriate slot on your PC. Here you can do the adjustment with an editor.

TIP: License User should activate in the Settings "Miscellaneous (Misc)" the function "SD card missing".
(For your convenient information: In France, i.e., with the beginning of 2012 are those settings now obligation for commercial user and the Kopter MUST come down if it is out of a 150mtr. radius!)

Attention

1. If you need to change those datas please **do not use** Logging-times under 500ms - that can affect the navigation and lead to failures!

2. **After an Update of the NaviCtrl** please clear the **SETTINGS.INI** on the SD-Card.
The new Software will set a new file with the needed values.

11.2 stored data - folder "LOG"

During flight the Kopter will create once a folder "LOG" and save some informations (for each flight) on the micro-SD-card in a .KML and a .GPX file.

These are:

- ele
- time
- sat
- Altimeter
- Variometer
- Course
- Groundspeed
- VerticalSpeed
- FlightTime
- Voltage
- Current
- Capacity
- RCQuality
- RCRSSI
- Compass
- NickAngle
- RollAngle
- NCFlag
- ErrorCode
- TargetBearing
- TargetDistance
- RCSticks
- GPSSticks
- Actual Waypoint

- Value of the WP-Event
- Nick- and Roll-Servo-Value

You can take a look on this informations with the programm "**GPX-Viewer**" or "**MK_GPX** ([Link](#))

11.3 Presentation of the flight data in Google Earth

In Google Earth you can display and see the saved flight-datas of the Kopter. In the actual Google Earth Version (>6.1) you can display the flight-route by loading the .KML or the .GPX-file.

Tipp

If you open a .KML file with "Google Earth" and see only red stripes, you have to edit the .KML file. Here in this file you can change the coordinates like you see here:

- **Example:**

- ◆ Wrong: +7.1234567,+53.1234567, 0.000
- ◆ Right: +7.1234567,+53.1234567,0.000

Since software version v0.26g ([NaviCtrl](#)) the changes are already included in the KML-log.

(The flight-route will be also displayed in the height if you set up in the properties of the file the **Height to Relativ to ground.**)

12 Parameter

The practice has shown that the default parameters (settings) are already sufficient for almost all [MikroKopter](#).

Who wants to do a little bit fine-tuning that can be done in the settings. You can do that in the tabs [NaviCtrl](#) and [NaviCtrl2](#).

13 Debug-Interface

To the **Debug**-Interface the MK-USB will be hooked up there. Here you can set up the [NaviCtrl](#), download new software or you can get failure information over the [KopterTool](#).

For the data transfer between the Kopter and the PC you can use also a **Bluetooth-Module** or a **Wi232-Module**.

The module will be hooked up also to the **Debug**-Interface of the [NaviCtrl](#). A second module (Bluetooth or Wi232) to receive the datas will be connected to the MK-USB.

13.1 NMEA

Since the Software-Version 2.00a (for NaviCtrl) we can also use the format **NMEA** (e.g. for Cameras with Datalogging). The output is at 57600 baud. The records are sent with RMC & GGA. You can get the data on PIN9 of the *Debug* connection of the NaviCtrl.

NOTE: To use the NMEA you need a plugged microSD card (max. 2GB/FAT16) and the entry "NMEA_INTERVAL" in the Settings.ini must have a value entered. If you already have a microSD card in! [NaviCtrl](#) used muss after a software update the existing settings.ini it are deleted so that a new one can be created with the parameters.

14 Upgrading software

1. Connect the NaviCtrl over the 10- and 6pole connection plug with the FlightCtrl (see [MK-Tower](#))
2. Connect the [MK-USB](#) to the **Debug**-Interface of the NaviCtrl - **DO NOT** place the jumper on the MK-USB.
3. Now switch ON the Kopter.
4. Start the [KopterTool](#) and click in the Terminal Window (Button *Firmware Update and Terminal*) on **Update Software (serial)**. Then choose the .hex-file.
5. The Update-sequence starts and should be done after approx. 1-2 minutes. At the end you can see debug-datas in the Terminal.

Further information for the Update (also if an update fails) you can get here: [SoftwareUpdate](#)

INFO

For updating the software you should always use the MK-USB.

If you use for the data-transfer a Wi232 Module or a Bluetooth Module the update can be faulty!

INFO

To flash the bootloader is not necessary and also not possible.

If the processor is defect you can buy a new one with the appropriate bootloader in the [Shop](#).

15 Error Codes

If you use the GPS-System (NaviCtrl + Compass + MKPGS) on your Kopter and you calibrate the Gyros, you can see for a short time "error 6" + "error 3" in your Telemetry-Display.

This is normal. Because the connection between [FlightCtrl](#) and [NaviCtrl](#) is briefly interrupted when you calibrate the Gyros .

For all other Failure codes you can find here some Tipps to resolve it: [ErrorCodes](#)

16 Schematic Version 1.1

Schematic: [Link](#)

BOM: [Link](#)

-
- KategorieMK-Baugruppe/en