

## **en/NaviCtrl\_2.1**

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# 1 NaviCtrl V2.1

The NaviCtrl is an additional module for the [FlightCtrl](#). On the MikroKopter you use the NaviCtrl together with the [MKGPS](#) as a navigation unit.

With the navigation unit you can use functions like [PositionHold](#), [ComingHome](#), [CareFree](#), [FollowMe](#) or a [Waypoint fly](#).

(All functions of the MikroKopter are described here: [Functions](#))

The NaviCtrl V2.1 includes an integrated compass module and a connector for an [external compass module](#).

On the [NaviCtrl](#) board is also a Micro-SD card socket. Here you can insert an micro SD card (max. 2GB / FAT16).

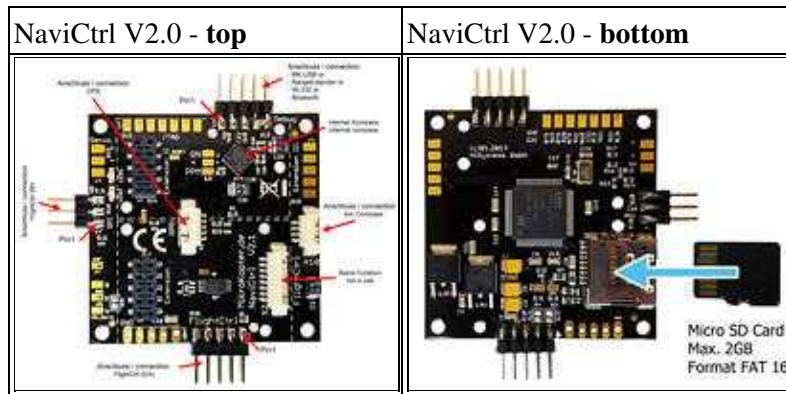
During flight the LOG files of the Kopter will be saved on this micro SD card.

After the flight you can take a look on the recorded data in the LOG file (if required) wit our program **GPX-Viewer**.

Informations for the GPX Viewer can be found here: [GPX-Viewer](#)

## 2 Mounting / Connections

The connections of NaviCtrl are as follows:

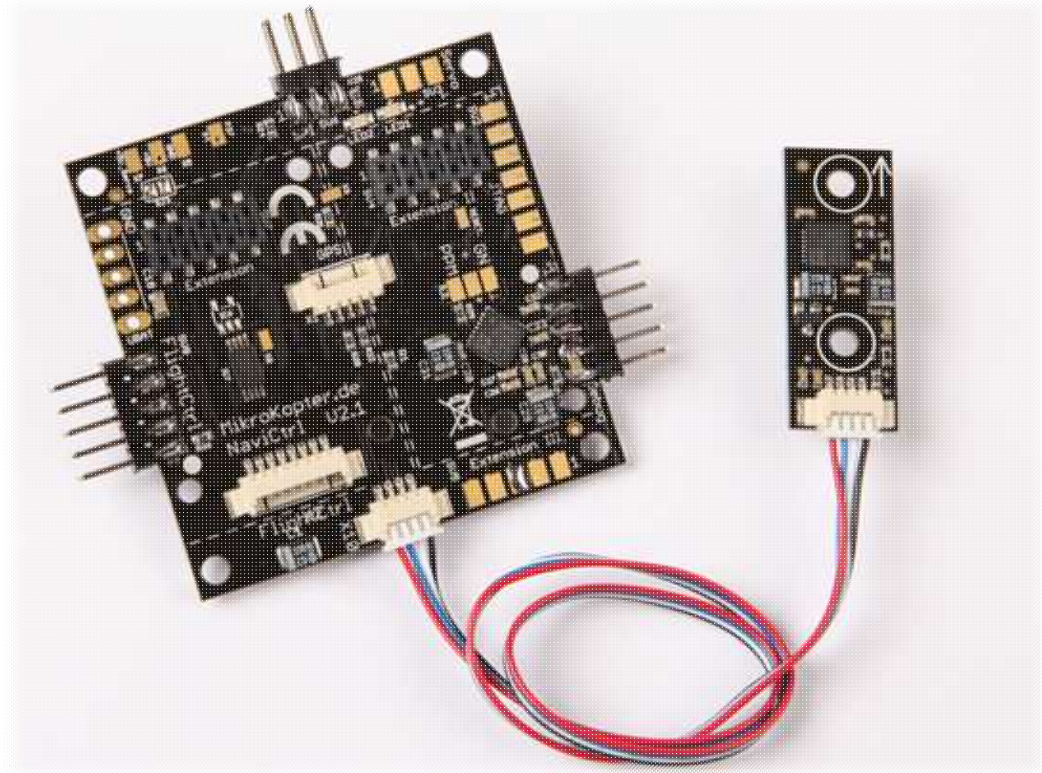


The installation of the navigation unit can be done quickly:

### 3 Connection ext. compass

The external compass is easily connected with the 4-pin Molex cable to the NaviCtrl.

More information on mounting the external compass can be found here: [ExternalCompass](#)





## 4 Settings in the KopterTool

When the navigation unit is mounted on your copter you need 2 free channels on your transmitter that you can use the functions.

The first channel can be used with a 3way switch and the second with a 2way switch on your transmitter.

With the 3-way switch you use the GPS functions:

- Switch position OFF = GPS off
- Switch position center = [PositionHold](#)
- Switch position center ON = [ComingHome](#)

With the 2-way switch you use the GPS functions:

- Switch position OFF = [CareFree](#) off
- Switch position ON = [CareFree](#) on

Both channels must also be set under ["Easy Setup"](#) -> *GPS Mode Control* and *Carefree control*.

## 5 Calibrate Compass

The compass (and the GPS) is needed for the automated control of the MikroKopter. Therefore a new compass must be calibrated once for a proper function.

If the compass has not been calibrated, compass and GPS supported features can not be used and you can not start the copter.

An error message (error 31) is then displayed via the telemetry.

A recalibration of the compass is usually only necessary when the Kopter fly under the "[PositionHold](#)" function in circles at a remote location.

### The calibration

#### Please note

Calibrate the copter outside, far away from magnetic influences!

During the calibration you have to turn the copter completely around the axis.


The following applies: If you calibrate the compass precisely, the copter will fly perfectly.

If the copter is flying in circles (with activated function PositionHold and in an altitude above houses and trees), you better calibrate the compass new.








When you have problems after the calibration (e.g. an err22), a magnetic problem on your copter can be the problem.



Informations for the "magnetic error" can be found here:: [MagnetError](#)

### The calibration will be done in 5 steps:

Step	Funktion	Beispielansicht / Funktion
Switch ON the Transmitter and connect the Copter with the Lipo.		



<b>Step 1</b> Initiate compass calibration	<b>Nick down</b> (and hold)  then  <b>Throttle up + Yaw left</b>  (The Kopter beeps 1x)	
<b>Step 2</b> Start Calibration	<b>Pull Nick down 1x</b>  (The Kopter beeps 2x and the clicking starts)	
Calibration of the <b>X-Axis</b> (Nick-Axis)	The Kopter with the front (Arrow direction of the FlightCtrl) pointing to the South or North,  then  rotate the Kopter a couple times <b>completely</b> over the Nick-Axis until the buzzer stops with the clicking.	
Rotate the Kopter	<b>Rotate the Kopter by 90°.</b> The clicking starts again.	
Calibration of the <b>Y-Axis</b> (Roll-Axis)	Rotate the Kopter a couple times <b>completely</b> over the Roll-Axis until the buzzer stops with the clicking.	
<b>Step 3</b> Finish the calibration of the X and Y-Axis	<b>Pull Nick 1x down</b>  (The Kopter beeps 3x)	
<b>Step 4</b> Start calibration of the Z-Axis (Yaw-Axis)	<b>Pull Nick 1x down</b>  (The Kopter beeps 4x and the clicking starts)	

Calibration of the Z-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 <b>completely</b> over the Roll- or Nick-Axis until the buzzer stops with the clicking.</p>	
<b>Step 5</b> Finish the calibration of the Z-Axis.	<p><b>Pull Nick 1x down</b></p> <p>The Kopter confirms it with 2 beeps</p>	

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

## 6 Videos

## 7 Check the calibration

You can now check the calibration of the compass in the KopterTool or also with a suitable transmitter.

Please do this also outside, far away from magnetic influences!

Here you have to check two values:

- MAG (or Field) = This should be around 100%
- Inclination (Incl) = This should be nearly the same value as the one in brackets

### IMPORTANT:

To see the right values you have to calibrate the Gyros first (throttle up + yaw left).

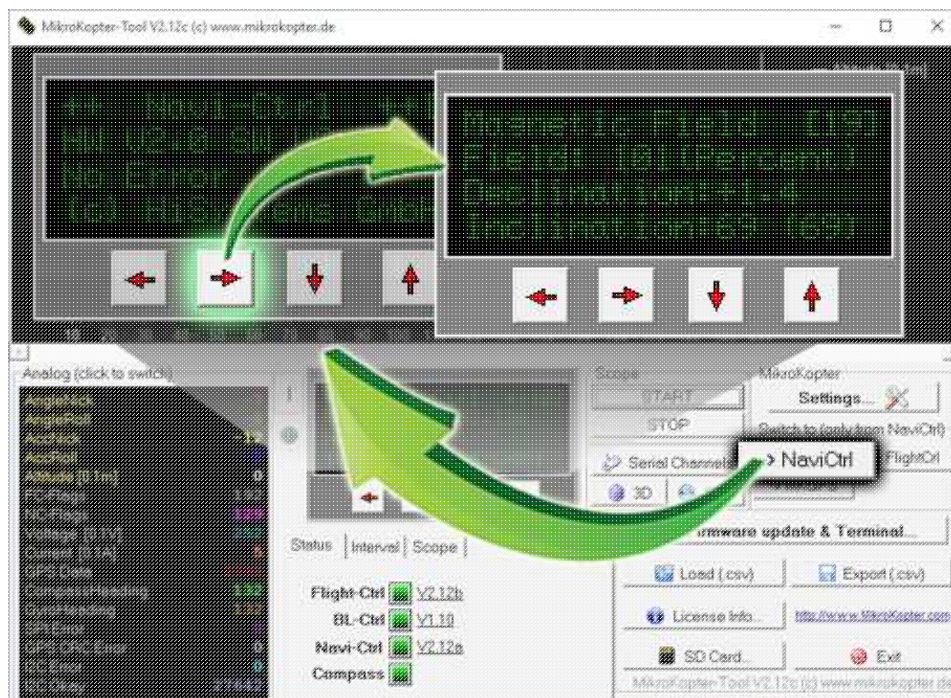
Without calibration you will still see 100% and no Inclination.

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### Check via [KopterTool](#)

Here you use:

- a MK\_USB or a wireless connection between Copter and Computer  
+
- you have calibrate the Gyros (throttle up + yaw left).



In the main window of the KopterTool click the button [NaviCtrl].

Under the virtual display click the red arrow (left or right) until the window "Magnetic Field" displayed.

The value for "Field" must be around 100% and the value for Inclination around the value you see in brackets.  
(If the value for "Field" (or for "Inclination") is ~10%-15% higher/lower then 100%, recalibrate the compass)

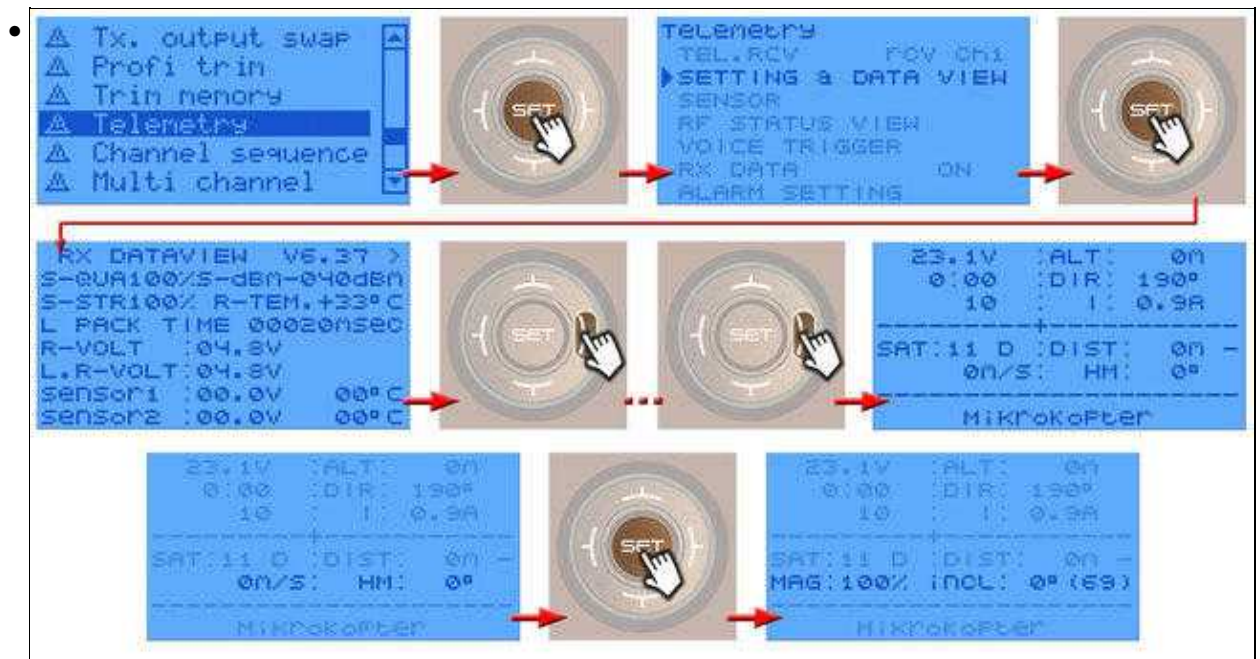
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### Check via [HoTT transmitter](#)

- To see the right values of the calibration you have to calibrate the Gyros again (throttle up + yaw left). Now you can check the magnetic value in the lower display of the Graupner HoTT transmitter.

How to open it:

- ◆ With the right "four-way button" select the middle button **SET** to open the Menu
  - ◆ Go down to **Telemetry** and press **SET**
  - ◆ In the telemetry window choose **setting & data view** and press **SET**
  - ◆ In the next menu press the **right** button until you see the "Text-telemetry"
  - ◆ To change the view of "0m/s" to "MAG" press **SET** again.
- 
- The value for "MAG" must be around 100% and the value for Inclination (incl) around the value you see in brackets.  
If the value for "Field" (or for "Inclination") is ~10%-15% higher/lower then 100%, recalibrate the compass!



## 8 Sat-Fix

For all GPS functions like PositionHold, ComingHome or a waypoint flight you need the GPS modul. In addition, there must be a Satfix.

To test if the copter (the GPS) already have a Satfix, you can use the 3 way switch for the GPS functions on the transmitter.

The copter is outside, the transmitter ON and the copter is connected with the battery.  
The motors are OFF!

The switch positions of the 3 way GPS switch:

- Switch position OFF
  - ◆ The copter is quiet and does not beep
- The 3 way switch is centered (*PositionHold*) or ON (*ComingHome*):
  - ◆ Option 1 -> The computer beeps now once every second => **no** Satfix
  - ◆ Option 2 -> The copter is quiet and does not beep => there is a Satfix and you can use all GPS functions

## 9 Dynamic PositionHold

If the position function PositionHold is activated, the copter automatically hold the position.  
When you will change the position of the copter in the air, move the Nick/Roll Stick on your transmitter.

The function of the mode PositionHold is different if Dynamic PositionHold is enabled or disabled:

- Function *Dynamic PositionHold* disabled:

- ◆ The copter is directly controlled by moving the nick / roll stick.

Here the function PositionHold will be automatically switched off if you move the sticks. At the new position and after you release the sticks, the function PH will be automatically switched on again.

- Function *Dynamic PositionHold* activated:

- ◆ Also here you can fly the Kopter through moves with the Nick- / Rollstick to a new position.

But 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.

Here you can change the settings under *EasySetup*: [MK-Parameter](#)



# 10 Beeps

With correctly connected navigation unit you hear additional beeps.

This beeps are:

- Satfix control => beep every second (see: Sat-Fix)
- Using the 3 way GPS switch from OFF to PositionHold or ComingHome) => one beep for each using
- Enabling Carefree => a long beep

# 11 Softwareupdate and Functionality Tests

With the [KopterTool](#) you can change the Software on the NaviCtrl and also check the function.

The current mating software (KopertTool, NaviCtrl and FlightCtrl) can be downloaded here: [Download](#)

Connect the [MK-USB](#) with the **Debug** port on the NaviCtrl, or use a wireless connection (like e.g. the [RangeExtender](#)) to connect the copter with the computer.

Open the terminal window in the KopterTool and connect then the copter with the battery (Dont forget to switch on the transmitter ;-)).

In the terminal window you should now see the initialization of the NaviCtrl. Here you see e.g. if a micro SD card is in use, the hard- and software version. if you use the internal or an external compass and if you use a license or not:



```
MikroKopter-Tool V2.12c (c) www.mikrokopter.de
Connected to Navi-Ctrl.
Terminal #87600

UART1 init...ok
-----
UART0 init...ok
ADC init...ok
SPI init...ok
I2C0 init...ok
I2C1 init...ok
FAT16 init...
SSC init...ok
SDC init...
Setting SD-Card speed to 2000 ok
SD-CARD V2.0 or later
Capacity = 1876 MB
Manufac. Date: 4/2014

ok
Settings init...ok
-----
Version information:
NaviCtrl HW: V2.0 SW: V2.10a
-----
Looking for compass..... internal sensor
LSM303DLM ID 0x48/34/33-3c
EEPROM init...ok
Selftest ok
Looking for GPS:..... V3.0 SW:2.01
Configuring GPS =..... done
-----
+ the use of this software is only permitted
+ on original MikroKopter-Hardware
+ www.MikroKopter.de (c) HiSystems GmbH
+-----

License found on SD-card:
+-----
+ Name: MikroKopter.de #87600
+ eMail: support@hisystems.de
+ License: 1000m-range-limit,commercial
+ Feature: 1000m-range-limit,commercial
+ Expires: none
+ Range: 1000
+ Waypoints: 100
+ SinglePts: 99
+ WP_Lists: 99
+-----
Looking for FlightControl..... FC V2.10a HW:2.5
```

To update the software "click" on the button *Update Software (serial)*... and chose the software for the NaviCtrlund. A click on ""Open" starts the update.

The update itself is displayed in green. When you see the white initialization the update is done.

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## 12 Micro SD-card

You can use a **micro SD-Karte** (up to 2GB / FAT16) in your NaviCtrl.

All telemetry data of the copter will be automatically saved on the micro SD card in a GPX and KML file.

After the flight you can take a look on the recorded data in the LOG file (if required) wit our program **GPX-Viewer**.

Informations for the GPX Viewer can be found here: [GPX-Viewer](#)

Plug in the SD card as you can see under *Mounting / Connections*.

If the card is inserted, the needed file *SETTINGS.INI* will be created automatically after you connect the battery with the copter.

Also a folder *LOG* will be created automatically when you do your first flight.

## INFO

If you update the Software, it can be that there are new functions.

To use all the new functions you should clear the *SETTINGS.INI*. It will be created automatically new with the right new values that are needed.

## 12.1 SETTINGS.INI

The file *SETTINGS.INI* includes some settings you normally have not to change.

If you must change a value you can do it with an normal windows editor.



The values in the *SETTINGS.INI* are largely self-explanatory.

If you e.g. want to achieve greater speed in manual flight under PositionHold or during a waypoints flight, you can increase the value of `DYNAMIC_PH_SPEED`. Or you will use use GPS and BEIDOU (instead of GOS and GLONAS) as receiving satellites you can change it under `GPS_SYSTEM_CFG` anpassen.

## 12.2 Presentation of the flight data in Google Earth

In the current version of Google Earth (> 6.1) you can show the route by loading the .KML or .GPX files. (The flight-route with a .GPX file will be also displayed in the height if you set up in the properties of the file the Height to Relativ to ground.)



## 13 NMEA

Since the software version 2.00a for NaviCtrl, the UBlox Modul can also send a **NMEA** Format. (e.g. for Cameras with Datalogging).

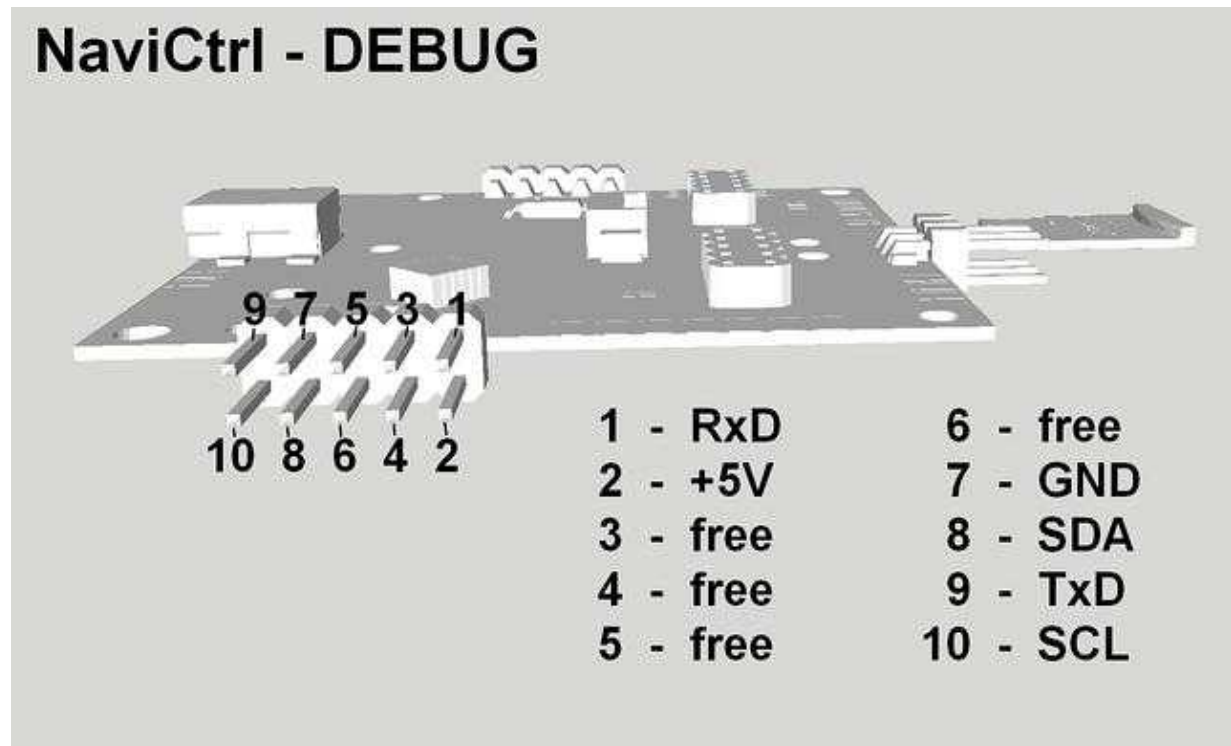
The output is at **57600 baud**. The records are sent with **RMC & GGA**.

You can get the data on **PIN9** (+ PIN7 GND) of the *Debug* connection of the NaviCtrl.

**IMPORTANT:** Only with an microSD card in the NaviCtrl you can use the NMEA Data.

The file *SETTINGS.INI* on the microSD card includes then the necessary command "NMEA\_INTERVAL"s for this purpose. This entry is set to "0" by default, so there is no output of the NMEA signal.

Here a transmission interval must be entered (e.g. 500 = 500ms = 0,5s). You can change the Settings.ini with an Editor.





# 14 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.

an error has occurred if an error message will be displayed permanently.

The error codes and the meanings you can find here: [Error Codes](#)

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- KategorieMK-Baugruppe/de