MICROBEAST PLUS Version 4.x.x

Instruction manual

Contents

Introduction

MICROBEAST PLUS - What is this?

MICROBEAST PLUS is the official successor of the famous MICROBEAST flybarless system. In comparance to MICROBEAST the hardware has been revised thoroughly to be on par with the state of the art. Latest MEMS sensors and faster processing gives a more precise control in all flight situations. At the moment MICROBEAST PLUS can only be used in combination with RC model helicopters. Different application types will be available soon.

If you have MICROBEAST already in use you will find that the setup of MICROBEAST PLUS runs as usual. The proven „EasySetup" concept and ease of use is maintained. So upgrading to MICROBEAST PLUS is very easy. As MICROBEAST PLUS is much more powerful than MICROBEAST, it is specifically tailored for use with the StudioX software solution that enables more complex adjustment processes thus resulting in completely new applications. We recommend to visit this wiki and our support website [1] from time to time to get the latest features for your MICROBEAST PLUS.

At the moment we offer two additional features for the device, the RPM governor and the AttitudeControl function. All MICROBEAST PLUS units can be upgraded with these functions by paid software update. Additionaly these functions are already included in ProEdition devices.

Firmware version display

Please note that these instructions are only valid for the MICROBEAST PLUS firmware version 4.x.x!

The firmware version can be detected by connecting the unit to a computer by using the USB2SYS interface together with the StudioX software bundle .Also you can directly read on the MICROBEAST PLUS unit during the initialization phase what firmware version your MICROBEAST PLUS is running: MICROBEAST PLUS first carries out a brief LED test by lighting up all Menu-LEDs simultaneously, and cycling the Status-LED color (red->blue->purple). Then for about 3 seconds, the Status-LED lights red while the Menu-LEDs A to G display the first digit of the firmware version, and the LEDs H to N the second digit of the firmware version. By briefly pushing the button you can get more version informations displayed. In respect to the manual this information is not important.
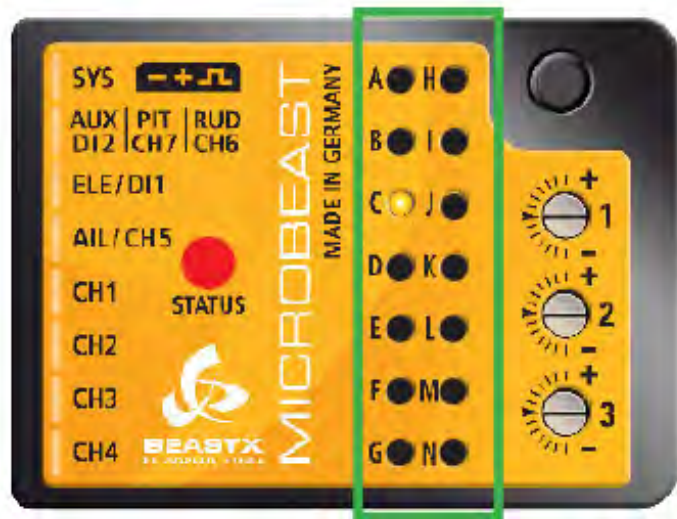
Firmware version 4.0.x

In the left row menu LED C shows the major version „4".

In the row from LEDs H to N nothing lights up. So minor version is „0".

Safety notes

⚠️ Radio controlled (R/C) helicopters are no toys! The rotor blades rotate at high speed and pose potential risk. They may cause severe injury due to improper usage. It is necessary to observe common safety rules for R/C models and the local law. You can gather information from your local R/C model club or from your national modelers association.

⚠️ Pay attention to your own safety and the safety of other people and property in your vicinity when using our product. Always fly in areas away from other people. Never use R/C models in close proximity to housing areas or crowds of people.

R/C models may malfunction or crash due to several reasons like piloting mistakes or radio interference, and cause severe accidents. Pilots are fully responsible for their actions, and for damage or injuries caused by the usage of their models.

⚠️ Please read the instruction manual thoroughly before the first use of your MICROBEAST PLUS and setup the system carefully according to this manual. Allow sufficient time for the setup procedure and check each step carefully. Watch for a mechanically clean and proper build of your helicopter. A wrong system setup can lead to a serious accident and damage to the model.

⚠️ Radio controlled (R/C) models consist of several electrical components. It is therefore necessary to protect the model from moisture and other foreign subtances. If the model is exposed to moisture this may lead to a malfunction which may cause damage to the model or a crash. Never fly in the rain or extremely high humidity.

⚠️ When operating the helicopter with a MICROBEAST PLUS ensure there is a sufficiently large and stable receiver power supply. Because of the direct coupling of the rotor blades to the servos, without the use of a flybar mixer, the servos are exposed to increased actuating forces. In addition, because of the intermediary electronic gyro system, the servos are driven more often than with traditional use. These factors can make the power consumption increase a lot compared to a flybar helicopter. When the supply voltage falls below 3,5 volts for a short amount a of time, the system will power off and reboot. In this case a crash of the helicopter is unavoidable.

⚠️ Do not expose the MICROBEAST PLUS system to extreme variations in temperature. Before powering up the system, wait some time so that the electronics can acclimatize and any accumulated condensation is able to evaporate.

⚠️ The sensors of MICROBEAST PLUS consist of highly sensitive electromechanical components. These can be damaged due to moisture or mechanical or electrical impact. Do not continue using this product if it has been exposed to such influences, e.g. due to a crash of the model or due to overvoltage caused by a defective receiver power supply. Otherwise a failure may happen any time.

⚠️ When operating electric helicopters make sure that the electric motor cannot start inadvertently during the setup procedure. Particularly pay attention if using a single-line receiver and if the ESC is connected directly to the MICROBEAST PLUS. We recommend disconnecting the electric motor from the ESC during the setup procedure. Prior the first usage please slide the motor/pinion away from the main gear, then check that the motor does not to start inadvertently when the receiver is switched on.

⚠️ When operating the RPM Governor feature of MICROBEAST PLUS it is essential to ensure that the motor cannot start by accident when making adjustment or performing preparations to start the engine. Carefully read this manual and make sure you fully understand how the RPM Governor feature is operated before making any adjustments. Also make sure the motor does not start when the radio link is interrupted or when you switch on the transmitter initially. With electric driven models do not dock the motor to the main gear unless all necessary adjustment procedures have been finished. Always maintain sufficient safety distance to the motor and other rapidly rotating components of the helicopter.

⚠️ MICROBEAST PLUS with AttitudeControl can be used as a flying aid for beginners by limiting the reaction of the helicopter to stick inputs and by stabilizing the helicopter with a electronic control loop. However, this does not provide that the helicopter can always be flown safely! By incorrect control inputs the helicopter still may crash or be placed in a position in which the pilot becomes disoriented even when using AttitudeControl. In addition, the helicopter can drift due to external influences and it is not guaranteed that the artificial horizon of the device can stabilize the helicopter at any time and recover from any orientation. Influences such as temperature fluctuations or vibrations may cause incorrect results and distort the position calculation of the system in consequence. There is no guarantee that the system will always work correctly. Only the pilot is responsible for the control of the helicopter and thus also for the use of the system. Note that the system for technical reasons will not hold the helicopter absolutely to the point. The unstable tendency of a helicopter will cause the model to fly in a certain direction even when using AttitudeControl. External influences such as wind can further strengthen this effect. In addition measurement inaccuracies of the sensors can distort the position determination slightly. You must always be able to turn off the system immediately and be able to take over full control of the helicopter.

⚠️ We suggest you to seek the support of an experienced helicopter pilot before you undertake the first flight of your model. Additionally, flight training with a R/C simulator can help make flying easier and more enjoyable. Ask your local dealer if you need technical support or if you observe problems during the usage of our system.

⚠️ AttitudeControl can help to facilitate flying of model helicopters by briefly passing over control to the system if the pilot becomes disoriented. By using the built-in artificial horizon the helicopter can be brought to a nearly horizontal position so that the pilot gains time to reorient. Thus, there can be no assurance that the model is saved from a crash in general. Depending on the current attitude and the speed of the model and depending on how fast the AttitudeControl is activated, the model may crash before or while the system tries to recover. In addition, the helicopter can drift due to external influences and it is not guaranteed that the artificial horizon of the device can stabilize the helicopter at any time and recover from any orientation. Influences such as temperature fluctuations or vibrations may cause incorrect results and distort the position calculation of the system in consequence. Strictly observe the general safety rules for dealing with RC models and do not totally rely on the system. The pilot is responsible for the control of the helicopter and thus also for the use of the system. You must always be able to turn off the system immediately and be able to take over full control of the helicopter.

Box content and accessories

Box content MICROBEAST PLUS

MICROBEAST PLUS

Gyro pads
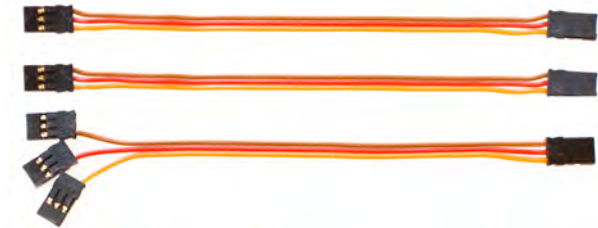
Connection cables 15cm
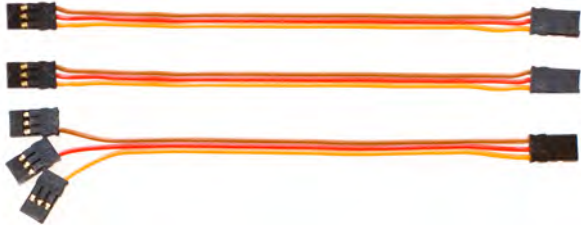

Adjustment tool

Quickstart
manual

Box content MICROBEAST PLUS HD

MICROBEAST PLUS HD

Gyro pads

Connection cables 15cm

Power connector

Power switch

Adjustment tool

Quickstart manual

Optional accessories

Connection cables
8cm

USB2Sys PC
Interface

Spektrum remote satellite adapter

Adapter for RPM sensors

RPM sensor for brushless motors

MICROBEAST PLUS HD

The operation of MICROBEAST PLUS HD is identical to MICROBEAST PLUS apart from the high power supply and the switch system. So it is not explicitly dealt with the HD version later on in this manual. **All subsequent executions are also based on MICROBEAST PLUS HD!**

Introduction to MICROBEAST PLUS HD

MICROBEAST PLUS HD is the most powerful flybarless system from the MICROBEAST series. While function and operation are identical to MICROBEAST PLUS, the HD version is characterized by the possibility of a high power supply. This meets the requirements of speed flyers and extreme 3D pilots and is primarily used in helicopters larger than 500 size that have very power consuming servos installed.

By using a low-resistance high-current connector system MICROBEAST PLUS HD makes it possible to use thick power cables for connecting receiver battery or BEC which preserves a virtually loss-free transfer of electric current. In addition the power connection is switchable using a particularly fail-safe switch system, so there is no need for a separate and costly power switch. **The input voltage range is 3.5 to 8.4 volts.**
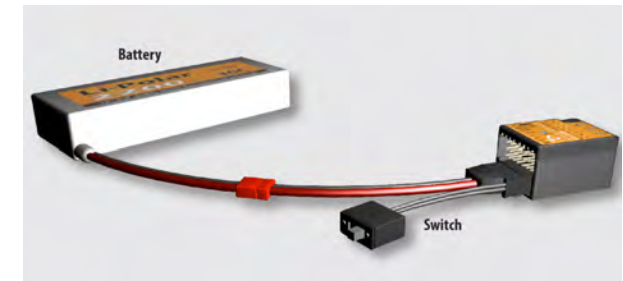
Solder to the supplied power cable a matching counterpart for the supply battery used or connect it with the BEC power wires (of your speed controller). When using a battery it is not recommended to directly connect the battery to the MICROBEAST PLUS HD without using the supplied power cable as an adapter. Continuous plugging and unplugging can cause the overlying servo plugs getting unplugged accidentally or cause the adhesive gyro pad to get loose! Receiver and servo plugs are connected to the ports on top of the unit. There is no difference between HD and non HD version in this respect.

The use of the electronic switching system is optional. The switch is designed in a way so that it interrupts the power circuit by shorting the switch circuit in OFF position. If the switch is not connected MICROBEAST PLUS HD is switched on permanently as soon as the power is connected.

Please note:

- Using the high power connection port is not a must. You can also use MICROBEAST PLUS HD in a conventional manner by powering the unit from the receiver ports in the top row, as shown in the chapter on receiver installation. However, using the electronic power switch system is not possible then!
- The electrical connections of the high power connection port and the upper terminal row form a parallel power circuit during operation. So it is possible to connect an additional power source at the upper terminal row. For example this can be a buffering battery or a backup system that shall protect against failure of the primary power source. In this case note the manufacturer's instructions, if this is possible and permissible for the supply systems used. Also note that using the electronic power switch system of MICROBEAST PLUS HD is not possible in this combination!
- Note that the system can only be as powerful as the power source allows. Use power cables with sufficient diameter, avoid long cable length and only use a plug system for connection of battery and power cable that is capable of transferring high currents.
- MICROBEAST PLUS HD does not supply an internal voltage regulation! The voltage that is applied to the high power connection port will directly be passed to the servo and receiver connections. Only use electronic components (servos and receiver) that are designed for your power source.

⚠ MICROBEAST PLUS HD will draw a very low amount of current even when the system is switched off. **Therefore always completely disconnect the battery from the system if you do not use the model for a extended period of time to prevent the supply battery from getting discharged and damaged in consequence.**

Preliminary steps

Mounting the Microbeast PLUS unit

Attach the Microbeast PLUS unit by using one of the provided 3M® gyropads at a preferably low vibrating position on your helicopter such as the gyro platform or receiver platform. You may need to choose another type of mounting pad depending on the vibration pattern of your helicopter. For more information please ask you Microbeast PLUS dealer.

The MICROBEAST PLUS unit can be attached **flat or upright** on the helicopter. However, the **servo connector pins must always point towards the front or rear** of the helicopter. The small white sensor pinboard on the side must always be inline with flight direction.
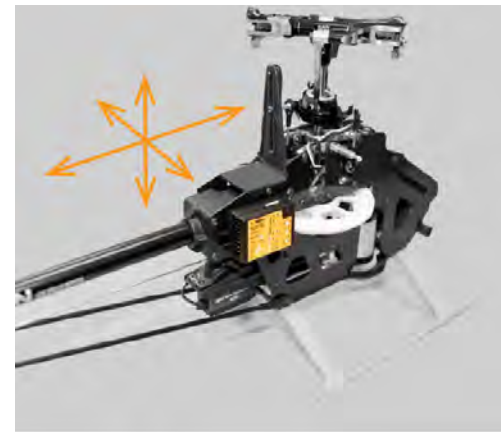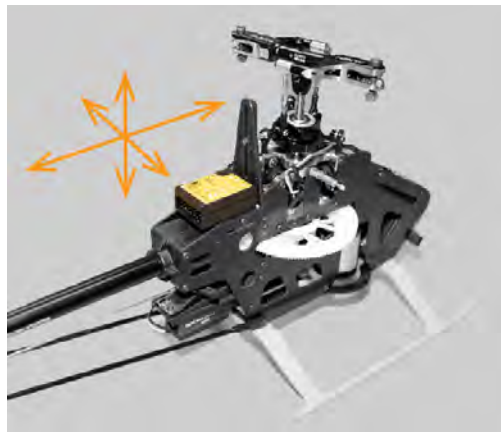
Pay attention that the edges of the Microbeast PLUS unit are all parallel with the corresponding rotational axes of the helicopter! Especially make sure that the mounting platform is perpendicular to the main shaft! On the other hand it is not important that the unit is directly placed on the rotation axis (which is nearly impossible).

There are eight possible mounting orientations:

flat, cover on top, servo connectors showing to front

upright, button on top, servo connectors showing to front
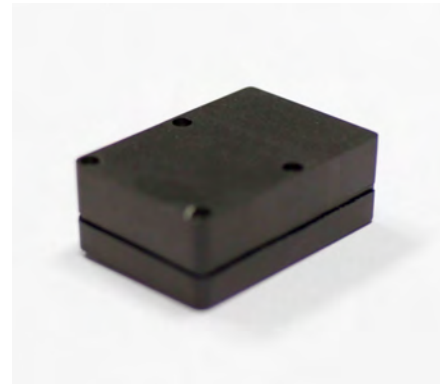
flat, cover showing to bottom, servo connectors showing to front

upright, button on bottom, servo connectors showing to front

flat, cover on top, servo connectors showing to rear

upright, button on top, servo connectors showing to rear

flat, cover showing to bottom, servo connectors showing to rear

upright, button on bottom, servo connectors showing to rear

Preparing the transmitter

You can use nearly any transmitter that provides at least 6 channels. By default 5 channels are used for controlling Microbeast PLUS and one channel controls the motor. If using additional features like AttitudeControl or (nitro) RPM Governor more channels may be useful to have.

Create a new model in your radio's model memory. Disable any mixing functions for the swashplate or rudder. Each function should be assigned to just one receiver channel.

Never enable your radio's eCCPM mixing function! All the swashplate mixing will be done by Microbeast PLUS. Always set your radio's swash mixer to mCCPM (mechanical mixing) which is often called "H1", "1 servo" or "normal" mixing or disable "swash mixing" if applicable.

Be sure that all trims and sub trims are disabled and that all servo travels are set to 100%. Increasing or decreasing the servo travel/stick throw for aileron, elevator and rudder will later adjust the (maximum) control rates. For the moment to setup Microbeast PLUS let anything stay at default. Also do not adjust the collective pitch curve at the moment. For the setup procedures it has to be set as a straight line reaching from -100% to +100% (or 0 to 100% depending on radio brand).

Again make sure that there are no mixing functions active (for example rudder revo-mixing). Have a look at the radio's servo monitor: each stick has to control one channel/servo output (except for thrust stick which typically controls collective pitch and motor). Remember when using Microbeast PLUS you do not directly control the servos of the helicopter. By moving a stick you give a control command to the Microbeast PLUS unit which then performs the necessary servo movements to move the helictoper in the commanded direction. Each control command is bound to one servo output channel of the transmitter.

Other functions such as throttle curves, ESC switches or auxiliary functions can be adjusted as usual. When using the RPM Governor function the throttle adjustment will be described later. Also the switch assignment for AttitudeControl will discussed at the specific topic.

⚠ **Always make sure that the motor in electric models can not start when doing the adjustment work!** If the drive battery is used as power supply for receiver, servos and Microbeast PLUS, disconnect the motor from the ESC.

Receiver installation

To control your helicopter with MICROBEAST PLUS you have the opportunity to use different receiver types. Basically it is distinguished between (conventional) „Standard" receivers and „Single-Line" (or „sum signal") receivers.

Standard receivers

A standard receiver is a receiver that is connected to MICROBEAST PLUS by using the single servo outputs of the receiver and connect them to the five control channels of MICROBEAST PLUS. The channel which determines the controlled function simply is selected by inserting each plug to the correct output at the receiver.
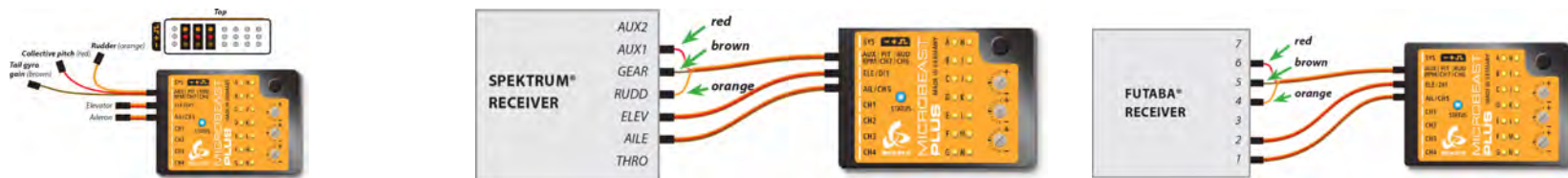
The designation Spektrum®/Futaba® is only exemplary. You can use any radio system with at least 6 output channels to connect to MICROBEAST PLUS. For finding out how to connect the wires to MICROBEAST PLUS have a look at your radio's servo monitor and refer to the radio's instruction manual.

⚠️ Ensure a tight fit of the connectors. The pin board of MICROBEAST PLUS is designed so that the plugs firmly clamp each other when they are fully inserted. Anyhow, especially when using a single-line receiver, it is possible that connectors are plugged in with no adjacent neighbors. Such plugs should additionally be secured against loosening.

Single-Line receivers

With a single-line receiver all channels (control functions) are transmitted by one single connection line to MICROBEAST PLUS. This is done by packing all channel output data to a digital data paket or by chaining the servo signals to one output port. Because of this, it is not possible here to assign functions by inserting the appropriate plugs in the receiver. Instead you have to assign the function ordering by software in the MICROBEAST PLUS receiver setup menu, so that the unit "knows" what control function each incoming channel is used for.

There are single-line receivers available that supply additional single channel connectors/servo outputs similar to a standard receiver. In combination with MICROBEAST PLUS you only have to treat such receivers as single-line receivers if you really use the single-line function. If you connect the receiver by using the standard 5-plug layout, such receiver has to be considered as "standard" receiver in the following and as shown above.

In general the single-line connection wire is plugged into the [DI1] input of MICROBEAST PLUS. When using the signal of a single Spektrum® remote satellite you must connect the optional available Spektrum® satellite adapter (Order Nr. BXA76009) in between, in order to supply the remote satellite with the correct voltage level (figure 3).

The throttle servo or ESC is connected to the [CH5] output. When using a speed controller with BEC, from here the power will be distributed to receiver and servos. Alternatively or additionally you can connect a power supply/second BEC wire/buffering battery to the [SYS] port. **Note that all plus and minus connectors are bridged on the MICROBEAST PLUS. Only at the triple input/output [AUX|PIT|RUD] you musn't connect any power source as this is not part of the power rail!** When using a big heli with standard size servos it may be insufficient to only provide power at the [SYS] port! If there are no other ports left to (additionally) feed in power, we highly recommend using the MICROBEAST PLUS HD with separate high power input.

Using a single-line receiver with additional servo output ports you can choose between connecting throttle servo/ESC and additional devices to MICROBEAST PLUS (figure 1) or directly to the receiver (figure 2). But note that when connecting the power supply at the receiver, MICROBEAST PLUS and the servos will only be supplied over the small single-line connection. Especially on big helis with standard size servos this might not be sufficient! Here it is mandatory to connect some supply lines in parallel to other free ports, such as [SYS] or [CH5] or better connect the power supply (i.e. ESC with BEC supply) directly to the MICROBEAST PLUS as shown in figure 1.
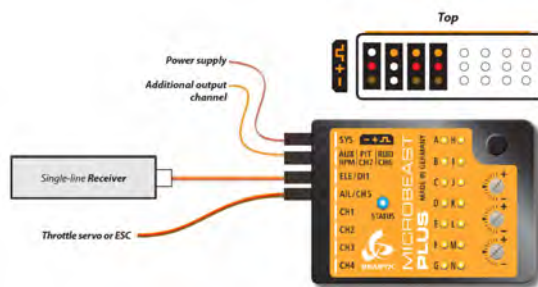
Figure 1 - Typical wiring layout for single-line receivers
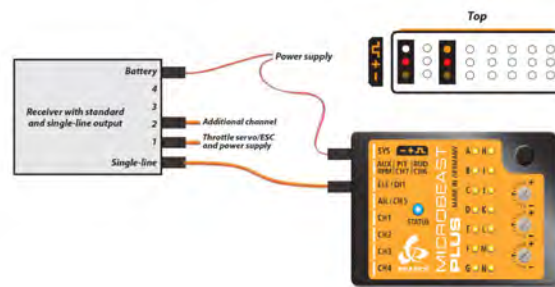
Figure 2 - Alternative wiring layout for single-line receiver with additional servo output channels
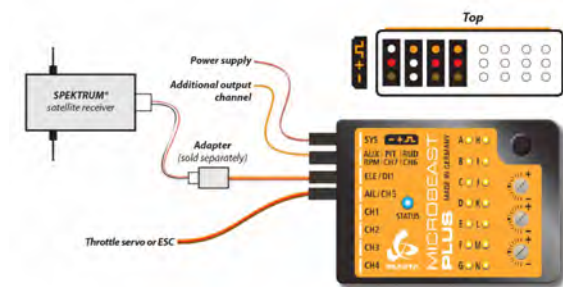
Figure 3 - Spektrum® remote satellite connection with power adapter

Ensure a tight fit of the connectors. The pin board of MICROBEAST PLUS is designed so that the plugs firmly clamp each other when they are fully inserted. Nevertheless, especially when using a single-line receiver, it is possible that connectors are plugged in with no adjacent neighbors. Such plugs should additionally be secured

against loosening.

Receiver binding

Before using your receiver with MICROBEAST PLUS make sure that the receiver is bound to the transmitter and that it is sending output data on the servo outputs and/or single-line port. Please refer to the manual of your radio system to find out how binding procedure is performed with your specific system. Also check if there is the need to perform special settings to enable the single-line data output of the receiver in case you intend to use this output port in combination with MICROBEAST PLUS.

Only in the case of using a single Spektrum® satellite receiver that is directly connected to MICROBEAST PLUS, this is bound by the aid of MICROBEAST PLUS as there is no other option to enable binding procedure at the receiver. Even more, here it is very important to bind the receiver first before programming MICROBEAST PLUS and this step must be performed, even if the satellite was already in use elsewhere (e. g. in connection with a "Standard" Spektrum® receiver) and was already bound to the transmitter earlier.

⚠️ **Watch out that the motor can not start accidentally when using the BEC of your speed controller to power the unit!**

Simultaneously with the binding process, the type of satellite receiver has to be set, i.e. whether it is a DSMX or DSM2 satellite (The actual selected signal protocol in the transmitter is not relevant!). It is very important to choose the correct type of satellite receiver here, since an improper setting may seem to work but can lead to radio interference or total loss of the link in the subsequent operation!

Insert a Spektrum® "Bind Plug" at the [SYS] port of MICROBEAST PLUS. In case the power is supplied exclusively at the [SYS] connection, to bind a Spektrum® satellite receiver the power supply must be provided temporarily through any of the other ports [CH1] - [CH5]. To select a **DSM2** satellite and to enter bind mode, simply switch on the power supply now. The LED on the receiver and LED **N** on MICROBEAST PLUS will start to flash. You can bind the transmitter as usual (for more information refer to the instructions of your radio control system). To select and bind a **DSMX** satellite, hold down the button on MICROBEAST PLUS while switching on the power supply. Now the receiver's LED and LED **H** (!) on the MICROBEAST PLUS will flash and you can release the button and bind the receiver with your transmitter. After successful binding procedure the receiver's LED will stay solid. LED **H** respectively **N** flash alternately to all other LEDs. Now switch off the power supply and remove the bind plug. Continue with receiver type setup in the next step.
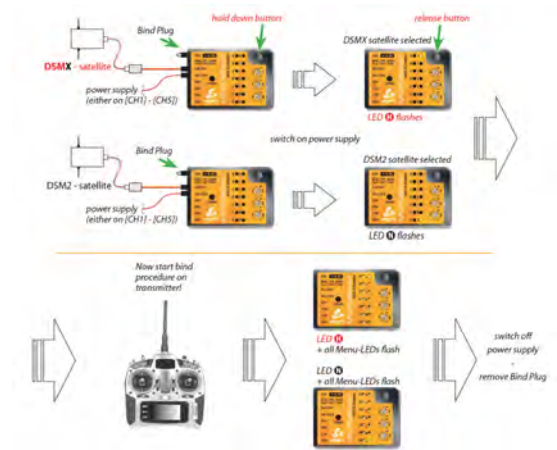
Note:

- Decisive for the selection alone is, which type of satellite receiver is plugged in! It is irrelevant which transmission method between the receiver and transmitter is actually used. Check carefully what type of receiver you have and what type you setup. An incorrect setting is not obvious but will lead to malfunction or failure of the radio link later in use.
- It makes no difference if you pull off the "Bind Plug" during the binding process or leave it connected as you would expect from some "standard" Spektrum® receivers!

Optional features explanation

At the moment we offer two additional features for MICROBEAST PLUS: the **RPM Governor** and the **AttitudeControl** function. All MICROBEAST PLUS units can be upgraded with these functions by (paid) software update. Additionaly these functions are already included in ProEdition devices.

With MICROBEAST PLUS you have purchased an electronic control system that continuously detects and controls the commands from the pilot. As a result the system is constantly aware of how the drive system will be burdened. The **RPM Governor** system uses this advantage to control the motor rpm. Contrary to conventional motor control systems that only monitor the engine speed, MICROBEAST PLUS can thus react sooner to speed changes. A separate engine governor system is no longer required for nitro helicopters and electric models can be used with a simple (cheap) speed controller without additional features such as soft start or governor mode. The desired rotor speed is specified via the remote control transmitter and MICROBEAST PLUS controls the throttle servo or speed controller accordingly, so that the predetermined head speed is maintained from takeoff to landing. MICROBEAST PLUS offers an integrated soft start for spooling up the rotor before takeoff and a quick start to regain head speed in a controlled manner when practicing autorotation maneuvers. The system is suitable both for electric and nitro/gas helicopters. Using the proven „Easy Setup" concept no additional equipment is required for programming (apart from your remote control system) and the initial setup is done within minutes.

Note: The RPM Governor function can only be used in combination with a single-line receiver or Spektrum remote satellite. When using a receiver with standard connection layout there is no option for connecting the rpm sensor and throttle servo/ESC and no connector for throttle control.

With **AttitudeControl** MICROBEAST PLUS can determine the absolute position in space of the helicopter on the roll and pitch axis, regardless of the position in which the helicopter is currently located. At the moment this can be used as flying aid with five different operation modes:

- Bail out rescue mode (with/without collective pitch)
- 3D − Mode (with/without collective pitch)
- Flight trainer mode

AttitudeControl helps you to learn new maneuvers and reduces the probability of crashing significantly. If AttitudeControl is switched on in flight the helicopter will be oriented in a nearly horizontal position, depending on the selected mode always in normal or also in inverted flight. So the helicopter can be brought in a save position by the press of a button, i. e. if the pilot becomes disoriented. Beginners can use AttitudeControl permanently (preferably in the „Flight trainer mode"), whereby the helicopter loses the peculiarity of having to be constantly controlled by the pilot. While AttitudeControl is switched on the pilot can simply release the sticks for aileron and elevator and the helicopter will be held almost horizontally without external control commands.

Preparations for RPM Governor usage (optional)

To use the RPM Governor function of Microbeast PLUS it is necessary that Microbeast PLUS is able to measure the motor speed. Therefor the separate purchase of a motor rpm sensor is required. Additionaly you need the rpm sensor adapter cable (Order Nr. BXA76401) to be able to connect the sensor to your Microbeast PLUS unit and power it from there. When using an electric helicopter it is possible that your speed controller already supplies a rpm signal output. In this case no additional accessories are required as you can directly connect this signal wire's connector to the front pin board of Microbeast PLUS.

When using a nitro helicopter remove the servo horn of the throttle servo before powering up the system or do not connect the throttle servo linkage yet, in order to avoid blocking and in consequence damage of the servo due to incorrect setting.

Using an electric model ensure that the speed controller is programmed correctly and that the travels for the throttle channel have been adjusted in the transmitter if necessary. **Note that the speed controller itself must not be operated in a (heli specific) governor mode, but must be operated in a simple motor control mode that allows to control the motor rpm as direct as possible.** The throttle signal must not be filtered by the ESC and should be processed as linear as possible. This ensures that the control loop of Microbeast PLUS can govern the motor rpm optimally. Also you should switch off any "soft start" function, as this will be done by Microbeast PLUS. Some electric speed controllers offer a special „External control mode" or „Flybarless mode" which meet these requirements. If your motor controller does not have such a mode, we recommend to select a mode that typically offers such behavior, like a some mode for fixed wing aircraft. Note, however, that no brake function (which is required for electric gliders) must be active and that the throttle response should be set to maximum speed, if such a feature is provided.

⚠️Pay attention to your own safety and the safety of other people and property in your vicinity when using our product. When using helicopters with nitro/gas engines make sure that the motor will not start when making adjustments to the system. When using a gas engine always keep the ignition system deactivated!

⚠️For electric helicopters remove the motor pinion from the main gear during initial setup. **Warning! Risk of injury!** Never touch the motor when it's running. Always keep a save distance to all rotating parts of the helicopter.

Operating principles of AttitudeControl (optional)

When the term „AttitudeControl" is used in the further course, in general reference is made to the function of the artificial horizon, irrespective of a particular operating mode such as „Bail out rescue mode", „3D – Mode" or „Flight trainer mode".

AttitudeControl can be enabled or disabled via Parameter menu point **L** by selecting one of the operating modes as mentioned above. Only if AttitudeControl is enabled, i.e. one of the five operating modes is selected, then AttitudeControl can be activated in operation via the remote control transmitter. *Enable/disable* and *activate/deactivate* are therefore to separate conceptually!

For the use of AttitudeControl it is strongly recommended to use a single-line receiver, since for activating AttitudeControl in flight an additional control channel is needed. Almost every manufacturer of remote control systems offers such a receiver for his system and Microbeast PLUS supports almost all types of single-line protocols. The additional control channel allows to activate AttitudeControl before, during and after the flight via the remote control transmitter, so that the helicopter is stabilized depending on the selected operating mode if required. As long as AttitudeControl is deactived the helicopter can be flown as usual and Microbeast PLUS solely works as

flybarless stabilization system. Preferably use a switch or push button on the transmitter that actuates the specific channel for activation/deactivation and that is safe and easy to reach.

Alternatively, the already existing channel for the tail gyro gain can be used to additionally switch AttitudeControl on and off, e.g. if a standard receiver is used (here only 5 channels can be plugged into Microbeast PLUS) or a transmitter with only six channels is used. This alternative, however, is far less convenient as it may require some complex programming of the transmitter, especially if several flight modes are programmed with different tail gyro sensitivity settings on the transmitter.

Receiver setup menu

Due to the possibility of connecting very different types of receivers with different types of signal output to MICROBEAST PLUS, you must choose the receiver type in the receiver setup menu. Additionally when using a single-line receiver it is mandatory to define the function assignment to the receiver output channels, as typically on the single-line receiver the channel ouput data is packed together and therefore it is not clear, which channel controls which stick function.

To get into the Receiver menu press the button on MICROBEAST PLUS and hold it down while turning on the receiver power supply. The yellow Menu-LED A should now be flashing instantly. Release the button.
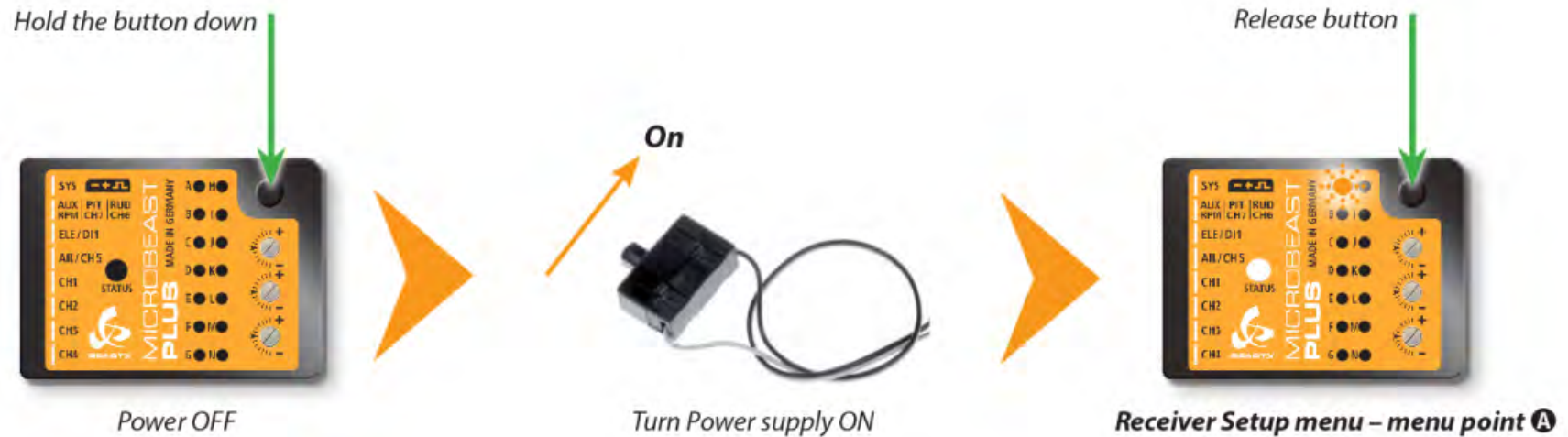
When you entered Receiver setup menu correctly, the Menu LED **A** will flash instantly and the Status LED may show some color to indicate the currently selected receiver type. Proceed with receiver type setup as described for Receiver setup menu point A. When you see all MENU LEDs lighting up and/or Status LED is changing colors you did not hold down the button before powering up and MICROBEAST PLUS started with standard initialization procedure! In this case power off and try again.

⚠️ **If you use a speed controller with BEC, disconnect the motor to avoid unintentional starting of the engine!** For a heli with combustion engine you should remove the servo horn from the throttle servo.

Note that in the first menu points of Receiver setup menu no control signal is emitted on CH5 Output of MICROBEAST PLUS, in case you are using a single-line receiver. At menu point **N** (Throttle failsafe setting) the output is activated though to check throttle position!

A - Receiver type (signal input)

At Receiver setup menu point **A** color and state of the Status-LED give you information about which type of receiver/transmission protocol is currently selected. In order to change the type, press and hold the button for about 2 seconds. The Status-LED will light in the next color and flash eventually. Repeat this as many times as required until the Status-LED matches your receiver type/transmission protocol:

Status-LED	Receiver type/Transmission protocol
off	Standard receiver
purple	Single Spektrum® satellite
red flashing	Futaba® S-BUS
red	SRXL
blue flashing	PPM composite signal

- **Standard receiver** is any receiver that is connected to MICROBEAST PLUS using the standard servo output ports on the receiver and connecting these to the function input ports on MICROBEAST PLUS using the five connection cables. Also see the topic Receiver installation.
- Choose **Single Spektrum® satellite** only when you have connected one single Spektrum® remote satellite directly to the [DI1] port of MICROBEAST PLUS using the optional available Spektrum® satellite adapter (Order Nr. BXA76009). If using a conventional Spektrum® receiver that is connected with multiple wires to MICROBEAST PLUS please select option **Standard receiver**.
- When using the S-Bus signal of a **Futaba® S-BUS** receiver make sure the signal output of the receiver is setup correctly. Newer Futaba® receivers allow to configure the signal outputs differently and also may have different ports for S-Bus2 and S-Bus1. In this case make sure to use the S-Bus1 signal!
- **SRXL** is a data format that is used by different manufacturers of radio systems and that is sometimes designated differently. Please see this site for further information. Choose **SRXL** when using the single-line signal of one of the following receivers: JETI receivers with UDI serial output mode (not PPM), JR receivers with XBUS Mode B output, Multiplex M-Link receivers with SRXL output, BEASTRX receivers with SRXL output, GRAUPNER HOTT receivers with SUMD output (not SUMO!), Spektrum AR9020 receivers with SRXL output (only with special MICROBEAST PLUS firmware!)
- **PPM composite signal** is used for receivers with analog sum signal output. Here the analog servo position data is simply transferred in one long chain of servo pulses. Note that depending on the number of transferred channels this chaining process can cause the transfer take more time than when processing data from the single servo

outputs in **Standard receiver** configuration. Therefore it is not recommended to use such configuration as the control might feel delayed. If the receiver allows to switch between different modes better use a digital sum signal like SRXL or S-Bus. Exemplary the following receivers send out a PPM composite signal: JETI receivers with PPM serial output mode, robbe/Futaba® R6007/R6107 receivers, Graupner HOTT receivers with SUMO output mode.

Press the button, but only briefly, to save the setup and switch to Receiver setup menu point **B** (the yellow Menu-LED B will flash) in case you selected a single-line receiver. If the selected receiver type is "Standard" the setup is finished now and briefly pushing the button will complete receiver setup (all LEDs flashing). Channel assignment (Menu point **B** and following) is not necessary and not provided since the allocation takes place by appropriate insertion of the cables into the receiver's servo output ports.

If you have already briefly pressed the button by mistake and it did not change the receiver type but switch to Menu point **B** or end of menu, then simply switch off power and repeat the above procedure.

B - Channel to function assignment

If not a standard receiver but a single-line receiver was selected at menu point **A**, it must be established which control function is controlled by what channel. This is necessary because all the control functions are transmitted via one single line and virtually every manufacturer uses his own order in the arrangement of channels to control functions. There is no possibility of plugging the cables in each individual channel matching, like it is with a standard receiver.

Preset channel assignment

For each specific type of single-line receiver selected at menu point **A** there is an appropriate type of receiver channel allocation saved in MICROBEAST PLUS. Please refer to the tables below. Use the column that represents your receiver type and the Status-LED color that was set at menu point **A** and check if your radio transmits the channels in the defined order respectively each stick function on the radio is transmitted using the specified channel number on the left. To know the channel assignment of your transmitter you can check the user manual of the transmitter or look at the servo monitor of the transmitter if it has this feature. If in doubt ask the manufacturer of your transmitter.

Channel*		Spektrum® Satellite	Futaba® S-BUS	SRXL					PPM composite signal
				BEASTRX	Multiplex®	Graupner® SUMD	Spektrum® SRXL		
	1	Throttle	Aileron	Aileron	Aileron	Collective	Throttle		Collective
	2	Aileron	Elevator	Elevator	Elevator	Aileron	Aileron		Aileron
	3	Elevator	Throttle	Throttle	Rudder	Elevator	Elevator		Elevator
	4	Rudder	Rudder	Rudder	Collective	Rudder	Rudder		Rudder
	5	Tail gyro	Tail gyro	Tail gyro	Throttle	AttitudeControl**	Tail gyro		AttitudeControl**
	6	Collective	Collective	Collective	Tail gyro	Throttle	Collective		Throttle
	7	AttitudeControl**	AttitudeControl**	AttitudeControl**	AttitudeControl**	Tail gyro	AttitudeControl**		Tail gyro
	8	RPM Governor***	RPM Governor***	RPM Governor***	RPM Governor***	RPM Governor***	RPM Governor***		RPM Governor***
	9	CH6 Output	CH6 Output	CH6 Output	CH6 Output	CH6 Output	CH6 Output		CH6 Output

*Channel designation of Spektrum® transmitters:

1	2	3	4	5	6	7	8	9
THROTTLE	AILERON	ELEVATOR	RUDDER	GEAR	AUX1	AUX2	AUX3	AUX4

**AttitudeControl only applicable with MICROBEAST PLUS ProEdition firmware. When using a different firmware this channel by default controls CH6 Output.

***Only applicable when RPM Governor feature is installed. Please note that the separate RPM Governor control is only used for nitro helicopters. The RPM Governor for electric helis always uses the throttle channel for governor control.

To load the preset channel assignment wait until the Status-LED lights blue and then hold down the button for several seconds. The yellow Menu-LED will immediately jump to Receiver menu point N.
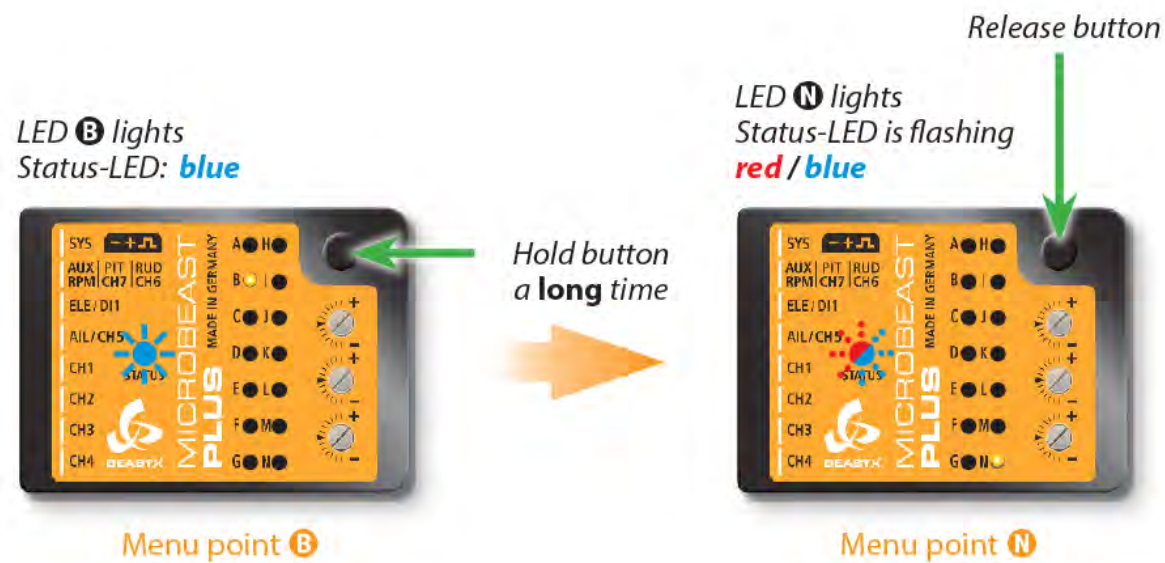
In case the ordering differs from the given tables, you have to manually assign the channel order step by step. How this works is described below.

- If the Status-LED stays **red** at menu point **B**, this means that there is no valid remote control signal available. A channel assignment in this case is impossible! Check if the receiver is properly bound to the transmitter and that a receiver/transmission protocol of the correct type is selected in Receiver menu point **A**. Switch off the power and restart the receiver type setup procedure from the beginning.
- You can also load the default assignment by pushing the button for several seconds in any of the following points for function assignment. This will erase all previously made individual assignments.

Teaching of customized channel order

If you need a customized channel order, please first prepare your transmitter as described here. Additionally make sure that each control function of your transmitter activates one and only one channel, for example by using the servo monitor of your transmitter. This can be tricky especially for throttle/collective pitch functions which are usually coupled by a mixer in the transmitter. In this case set the throttle channel quiet, for example by using the throttle hold switch or providing a flat throttle curve, so that the thrust stick actually controls only the channel for the collective pitch. For the later, keep the possibility to control also the throttle channel like by flipping a switch or similar.

In the following menu points you can assign the different functions by simply actuating the appropriate channel function on your transmitter.

Menu point	Function
B	Collective
C	Aileron
D	Elevator
E	Rudder
F	Tail gyro
G	Throttle
H	CH6 Output
I	RPM Governor
J	AttitudeControl

When you move the control stick/adjust the channel with the transmitter a blue flash of the Status-LED indicates that a channel has been detected. It does not matter how far or in what direction you move the stick or in what position the stick/switch was. Note the channel value itself is not important, but the change of this value is. It is therefore important that only the requested function is activated and not by accident several simultaneously. Otherwise MICROBEAST PLUS may not recognize the allocated channel correctly. If you have moved the wrong stick/switch, you can reactivate the correct function again. The MICROBEAST PLUS remembers only the last function that was operated and confirms it with blue flashing of the Status-LED.

Press the button after learning each function to save the assignment and to go to the next function. Once a channel was assigned, it is no longer available and is ignored by MICROBEAST PLUS for the remaining process. Thus, after learning of the collective pitch function (menu point **B**) you can enable the throttle function (remove throttle hold and switch to a linear or V shape curve) and teach the throttle channel by re-operating the thrust stick at menu point **G**. Now the collective pitch channel is no longer considered as this channel has already been assigned previously and MICROBEAST PLUS will detect and use the throttle channel as actuator for throttle function!

The first 6 functions must be assigned as they are necessary for the basic flight control and the button remains locked until you operate a new control function. The other options are optional to assign and can be skipped. If special features like AttitudeControl or RPM Governor are not installed on your device, the specific menu points for assignment will not be accessible at all.

- The assignment for CH6 Output can be skipped by pressing the button without teaching a channel for this function in case it is not used.
- Likewise, the assignment of the channel for nitro RPM Governor can be skipped in case it is not needed or if you don't want to control the RPM Governor by a separate channel, e. g. if your transmitter does not provide enough free channels. By skipping the assignment the RPM Governor function will use a different operating mode that allows to control it via the throttle channel (set at menu point **G**) if you like. When used in an electric model the RPM Governor generally is controlled via the throttle

channel (set at menu point **G**). In this case the assignment at menu point I can be skipped anyway, as an assignment will have no effect.

- Finally at menu point **J** you have to assign the channel that is used to activate/deactivate the AttitudeControl. Again this can be skipped if not needed or if you don't want to use a separate channel. AttitudeControl can still be used then. In this case the channel for the tail gyro sensitivity (set at menu point **F**) is also used to switch AttitudeControl, see the section about using AttitudeControl for further details.

- If the Status-LED stays **red** at one of the menu points this means that there is no valid remote control signal available. A channel assignment in this case is impossible! Check if the receiver is properly bound to the transmitter and that a receiver/transmission protocol of the correct type is selected at Receiver menu point **A**. Switch off the power and restart the receiver type setup procedure from the beginning.
- Please note that the RPM Governor as well as the AttitudeControl will not work as long as these functions have not been enabled at the specific menu points (Setup menu point **N** and Parameter menu point **L**). Here in receiver menu only the transmitter channel assignment for controlling these functions is defined.

After the last menu point for channel assignment by pressing the button the Menu-LED jumps directly to Receiver menu point **N** for throttle failsafe setting.

N - Throttle failsafe position

At Receiver menu point **N** you have to program the failsafe position for the throttle channel. If during operation the received single-line signal is interrupted, the throttle servo/speed controller connected to the CH5 Output is automatically set to this failsafe position. This particularly is the case:

- if using a single-line receiver that turns of the single-line signal in case of signal loss between receiver and transmitter (e.g. Spektrum® satellite receiver or Graupner® receiver in „SUMDOF" mode)
- if the connection between MICROBEAST PLUS and receiver gets disconnected
- during initialization when the transmitter was not switched on before or was switched on too late and the radio link between transmitter and receiver is not established yet
- when using the autorotation bailout feature of electric RPM Governor and throttle failsafe position is lower than throttle low position that is setup at Governor menu point **B** (Software version 4.1.x only)

Note:

- The fail-safe function is not effective if the receiver continues sending data even if the radio link is interrupted. In this case the failsafe setting of the remote control system may take precedence.
- To avoid accidents, you should program electric motors to "off" and reduce throttle on nitro helicopters to idle. The other control functions will be set to „position hold" in case of signal interruption. For these setting a failsafe position is not provided.

To teach the failsafe position simply set the throttle channel on your remote control to the desired position and press the button briefly. **If you did not connect a function to CH5 Output and don't need throttle failsafe, press the button to complete setup anyway!**

(Throttle failsafe setting)

⚠️ During failsafe setting the CH5 Output is enabled and can be controlled by the transmitter channel that is assigned to throttle function. This allows to check your throttle position in reality. When using electric models make sure the motor is disconnected from the ESC or the pinion is removed from the motor, so that it will not drive the model by accident.

This completes the receiver setup and the MICROBEAST PLUS will go into sleep state after the button is pressed (all Menu-LEDs flash). Power off the unit and power it again. It will start with the standard initialization procedure and if the adjustments of Receiver setup menu have been set correctly, the unit will recognize your receiver and control channels now. You can see this by the circulating LED row on the right side (Menu-LEDs H-N). When the receiver initialization is finished the row will disappear and change to circulation of Menu-LEDs A-G that shows sensor initialization is running. If this is finished too, MICROBEAST PLUS will go into operation mode and you may proceed with basic setup of your helicopter.

Setup menu

Before the first flight MICROBEAST PLUS has to be adjusted to your helicopter mechanics and its components. This is done in Setup menu level.

When MICROBEAST PLUS shows that the system is ready, press and hold the button down. The **Menu-LED next to menu point A** will begin to flash and then after a while will be **steady on**. Now and only now you can release the button. You just entered the Setup menu at menu point **A**.
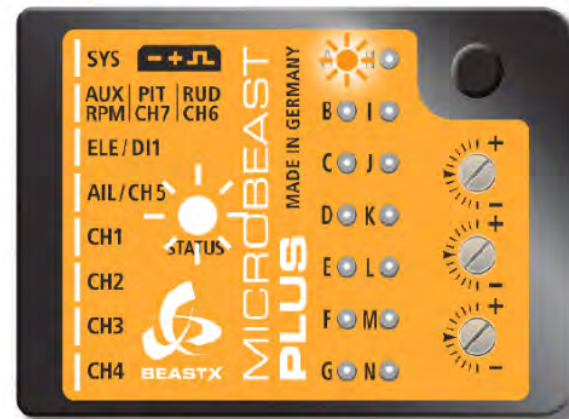
Proceed step by step through the different menu points and perform the basic adjustment as described on the specific pages. By briefly pushing the button at each step you will save the current setting and proceed to the next step. To leave the Setup menu you have to go through all menu points. After pushing the button at the last menu point (depending on installed firmware features and selected receiver type this either can be Setup menu point **M** or **N** or Governor menu point **F** or **H**) you will exit the Setup menu and the system is ready for operation again. Then again none of the LEDs A - N are glowing anymore.

Push button **shortly** ... Push button **shortly** ... Push button **shortly**

Menu point Ⓐ   Menu point Ⓑ   Menu point Ⓜ   Operation mode

If you need to change some specific setting later onwards you can enter the Setup menu again and skip the other menu points by only pressing the button without changing anything at these points. So you can navigate to the desired menu point by simply pressing the button several times untli you reach this point. Then after you have finished the adjustment, again press the button repeatedly to proceed to the end of the menu and to get back into operation mode.

⚠ **Never fly while MICROBEAST PLUS is in Setup menu!** In this condition the gyro control and the stick controls are disabled.

⚠ If there is no stick or button input for 4 minutes while being in the Setup menu, MICROBEAST PLUS will exit the menu automatically. However, this will not happen at Setup menu points **D**, **G**, **I** and **J** to give you enough time to adjust the mechanical setup of your helicopter at these points.

A - Mounting orientation

The MICROBEAST PLUS unit can be mounted in nearly all possible orientations. The only restriction is that the plug connectors have to point in or against flying direction and the egdes of the unit must be parallel to the rotation axis.

At Setup menu point **A** choose the orientation that the unit is actually mounted on your heli. There are 8 possible orientations. The color of the Status-LED displays the currently selected orientation:

Status-LED	Mounting orientation
off	flat, sticker on top side, socket points in flight direction
purple flashing	flat, sticker on top side, socket points in flight direction
purple	flat inverted, sticker on bottom side, socket points in flight direction
red flashing	vertical inverted, button is on the bottom, socket points in flight direction
red	flat, sticker on top side, socket points to the tail boom
blue flashing	vertical, button is on the top, socket points to the tail boom
blue	flat inverted, sticker on bottom side, socket points to the tail boom
red/blue	vertical inverted, button is on the bottom, socket points to the tail boom

You can switch between the options by briefly moving the rudder stick to one or the other direction. The Status-LED will change the color accordingly.

When finished briefly push the button to save the configuration and to proceed to Setup menu point **B**.

B - Swashplate update rate

Setup menu point **B** is for selecting the servo frequency (pulse rate) of your swashplate servos. To optimize the performance of MICROBEAST PLUS, the rule is the higher the better! Nevertheless if you experience an unusually high power consumption of the receiver power supply or if the servos get hot, you should reduce this frequency. When using a servo that allows a higher frequency as MICROBEAST PLUS offers or that allows a maximum frequency which is not choosable, please select the next lower frequency that is closest to the given frequency. Using a lower frequency is always possible. Only too high frequencies can damage the servo and/or will cause the servo to not work properly. Here you can find a list of parameters for the most common servos. Please understand that we can not list all servo types. We also can not guarantee the accuracy of this data. Ask the manufacturer of the servos or your local dealer for detailed information.

⚠ **If you do not know what the maximum pulse rate tolerated by your servos is, do not select more than 50Hz driving frequency.** A higher driving frequency can lead to failure of the servos!
With high frequencies, some servos run in a jerky manner, especially the fast ones with coreless or brushless servos. This is due to the high update rate that the servo receives. This is not critical and will not impact flight performance.

To select the desired servo frequency, move the rudder stick repeatedly in one direction until the Status-LED lights in the correct color:

Status-LED	Swashplate servo frequency
purple	50 Hz
red flashing	65 Hz
red	120 Hz
blue flashing	165 Hz
blue	200 Hz
off	user defined

The option "user defined" allows you to choose your own setting that can be edited by using the StudioX software bundle and the separately available USB2SYS interface.
Now plug in the swashplate servos, but do not install the servo horns yet as the servos could bind and get damaged on first power up:
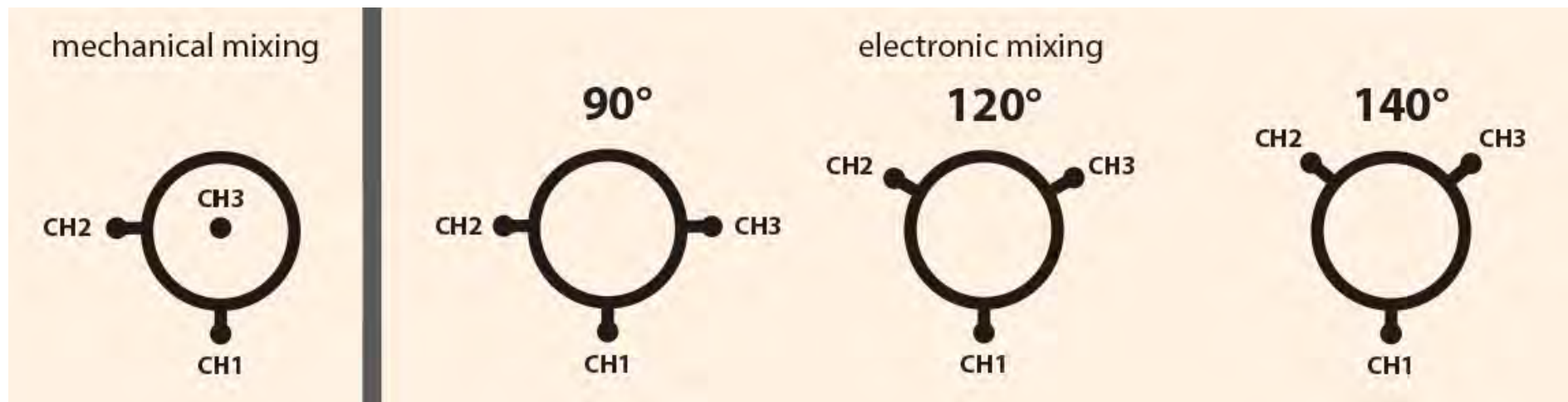
In slot CH1 is the elevator servo. With electronic swashplate mixing the two aileron servos have to be connected to CH2 and CH3 (the left/right ordering does not matter). With a mechanical mixed head (H1) the aileron servo connects to CH2 and collective pitch servo to CH3.
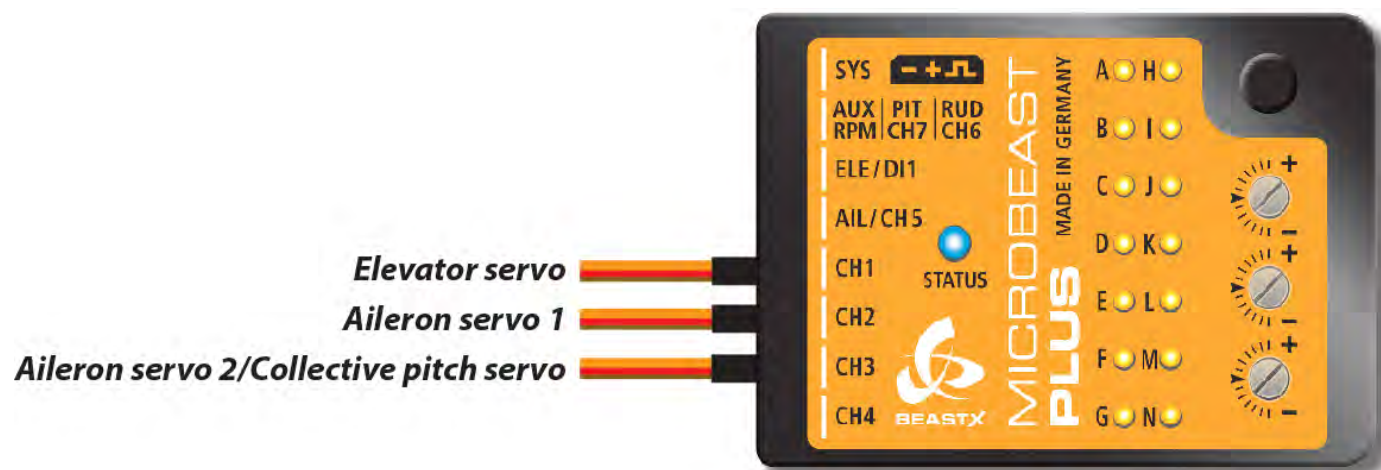
When you route the wire leads in your model make sure that there is no tension passed to the MICROBEAST PLUS. Make sure that MICROBEAST PLUS is able to move freely, so no vibrations get passed onto the unit by the wire leads. It is not recommended to bundle or tie down the leads close to the MICROBEAST PLUS. On the other hand the wires must be attached so that they are unable to move the MICROBEAST PLUS during the flight caused by g-force. In particular, do not use any shrink tubing or fabric hose to bundle or encase the wiring in close proximity to the point at which the cables are plugged into the MICROBEAST PLUS. This makes the cables stiff and inflexible and can cause vibrations being transmitted to MICROBEAST PLUS.

Push the button to save the configuration and to proceed to Setup menu point **C**.

C - Tail servo center pulse

At Setup menu point **C** you can select the pulse length for the rudder servo's center position. Almost all commercially available servos work with 1500 - 1520 μs. But there are a few special rudder servos on the market which use a different center position pulse length.

Here you can find a list of parameters for the most common servos. Please understand that we can not list all servo types. If a servo needs a special pulse length this usually is mentioned in the data sheet of the servo, mentioned on the packaging or directly printed on the servo. Ask the manufacturer of the servos or your local dealer for detailed information. If in doubt about the center pulse for your servo use the setting 1520 μs. It is very likely that the servo will work with this pulse length. Also when the servo is rated with 1500 μs center pulse use this setting. There is barely any difference between 1500 and 1520 μs and the operating pulse range is nearly the same, so these servos are all of the same type.

There is a relationship between the setting of the rudder servo center pulse length and the rudder servo frequency (Setup menu point **D**). If a pulse length is selected that does not allow a certain frequency, the frequency is automatically reduced. The center position pulse setting always has priority, since a servo can run without problems at a lower frequency but can not be operated with an incorrect center position pulse.

To select the desired servo center pulse repeatedly move the rudder stick in one direction until the Status-LED glows in the correct color.

Status-LED	Rudder servo center pulse length
purple	960
red	760
blue	1520
off	User defined

The option "user defined" allows you to choose your own setting that can be edited by using the StudioX software bundle and the separately available USB2SYS interface.

Push the button to save the configuration and to proceed to Setup menu point **D**.

D - Tail servo update rate

As with the swashplate servos at Setup menu point **B** you can select at Setup menu point **D** the update frequency for the rudder servo. For best tail gyro performance, the rule is the higher the better! A good rudder servo should be capable of running at least 270Hz. Nevertheless if you experience an unusually high power consumption of the receiver power supply or if the servo gets hot, you should reduce this frequency. When using a servo that allows a higher frequency as MICROBEAST PLUS offers or that allows a maximum frequency which is not choosable, please select the next lower frequency that is closest to the given frequency. Using a lower frequency is always possible. Only too high frequencies can damage the servo and/or will cause the servo to not work properly. Here you can find a list of parameters for the most common servos. Please understand that we can not list all servo types. We also can not guarantee the accuracy of this data. Ask the manufacturer of the servos or your local dealer for detailed information.

⚠️ **If you do not know what the maximum pulse rate tolerated by your servos is, do not select more than 50Hz driving frequency.** A higher driving frequency can lead to failure of the servos!
Please note that depending on the rudder servo center position pulse length chosen at Setup menu point C, you may not be able to choose a frequency higher than 333Hz. This also applies to the "user defined" setting which might be limited to 333Hz (Setup menu point **C**).

To select the desired servo frequency, move the rudder stick repeatedly in one direction until the Status-LED lights in the correct color:

Status-LED	Rudder servo frequency
purple	50 Hz
red flashing	165 Hz
red	270 Hz
blue flashing	333 Hz
blue	560 Hz
off	user defined

The option "user defined" allows you to choose your own setting that can be edited by using the StudioX software bundle and the separately available USB2SYS interface.

Now connect the rudder servo to [CH4] port of MICROBEAST PLUS:
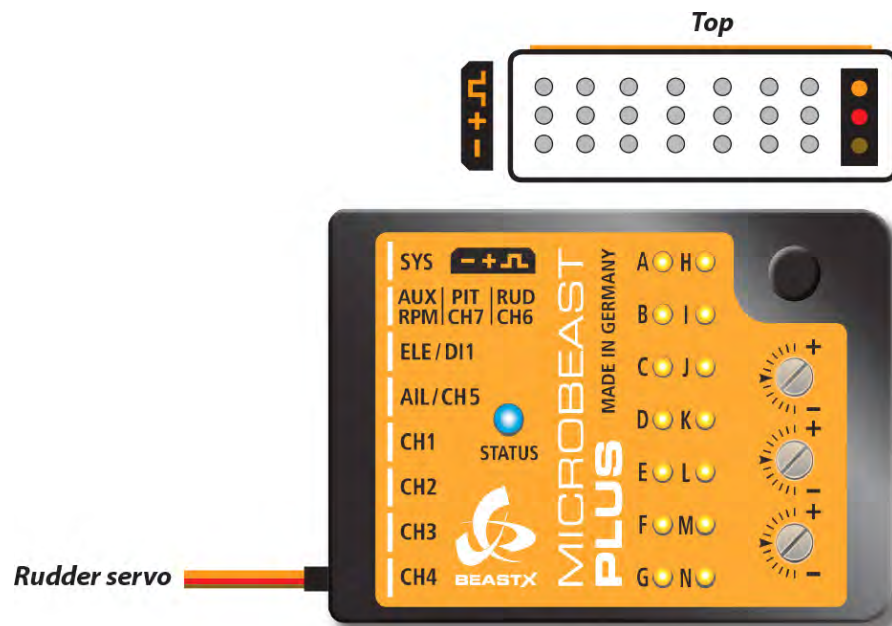
Attach a servo horn to the rudder servo in such a way that the tail linkage rod forms a 90 degree angle to the servo horn (or as close as possible). Then adjust the linkage rod as described in the manual for your helicopter. For most helicopters the tail pitch slider should be centred and the tail rotor blades will then have some positive pitch to compensate for the torque of the main rotor. This mechanical adjustment especially is important when using the tail gyro in Normal-Rate mode. If the adjustment was not done properly the helicopter will constantly drift to one side or the other on the rudder axis. When using the tail gyro only in HeadingLock mode this adjustment is not so critical. Here the gyro will actively control the rudder so the helicopter does exactly follow the commands of the rudder stick. For optimum performance it is nevertheless recommended to perform the mechanical adjustment as good as possible.

Note: This menu item will not be left automatically after 4 minutes, so you have plenty of time to adjust the mechanical setup!

Push the button to save the configuration and to proceed to Setup menu point **E**.

E - Tail servo limits

At Setup menu point **E** you adjust the best possible servo throw for your tail rotor. The optimum throw is determined by the maximum possible control travel of the tail mechanism or based on the maximum allowed angle of attack of the tail rotor blades that will not lead to an aerodynamic stall of the blades. Such stalls can cause very bad stopping behavior like overshooting of the tail when stopping from rotation and can also cause bad tail response to rudder stick input when performing directional changes. Keep this in mind when adjusting the tail rotor endpoints. Several helicopters on the market allow for a very wide range of tail travel. Here is not necessarily useful to use the whole range of travel. Check the helicopter's manual to find out where to set tail pitch end points.

To adjust the limits, move the rudder stick in one direction until the servo reaches the maximum endpoint without any binding or stall and release the rudder stick. The further you move the rudder stick the quicker the servo will steer into the given direction. If you move the servo too far you can steer the stick to the opposite direction and move the pitch slider a short way back. Once you adjusted the maximum endpoint don't move the rudder stick anymore and wait for the Status-LED to flash and light steady red or blue, depending on the adjusted direction. Now you have saved the servo limit for one direction.
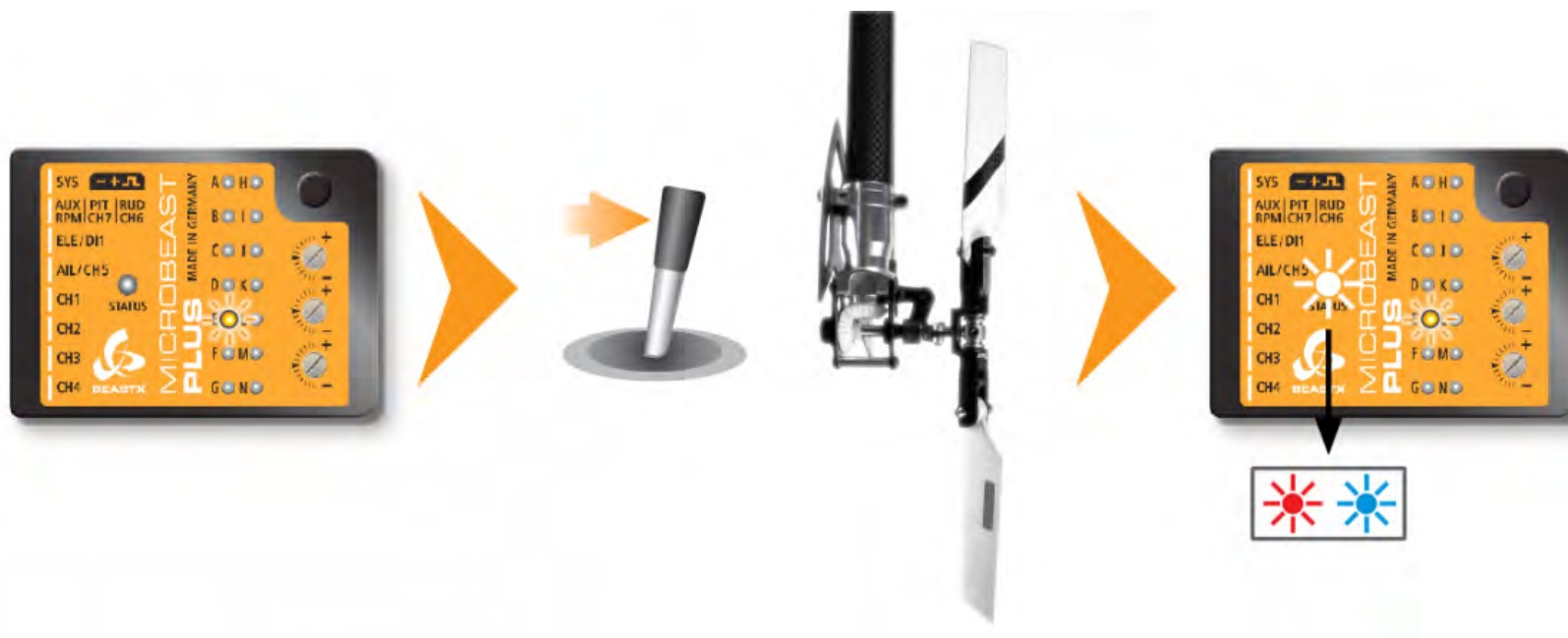
Then adjust the servo limit for the other direction. Drive the tail pitch slider by using the rudder stick to the other maximum endpoint and then release the rudder stick. After a short moment, the color of the Status-LED should start flashing followed by lightning steady purple (mix of red and blue) indicating that the servo endpoint adjustment is complete.

⚠️Pay attention that the steered direction of your rudder stick corresponds to the direction your helicopter should turn. If this is not the case, use your transmitter's servo reversing function for the rudder stick. If you're not sure in which direction the helicopter should rotate consult the manual for your helicopter.

⚠️If the Status-LED does not light or lights in an unexpected color, the servo throw is obviously too small. In this case mount the linkage ball of the tail linkage rod further inward on the servo horn. This ensures that the tail gyro of MICROBEAST PLUS will perform in the best way and that enough servo resolution is available.

⚠️By (re-)adjusting tail rotor endpoints the servo center trim will be reset to zero (in case it has been changed at Parameter menu point **A**).

Push the button to save the configuration and to proceed to Setup menu point **F**.

F - Tail gyro direction

At Setup menu point **F** you you have to check if the tail gyro of MICROBEAST PLUS does compensate to the correct direction.

The gyro always tries to steer in the opposite direction of the rotation that is applied to the helicopter. If you move the helicopter by hand around its vertical axis, the gyro must actuate a rudder servo movement to compensate this rotation. If for example you move the nose of the helicopter to the left (tail moving to the right), the gyro has to steer right the same way as you would steer right with the rudder stick, so that the tail is pushed back to the left.

When moving the tail to the right by hand (nose of the heli to the left), the gyro will steer to the right, so the tail is pushed back to the left.

When moving the tail to the right by hand (nose of the heli to the left), the gyro steers to the left and so will move the tail even further.

If the gyro does not move the tail rotor to the correct direction you have to reverse the gyro direction. This happens by moving the rudder stick once into any direction. For confirmation you will see that the Status-LED will change its color:

Status-LED	Tail gyro direction
red	normal
blue	reversed

Once again repeat the test as described above. MICROBEAST PLUS should now correct in the right way. **Check this function painstakingly as wrong gyro direction will cause the helicopter to spin at very high speed on the vertical axis when trying to takeoff!**

Push the button to save the configuration and to proceed to Setup menu point **G**.

G - Swashplate servo trim

When entering Setup menu point G connect all swashplate servos as described in chapter 3.3. They now will be running to their origin zero position (1520 µs) what we call reference position here when the Status-LED is off. This reference position is used to mount the servo horns on the servos at their true center position, so that you get roughly equal throws to both direction. Mount the servo horns so that they form as much as possible a 90 degrees angle to the linkage rod. Then in the next step you electronically fine trim every single servo's center position, as usually mounting the servo horn at exact 90 degrees will not work out perfectly depending on the servo's gear train and the servo horn.

Note: Although if you were able to mount the servo horn perfectly at 90 degrees, check the electronical trimming as described below as the reference possition is not used later onwards and in operation but the trimmed position is!

If you move the rudder stick to a single direction once, you can select one servo and change its center position by moving the elevator stick back and forth. Every color of the Status-LED is corresponding to a specific servo channel that is indicating its selection by a short up and down move. If you move the rudder stick once again in the same direction as before, you can select the next swash servo and adjust its center position by using the elevator stick. You can switch back and forth between the servos as often as you need and also switch back to the reference position anytime. The already adjusted servo centers will not be lost by doing this.

Status-LED	Swashplate servo center trim
off	Swashplate servos at reference position
purple	CH 1 − elevator servo center trim adjust
red	CH 2 − aileron(1) servo center trim adjust
blue	CH 3 − aileron(2)/pitch servo center trim adjus

Only the trimmed servo positions are important and get stored (those which have been set with the corresponding Status-LED colors). The servo positions at **Status-LED off** only serve for reference and to get the servo horns best plugged into position, for instance if you install new servos or replace the servo gears after a crash. This reference position will not be used later onwards. **Only the servo positions with active trimming are important.**

Now if servos are trimmed do not yet proceed to the next menu point. With active trimming (**Status-LED still lights up in one color!**) adjust the linkage rods according to your helicopter manual. The swashplate should now be at the midpoint and perpendicular to the main shaft and the rotor blades should have 0 degrees of pitch. Always work this out from bottom (servos) to top (blade grips). Also don't forget to level and phase the swashplate driver in the correct way (if it's adjustable)! At 0 degrees of pitch the swash driver arms must be horizontal and the linkage balls of the blade grips have to be perpendicular to the spindle shaft.
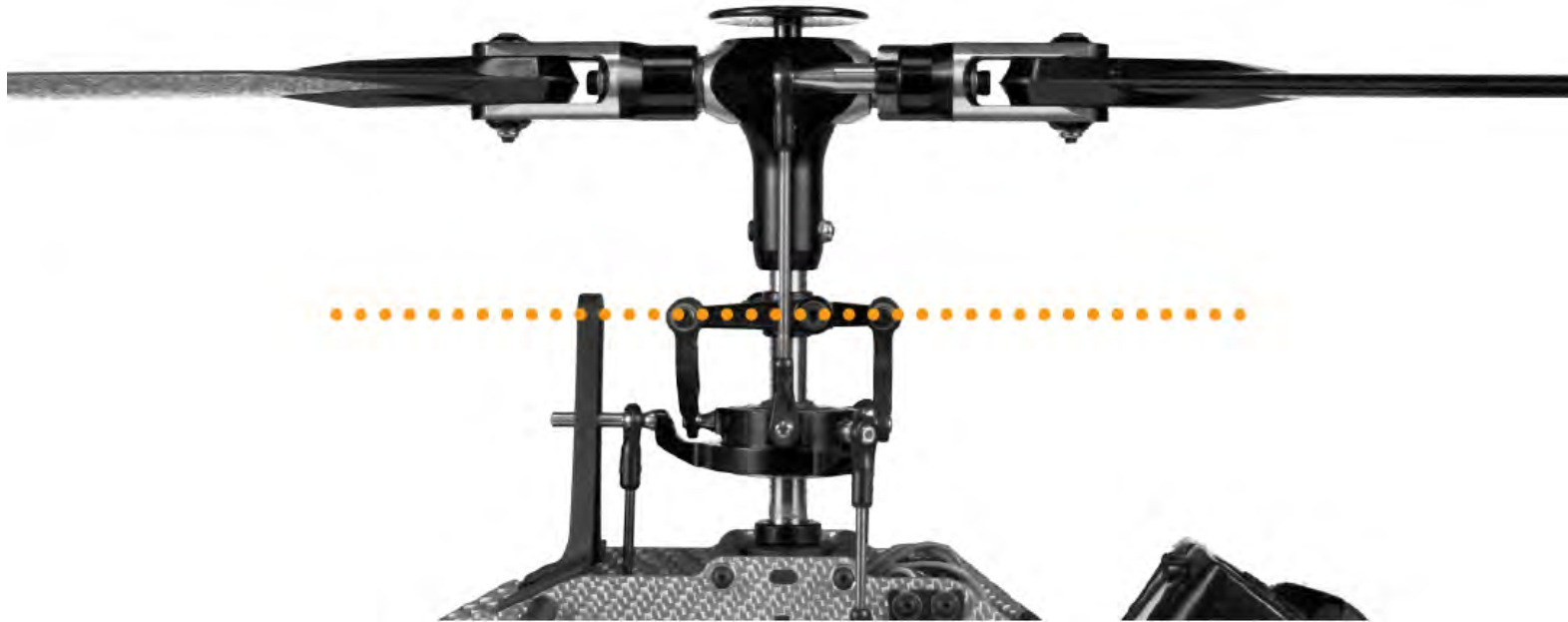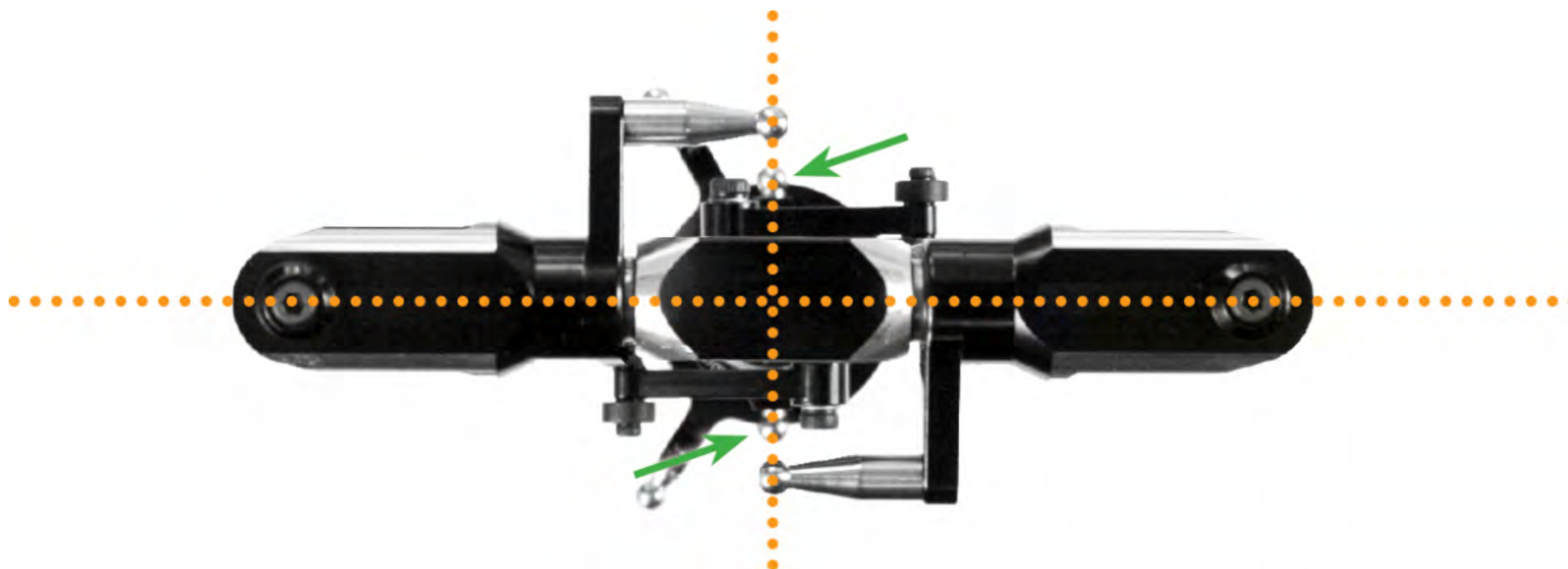
Push the button to save the configuration and to proceed to Setup menu point **H**.

H - Swashplate mixing type

At Setup menu point **H** you can choose the electronic swashplate mixer your helicopter requires or choose "mechanical" for switching of the electronic swashplate mixer if your helicopter has a mechanical mixer. For the electronic mixer by default MICROBEAST PLUS supports 90°, 120° and 140° swashplates. Besides these choices, you can set any swashplate geometry by using the StudioX software bundle in combination with the optional USB2SYS interface. This also includes setting a virtual swash phasing for scale helicopters. Which kind of CCPM your helicopter uses can be read in the manual for your helicopter.

⚠️ **If your helicopter requires an electronic swashplate mixer by no means use your transmitter's swashplate mixer function!**
The mixing is all done by MICROBEAST PLUS. Deactivate the swashplate mixing in your transmitter or program it to mechanical mixing (which is often called "normal", "H1" or "1 servo" mixing), even if your helicopter requires electronic mixing. Also see the section about preparing the transmitter.

The color and state of the Status-LED shows the currently selected mixing type. To select the desired type, move the rudder stick repeatedly in one direction until the Status-LED lights in the correct color:

Status-LED	Swashplate mixer
purple	mechanical
red flashing	90°
red	120°
blue flashing	140°
blue	140° (1:1)
off	user defined
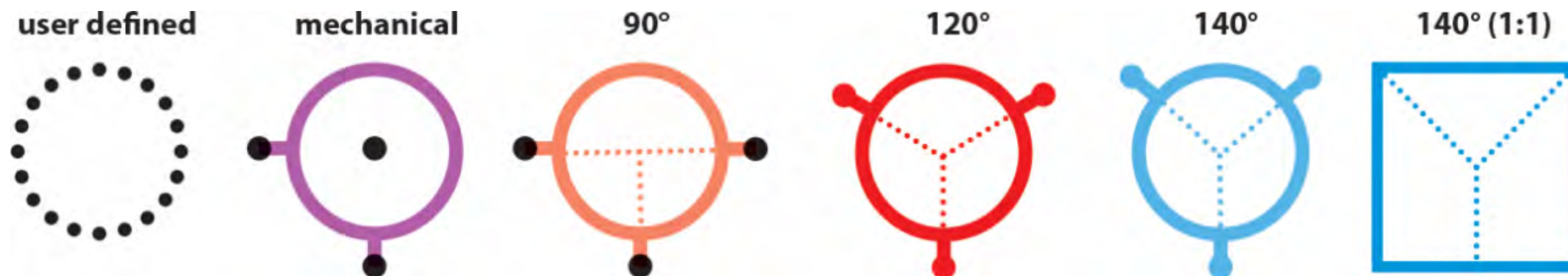
The type 140° (1:1) is the most common type of "140° degrees" swashplates. Often it is also considered as 135° swashplate! There is no uniform designation for this type of swash mixing. The main idea with this type of swash is to have an equal servo ratio on the elevator axis. If this is the case on your helicopter (elevator and aileron servos are moving the same distance when steering elevator) then choose this type, no matter whether it's called 135° or 140° swashplate. You can find this type of swashplate for example on Shape, JR and Hirobo helicopters.

Push the button to save the configuration and to proceed to Setup menu point **I**.

I - Swashplate servo directions

At Setup menu point I, you adjust the correct swashplate servo directions. To facilitate this setup, you don't need to adjust every servo by its own, but just try the 4 possible combinations. Move the thrust stick and check if the swashplate moves horizontally up and down. The direction itself is not yet important. If one or more servos are not running in the right direction, just choose another combination of servo directions by giving a short rudder input. Repeat this rudder input until all servos are running in the same direction and moving collective pitch up and down.

Status-LED	Servo directions CH1 - CH2 - CH3
off	normal - reverse - reverse
purple	normal - normal - reverse
red	normal - reverse - normal
blue	normal - normal - normal

⚠️ If the servos are not reacting properly to aileron and elevator functions, check if the servos and receiver wires are connected as described above. Also check if the channel assignment within Receiver menu has been done correctly if applicable. Additionally verify the settings of your transmitter on any remaining mixer functions and check if the transmitter is set to the correct stick mode (see the section about preparing the transmitter).

Check now, if your control directions of aileron, elevator and collective pitch are correct.

If this is not the case, you have to use the servo reverse feature of your transmitter to reverse the appropriate control function. **Do not change the servo directions of MICROBEAST PLUS anymore!** When the servos drive the swashplate up and down when giving collective pitch input, then the servo directions are setup correctly. The control directions are only a matter of stick input coming from the transmitter.

Note: This menu item will not be left automatically after 4 minutes, so you have plenty of time to adjust the mechanical setup.

Push the button to save the configuration and to proceed to Setup menu point **J**.

J - Swashplate servo throw

At Setup menu point **J** you have to teach MICROBEAST PLUS the cyclic pitch ratio. First don't touch any stick on your transmitter when entering Setup menu point J. Orientate the rotor blades (or one of the rotor blades when using a rotorhead with more than two blades) so that they are parallel to the tail boom. The swashplate should be in the neutral position and the blades should have 0 degrees of pitch (if this is not the case repeat the swashplate servo centering at Setup menu point **G**). Then attach a pitch gauge to one of the rotor blades on the longitudinal axis to measure aileron pitch from the front or from behind the heli.

Move and hold the aileron stick to one direction until the rotor blade has an exact 6 degrees of cyclic pitch, then release the stick. If you moved the swashplate too far you can steer the stick to the opposite direction and reduce the pitch. The direction you choose is not important, what is important is that you keep the position steady on 6° when you save and leave this menu point. Do not go to 6° and then move back before saving and leaving.
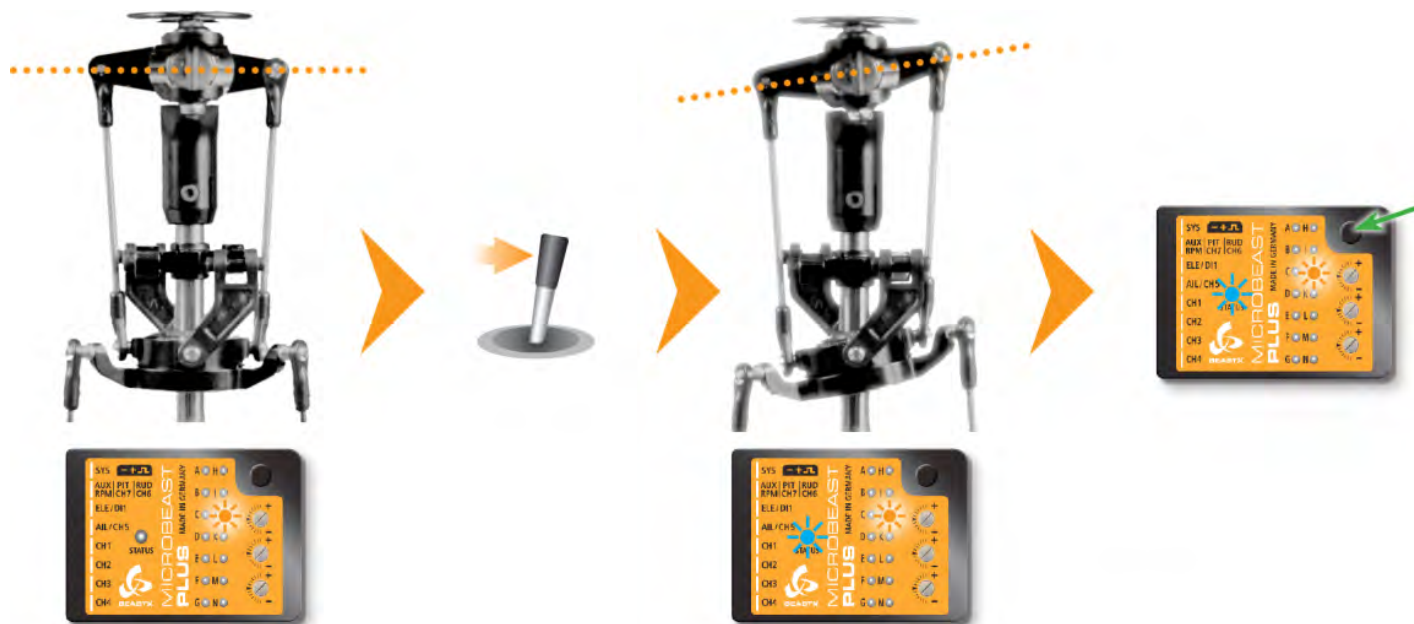
When reaching 6 degrees, the Status-LED should light blue. This indicates that your helicopter's rotor head geometry is perfect for the use with a flybarless system. Otherwise, if the Status-LED's color is red or purple or even if the Status-LED is off, this indicates that your helicopter's geometry is not optimal for flybarless usage. Correct this by using shorter servo horns, shorter linkage balls on the inner swashplate ring or longer blade grip link levers.

⚠️ **Always set the cyclic pitch to 6 degrees!** This setup does not affect the maximum rotation rate of the helicopter but is only there to show and teach MICROBEAST PLUS the actual mechanical cyclic geometry and to estimate servo throws. A wrong adjustment at this step may be extremely detrimental to the performance of MICROBEAST PLUS. The blue color of the Status-LED is secondary and just for information. Do not try to get a blue Status-LED by any means. For example if the LED only lights up red when the pitch is set to 6° then use this adjustment anyway but keep in mind that your helicopter's head geometry is not perfect. Do not adjust 7° for instance just because the Status-LED does become blue there!

By moving the rudder stick to one direction you can also delete the adjustment and reset the swashplate back to 0 degrees, e.g. to readjust your pitch gauge.

Note: This menu item will not be left automatically after 4 minutes, so you have plenty of time to adjust the mechanical setup.

Push the button to save the configuration and to proceed to Setup menu point **K**.

K - Swashplate pitch adjustment

At Setup menu point **K** you adjust the maximum desired negative and positive collective pitch. Move the thrust stick all the way up and let it stay there. Now you can increase or decrease the maximum amount of collective pitch using the aileron stick. When you adjusted the desired maximum pitch angle, move the thrust stick all the way down and again increase or decrease the collective pitch to the minimum desired value using the aileron stick.

⚠️Don't use any pitch curves in your transmitter while doing these adjustments. Later on for the flights, you can adjust your pitch curves as you like and are used to. Setup menu point K solely serves to teach MICROBEAST PLUS the maximum pitch range and the endpoints of the thrust stick.

⚠️At this point, verify again that the demanded collective pitch direction on the transmitter is in the correct direction for the model. Otherwise use your transmitter's servo reversing function for the collective pitch channel to correct this as already described in the section about Setup menu point **I**.

Now check the internal collective pitch direction of MICROBEAST PLUS:

The current pitch direction is indicated by the color of the Status-LED. When the thrust stick is set to positive collective pitch, the Status-LED must light up in blue color, when the stick is set to negative pitch the Status-LED must light in red. The crucial factor is the actual pitch angle of the rotor blades, not the position of the thrust stick! If the display of colors is inversed, i.e. the Status-LED lights blue when pitch is negative and lights red if pitch is positive, the directions can be interchanged by moving the **rudder stick** once into any direction. Check this setting several times and very conscientious. The setting is very important for proper function of AttitudeControl (if you do not use this feature by now you should check and set the pitch direction anyway).

Push the button to save the configuration and to proceed to Setup menu point **L**.

L - Swashplate cyclic limit

At Setup menu point **L** you adjust the maximum possible tilting of the swashplate for aileron and elevator. The deflection will be limited in a circular path similar to a cyclic ring function.

For adjustment proceed in the following way:

Carefully move the sticks for aileron, elevator and pitch to all maximum end points and watch out if the swashplate, the linkage rods or servos are binding somewhere or even getting not more driven.

By moving the rudder stick to the left or right, you can increase or decrease the throw limiter. The limiter affects all servo directions, so adjust it until there is just no binding at all possible servo deflections. Always try to achieve the maximum possible cyclic throw. This will ensure that the maximum possible rotation rate of the helicopter can be achieved and the the gyro control loop does not get sacrificed.

⚠️ Similar to Setup point J, the color of the Status-LED indicates whether the adjusted limit allows sufficient cyclic throw. In the ideal case, the swashplate is limited only to the extent where the Status-LED still lights blue. In particular, for models that are intended to be used in 3D aerobatics, 10° to 12° cyclic throw should be possible. But even for all the other helicopters, it is recommended to adjust as much throw as possible, because otherwise the control loop may not work properly. Here, the color of the Status-LED provides a clue. If you get only purple or even no light at all, it is essential that you change the mechanical setting of your model to increase the available throw.

⚠️ If afterwards any modifications are done to one of the other Setup menu points which affect servo adjustments (Setup menu points **G**, **J** and **K**) the cyclic swashplate limit adjustment has to be checked and redone.

Push the button to save the configuration and to proceed to Setup menu point **M**.

M - Swashplate gyro directions

At Setup menu point **M** you check if the sensors for aileron and elevator are measuring the correct direction. This can be directly verified in this menu point when you roll or tilt the helicopter by hand. The swashplate has to steer against the rotational movement:

⚠️ When tilting the helicopter forward the swashplate has to move backwards, when tilting the helicopter to the back, the swashplate has to compensate forward. Same thing applies to the roll axis: when you roll the helicopter to the left the swashplate has to steer right and vice versa. Basically the swashplate has to remain horizontal all the time while banking the helicopter.

If this is not correct, you can reverse the gyro directions by moving the rudder stick into one direction. For confirmation you will see that the Status-LED changes color. Repeat reversing directions step by step until the correction on both axis is working as expected. There are four possible displays to choose from, one of them will give the correct swash movement:

Status-LED	Swash gyro compensation (Elevator - Aileron)
off	reversed - reversed
purple	reversed - normal
red	normal - reversed
blue	normal - normal

Once again repeat the test as described above. MICROBEAST PLUS should now correct in the right way. **Check this function painstakingly as wrong gyro compensation will cause the helicopter to tip over and crash when trying to takeoff!**

Note: The sensor direction colors may differ between different BEASTX devices and different MICROBEAST/MICROBEAST PLUS firmware versions. Therefore the Status-LED colors should be used as reference for one device with one specific firmware version only. We highly recommend not to rely on the Status-LED color when transfering setups from one device to another. Always check sensor directions manually!

When the RPM Governor feature is installed on your unit and you're using a single-line receiver, push the button to save the configuration and to proceed to Setup menu point **N**. Otherwise pushing the button will end the Setup menu adjustment and you will get back into operation mode.

N - RPM Governor mode

This menu point is only accessible if you have installed the RPM Governor feature on your device and in case you're using a single-line receiver. The RPM Governor function is not applicable when a Standard receiver is used!

At Setup menu point **N** you can choose between three different options:

- **no governor** - the RPM Governor is not used. All control commands on the throttle channel will be passed to [CH5] output directly.
- **electric governor** - select this option if your helicopter is powered by an electric motor and an electric speed controller is plugged into [CH5] output of MICROBEAST PLUS. MICROBEAST PLUS reads the rpm signal from the speed controller or a phase sensor and controls the rotor speed accordingly. Note that the controller itself must not be operated in a (heli specific) governor mode. The speed controller must process the incomming throttle signals and control the motor as direct and unfiltered as possible.
- **nitro governor** - with this option MICROBEAST PLUS can govern the rotor rpm of a helicopter with nitro or gas engine. For this MICROBEAST PLUS controls the throttle servo which is connected to [CH5] output and that controls the carburetor of the engine. The motor rpm will be read from a magnetic or optical sensor that captures the rpm from the crankshaft of the motor, the clutch bell or the main gear.

The choice is done by moving the rudder stick in one direction until the LED indicates the desired color and state.

Status-LED	Governor mode
off	no governor
red	electric
blue	nitro

If the RPM Governor is deactivated (option **no governor**) MICROBEAST PLUS will exit the Setup menu if you briefly press the button. Otherwise pressing the button will lead to Governor menu point **A** (after Menu LED **N** now Menu LED **A** will flash)!

Parameter menu

The Parameter menu offers a variety of settings with which you can further improve the system performance and which allow you to adjust the flight characteristics of the helicopter to suit your personal preferences. Normally for the first flight you don't need to make any adjustments here. Only the control behavior (menu point **B**) and the stick deadband (menu point **E**) should be adapted under certain circumstances.

When MICROBEAST PLUS is ready for operation, hold down the button until the Menu-LED next to point A flashes quickly and release the button immediately. The flashing menu LED **A** shows that you've entered Parameter menu point **A**. Do not hold the button too long, as this will enter Setup menu!

No Menu-LED is on
Press button shortly
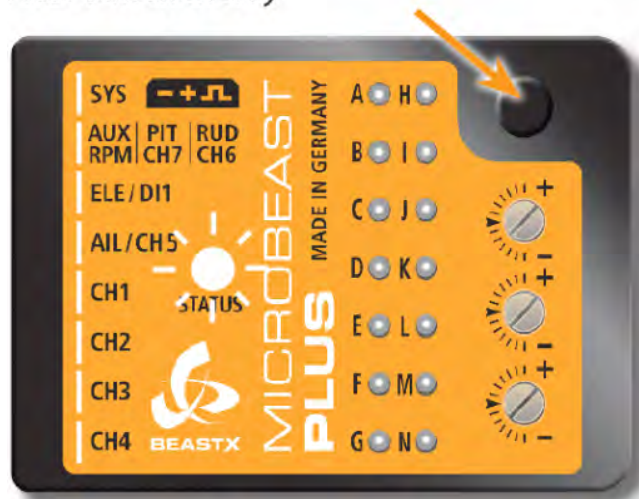
Menu-LED Ⓐ is flashing quickly

Operation mode
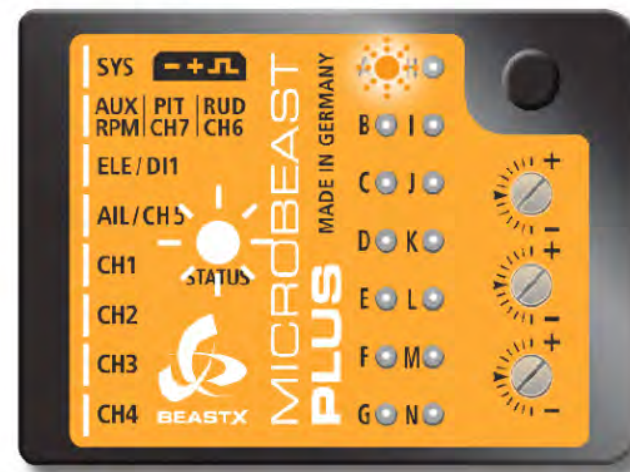
Parameter menu – menu point Ⓐ

To switch to the next Parameter menu point, just briefly press the button once again. After the last menu point (depending on the installed feature set this can be menu point **H**, **K** or **M**) pressing the button one more time exits the Parameter menu and MICROBEAST PLUS is ready for operation again (in this case the Status-LED will indicate the tail gyro mode and the LEDs A - N are off).

Push button **shortly**   Push button **shortly**   Push button **shortly**

Menu point Ⓐ   Menu point Ⓑ   • • •   Menu point Ⓜ   Operation mode
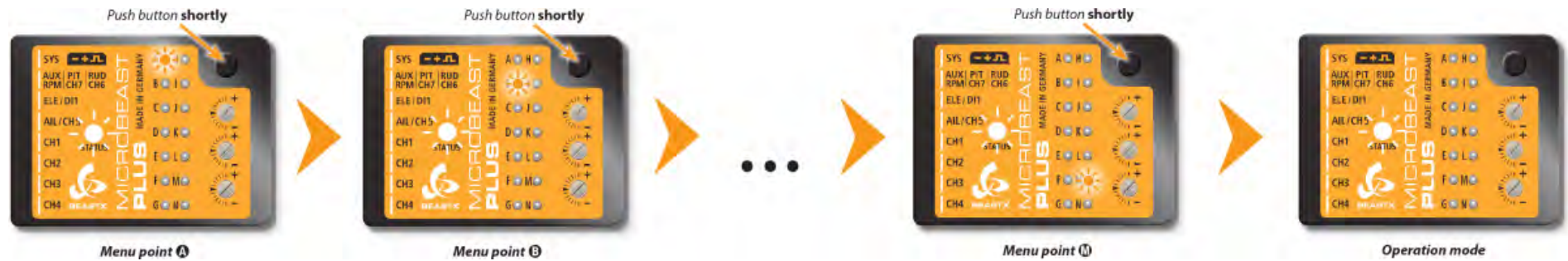
Single menu points can be skipped without performing any changes. Therefor don't move any stick while you are at the menu point you want to skip and just press the button (repeatedly) again, until you reach the menu point you want to adjust. Then again skip the following menu points (if there are any) by pressing the button, until the parameter menu level will be exited.

⚠ **Never fly while MICROBEAST PLUS is in Parameter menu!** In this condition the gyro control and the stick controls are disabled.

⚠ If there is no stick or button input for 4 minutes, while being in the Parameter menu, MICROBEAST PLUS will exit the menu automatically.

A - Quick trim

The first menu point of the Parameter menu gives you the possibility to easily adjust your servo center trim on the flying field as for instance your helicopter does slowly drift in hovering flight or when it doesn't climb out straight on collective pitch inputs. Additionaly when using the AttitudeControl feature you may trim the reference point for the artificial horizon in case the heli is not leveled correctly.

⚠️ **Never use the trim functions of your remote control!** MICROBEAST PLUS will see trim as a control command to turn the heli and not as servo trim.
There is one exception: The rudder servo can be trimmed on the remote control when the tail gyro is operated in Normal-Rate mode. Note, however, that this trimming should only be temporary as MICROBEAST PLUS calibrates the stick center positions during every initialization process. Thus, on the next flight the servo would be back on center position despite trimming in the transmitter.

Swashplate servos

Contrary to centering every single servo at Setup menu point G, here you are able to directly adjust aileron and elevator without taking care about the single servos. Similar to the digital trim function of most transmitters here at Parameter menu point A you can adjust the swashplate "one click" by shortly moving the aileron or elevator stick in the desired direction. If you want to trim the swashplate any further repeat tapping the stick several times or simply hold the control stick pushed for a longer time to automatically perform several trim steps. The color of the Status-LED gives you an approximate indication of how much you did trim.
Please note that this function, as opposed to the digital trim of the transmitter, is not a separate trim function. Here you directly adjust the servo centers as well as you would set servo centers at Setup menu point G. Technically there is no difference between Parameter menu point A and Setup menu point G.

Rudder servo

If the tail gyro is operated in Normal-Rate mode, the rudder servo must often be trimmed precisely so that the tail rotor produces just enough thrust to counteract the rotor torque in hovering flight. Otherwise the helicopter would constantly drift into one or another direction on its vertical axis as the gyro only dampens sudden movements but does not control the tail rotor's absolute position.

To trim the rudder servo proceed as follows: Switch the tail gyro to Normal-Rate mode fly the helicopter. By using the digital trim function of your transmitter trim the rudder servo so that the helicopter does not drift in hovering flight. Land the helicopter and immediately open Parameter menu point A by briefly pressing the button on MICROBEAST PLUS once. To take the tail trim value from the transmitter once again press the button and this time hold it for at least 2 seconds (if you briefly press the button only, you would switch to menu point B!). You can see the rudder servo move to the new center position and the Status-LED will flash for some moment to signalize the position has been set. Now reset the digital trim of your transmitter back to zero.

- MICROBEAST PLUS only accepts the the tail trim value from the transmitter when the gyro is set to Normal-Rate mode. When you land after the trim flight and open Parameter menu point A make sure that you do not change the gyro mode and/or trimming of the transmitter by accident, e.g. when using a flight mode switch in the transmitter.
- If the tail gyro solely is operated in HeadingLock mode, trimming the rudder servo is not required under normal circumstances. Here the gyro actively controls the rate of rotation whereby drifting is excluded on the vertical axis. Anyhow, in unfavorable mechanical conditions it may be helpful to fly the heli in Normal-Rate mode once and to trim the rudder servo accordingly, so that the mechanical throw is balanced more equally.

Reset adjustment

During the trim procedure you can delete the just performed trimming by moving the rudder stick in any direction. All servos will be moved to the initial position from entering Parameter menu point A. Note that a subsequent reset to previous states is not possible! If the servo trimming was changed and Parameter menu point A is left, the servo positions will be saved permanently. You can only bring back the servos to the previos positions by manually trimming them back into the opposite direction.

⚠ The trimming of the rudder servo will be fully deleted when the tail rotor endpoints are readjusted at Setup menu point **E**!

Trimming the artificial horizon (optional)

If the helicopter is not aligned horizontally as desired with active AttitudeControl, i.e drifts to one side in hovering, the artificial horizon can be readjusted. To do so, activate AttitudeControl at Parameter menu point **A** via the transmitter's AttitudeControl channel to switch from trimming of the servos to trimming of the horizon. The Status-LED will flash indicating that AttitudeControl is on (if the Status-LED is lit permanently, you are in servo trimm mode as described above). By moving the aileron or elevator stick the roll and pitch tilt of the horizon can be increased/decreased. Briefly touching the appropriate stick will trim the horizon stepwise by 0.5 degrees to the specific direction. Touching the stick repeatedly or holding it for longer time will trim the horizon by several steps. The Status-LED indicates the trim values: when it lights in blue color both angles are 0 degrees resp. they are in the factory setting. If the Status-LED lights red, one or both angles are adjusted slightly. If the Status-LED is purple then one axis is trimmed by more than 5.0 degrees. When the Status LED goes out, one of the two axes is further trimmed than 10.0 degrees, which is the limit for each axis! By moving the rudder stick you can remove the trimm that has been set since entering this menu point.

Place the helicopter in horizontal position and you should be able to see the effect of trimming. Note that the helicopter usually is slightly tilted to the side in hovering flight due to the drag of the tail rotor. Therefore as a starting point you may trim about 1-2 degrees to the right when using a helicopter with clockwise turning main rotor to make the heli tilt against the rotor torque, but by default it should not be necessary to use any trimming at all. Note that AttitudeControl can not recognize the absolute position of the helicopter. Depending on wind and environmental conditions it may happen that the helicopter drifts slightly into a certain direction during hovering flight. Also long-lasting vibration or fluctuations in temperature can cause the helicopter not always comply exactly the same attitude. Also make sure the MICROBEAST PLUS unit is perfectly aligned to the rotation axis of the helicopter otherwise you the axis will be cross connected together and the calculation of the artificial horizon will not match the real movement of the heli. Therefore only trim in moderate steps and only when the helicopter reproducible drifts to the same direction otherwise trimming can make the drift

even worse!

Push the button to save the configuration and to proceed to Parameter menu point **B**.

B - Control style

At Parameter menu point **B** you can choose between different control behaviors/control styles for your helicopter. This includes the maximum rotation rate of the helicopter as well as how sensitive MICROBEAST PLUS will react to stick inputs for aileron, elevator and rudder around the stick centre (Stick expo).

Factory setting for this option is "sport"! This should be suitable for most pilots. If you are a rather inexperienced model pilot it is absolutely suggested to select the option „normal" for the first flights. Here the rotation rate on cyclic and rudder is highly decreased and the stick inputs around center are very gentle.

To find your individual preference increase the option step by step. The choice is done by moving the rudder stick in one direction until the LED indicates the desired color and state.

Status-LED	Control behavior
purple	normal
red flashing	sport
red	pro
blue flashing	extreme
blue	transmitter
off	user defined

If you are not satisfied with the presets, you may adjust the control behavior by using your remote control. To do so, set the control behavior to "transmitter" (Status-LED "blue"). Then the maximum rotation rate for aileron, elevator and rudder can be adjusted by increasing or decreasing the servo travel for the corresponding function in your transmitter or by using the "DualRate" function. 100% stick throw (servo throw) in the transmitter are equivalent to a rotation rate of apprx. 400deg/s on cyclics and 600deg/s on rudder in this mode. To adjust the sensitivity around mid stick position you can use the "Expo" function of your transmitter. Please refer to the manual for your transmitter. The option "user defined" allows you select your own predefined setting. This can be edited by using the StudioX software bundle in combination with the optional USB2SYS interface. Thus you can take the values of the predefined settings and modify them directly in the MICROBEAST PLUS software without the need of adjusting anything in the transmitter.

⚠️When using predefined control behaviors other than "transmitter" we do not recommend to additionally adjust control curves (Expo/Dual rates) in your transmitter as this will indefinably mix the preset curves of MICROBEAST PLUS with the curves of the transmitter! Anyhow, if you only make small adjustments (e.g. slightly increasing the servo throw to increase rotation rate) this should be no problem.

⚠️If the tail gyro is operated in Normal-Rate mode the rudder stick directly controls the rudder servo instead of commanding a rotation rate to the gyro. In this mode the heli will turn as fast as it is determined by the rudder servo position and angle of attack of the rotor blades. The tail gyro does not monitor the rate of rotation. Therfore it is possible when using Normal-Rate mode, that extremely high rotation rates can be achieved. It is absolutely necessary to check how much pitch angle can be achieved at full rudder stick deflection at the tail rotor. Reduce the servo throw of the rudder servo by decreasing it on the remote control or limiting it at Setup menu point **E** to a reasonable level.

Push the button to save the configuration and to proceed to Parameter menu point **C**.

C - Speed flight stability

While in fast forward flight apply jerky collective pitch inputs to test this parameter. The helicopter should mainly remain in its horizontal path during climbing and descending. If the nose of the helicopter is pitching up and down heavily like a swimming dolphin, increase the value at Parameter menu point **C** to compensate for this effect. But if the value is too high, the helicopter might feel sluggish and lazy. Try to find the lowest suitable setting. Note that the Cyclic gain (Dial 1) must be set as high as possible, otherwise the pitching up effect maybe a result of too low reaction of the gyro system in general.

If the helicopter is still pitching up at the highest value, check if the swashplate has enough cyclic throw at high collective pitch values (Setup menu point L) and use faster and stronger servos as well as rotor blades that are as neutral as possible (for example blades specifically designed for flybarless helis).

The currently selected value is indicated by the Status-LED color and state. Move the rudder stick into one direction until the Status-LED lights in the desired color.

Status-LED	Pitching up behavior
purple	very low
red flashing	low
red	medium
blue flashing	high
blue	very high
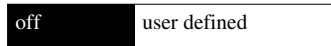
off	user defined

The option "user defined" allows you to choose your own setting that can be edited by using the StudioX software bundle and the separately available USB2SYS interface.

Push the button to save the configuration and to proceed to Parameter menu point **D**.

D - Rudder rate consistency

At Parameter menu point **D** the HeadingLock gain for the tail can be adjusted. This gain comes into play when the tail gyro is operated in HeadingLock mode. It determines how hard the tail gyro tries to maintain a given rotation rate from the transmitter. If the HeadingLock gain is too low, pirouettes will be inconsistent during fast forward flight or in crosswind conditions and the helicopter will slowly drift on the vertical axis when in stationary hovering flight with crosswinds. If the HeadingLock gain is too high, the tail rotor will respond delayed to fast directional changes and the rudder stick control does feel very inprecise. Also it is possible that the tail will bounce back slowly after stopping from a rotation and commute gently while hovering or flying around. So only adjust this parameter as high as necessary.

Parameter menu point **D** only adjusts some part of the tail gyro control loop. First of all, you must adjust the tail gyro gain in the transmitter and use it to switch the gyro to HeadingLock mode.

- Before adjusting the HeadingLock gain always try to find the maximum amount of tail gyro gain by flying around and using the tail gyro in HeadingLock mode.
- After adjusting the HeadingLock gain it might be necessary to readjust the tail gyro gain! Both parameters interact to each other.

The currently selected value is indicated by the Status-LED color and state. Move the rudder stick into one direction until the Status-LED lights in the desired color.

Status-LED	HeadingLock gain
purple	very low
red flashing	low
red	medium
blue flashing	high
blue	very high
off	user defined

The option "user defined" allows you to choose your own setting that can be edited by using the StudioX software bundle and the separately available USB2SYS interface.

Additional information

Please note that poor tail performance very often may be a sign of a stiff tail mechanics, slop in the tail linkage or an inadequate rudder servo! The tail rotor system in this case does not react as precise as necessary and hinders the tail gyro from working properly. If you cannot increase the HeadingLock gain more than "very low" or "low" without the tail rotor starting to slowly oscillate or bounce after doing a full stop, it is very likely that there is a mechanical issue. Also if on the other hand the tail does not turn constantly at high speeds or not turn around at all even in the setting „very high", then again this may be due to a mechanical cause.

Make sure that the maximum blade pitch at the tail rotor neither is too large nor too small. A large pitch angle can lead to a stall of the tail rotor blades. Then the tail rotor produces hardly any thrust, similar to a very small angle. Also check the entire tail mechanics running smooth and without binding. Make sure that the rudder servo is strong enough and that it is supplied with sufficient power (long supply leads cause high voltage loss!). Check that the rudder servo does not get powerless at maximum servo deflection. This can happen if the pulse range of the servo is exceeded. The cause for lacking tail thrust also can be that the tail rotor blades are too small or too soft, or because the rotation speed of the tail rotor is too low!

To gain better tail gyro performance also check for correct servo horn length. If the tail gain in general is very low and the rudder tends to oscillate very easy move the linkage ball on the servo horn further inwards to the center. If on the other hand you have a very large amount of tail gain and the tail gyro still does not seem to be capable to hold the tail rotor in any flight condition, move the linkage ball on the servo horn further out from the center, to get faster response speed when the gyro needs to control the rudder. Do not change the HeadingLock gain at menu point **D** in case the tail gyro does not hold well when abrupt direction changes occur as in general the HeadingLock gain does not compensate for quick changes.

Push the button to save the configuration and to proceed to Parameter menu point **E**.

E - Stick deadzone

Use Parameter menu point **E** to adjust the stick deadband for elevator, aileron and rudder sticks. The deadband is the range around the very center of the stick in which MICROBEAST PLUS will not react to stick inputs.

Unfortunately, some on the market available transmitters have the problem that when the sticks are brought back to the center position after a stick input, they aren't exactly at the same center position as before. This generates a continuous deviation on the corresponding function, although the stick seems to be at mid position. This deviation is interpreted as a small input by MICROBEAST PLUS which leads to an unwanted drift on one or more axis. Especially you can see and feel this in hovering flight when the helicopter is turning slightly to one or another direction all the time. This makes it difficult to have precise hovering as it is hard to find a stick position at which no input is sent to MICROBEAST PLUS. This can be very dangerous as it may cause the helicopter to tip over when trying to take off or it can cause the pilot to loose control over the helicopter at all! So increase the stick deadband stepwise just until you don't see such effects. Note that as a result of large stick deadband there will be a wide range around mid stick position in that MICROBEAST PLUS will not react to stick inputs. This will make the control more inprecise. So if using "large" or "very large" deadband is necessary, we recommend to let your transmitter get checked by its manufacturer for damaged or worn out stick potentiometers.

The choice is made by moving the rudder stick into one direction until the Status-LED lights in the desired color.

Status-LED	Stick deadband
purple	very small
red flashing	small
red	medium
blue flashing	large
blue	very large
off	user defined

The option "user defined" allows you to choose your own setting that can be edited by using the StudioX software bundle and the separately available USB2SYS interface.

Push the button to save the configuration and to proceed to Parameter menu point **F**.

F - Torque precompensation

The advantage of always knowing the pitch and cyclic load on the flybarless system, allows MICROBEAST PLUS to precompensate for the torque variations on the tail rotor, just before any noticeable deviation occurs. This method of torque precompensation (RevoMix) relieves the tail control loop and improves the tail performance, especially when using MICROBEAST PLUS on helicopters with insufficient tail authority and/or extreme motor torque (e.g. well powered electric helicopters) where the tail does blow out shortly when applying a sudden pitch or cyclic input.

To see the compensation direction, you can move the collective pitch, aileron and elevator control stick at Parameter menu point **F**. With precompensation activated the tail rotor has to produce a deflection which must counteract the rotor torque. Since at 0° pitch the least torque is applied by the main rotor, also the tail rotor makes the least deflection and the tail slider is in center position. If you pitch in positive or negative direction or move aileron or elevator control, a deflection will be added to the tail rotor which will act against the torque of the main rotor.

For helicopters with clockwise rotating main rotor, the precompensation has to always push the tail to the left (nose of the heli to the right). For helicopters with the main rotor turning anti-clockwise, the precompensation has to push the tail to the right (nose of the heli to the left). The deflection will be to the same direction, whether positive or negative pitch, as the torque only increases. So first of all check which direction is needed for your helicopter and determine the necessary Status-LED color (red or blue). Then you have two options to set the precompensation (low or high = Status LED flashing or constant lighting). The choice is made by moving the rudder stick into one direction until the Status-LED lights in the desired color.

Status-LED	Torque precompensation (RevoMix)
purple	off
red flashing	low - normal direction
red	high - normal direction
blue flashing	low - reverse direction
blue	high - reverse direction
off	user defined

Use torque precompensation when the tail does go away in torque direction when applying a sudden pitch input, even if the tail gyro gain is properly setup. Increase the amount of precompensation stepwise until the tail holds well. If the tail is moving against torque direction, the amount of precompensation is too high already. If the tail is blowing out even worse when torque precompensation is active, probably the direction of torque precompensation is wrong! If you can't find a good adjustment check the mechanical conditions. Use different (larger) tail rotor blades or higher tail rotor speed to gain better holding force. Also check your tail gyro gain. If the tail gyro gain in general is very low and the rudder tends to oscillate very easily move the linkage ball on the servo horn further inwards to the center. If on the other hand you have a very

large amount of tail gain and the tail gyro still does not seem to be capable to hold the tail rotor in any flight condition, move the linkage ball on the servo horn further out from the center, to get faster response speed when the gyro needs to control the rudder.

- Torque precompensation can only be used if you have 0° of pitch at the servo center positions (adjusted at Setup menu point G)!
- The amount of servo throw in the ratio of cyclic to collective pitch adjustment depends on the setting of the maximum collective pitch angle at Setup menu point K. The larger the maximum collective pitch angle, the greater the rudder servo throw due to the collective pitch input will be, while the servo throw through cyclic control commands will remain the same.

The option "user defined" allows you to choose your own setting that can be edited by using the StudioX software bundle and the separately available USB2SYS interface. With this you can also change the ratio between cyclic and collective pitch compensation.

Push the button to save the configuration and to proceed to Parameter menu point **G**.

G - Pitch pump

With point **G** can be set how aggressive the MICROBEAST PLUS responds to cyclic control commands (roll and pitch). This can reduce the usual uniform and linear control feeling of flybarless systems and approach it to the feeling of a flybared helicopter.
If you want to use this feature, start from the "slightly increased" setting, gradually increasing to the desired level, until you have found your ideal setting. A too high setting will result in uncontrollable, inaccurate rotation and deteriorating stopping behavior of each control function. How high this feature is adjustable without causing any adverse effects depends on many factors such as heli size, swashplate servos, main rotor blades, main rotor speed, servo power supply and depending on the particular heli setup.
The choice is made by moving the rudder stick into one direction until the Status-LED lights in the desired color.

Status-LED	Cyclic response
purple	normal
red flashing	slightly increased
red	increased
blue flashing	high
blue	very high
off	user defined

The option "user defined" allows you to choose your own setting that can be edited by using the StudioX software bundle and the separately available USB2SYS interface.

If using an increased Cyclic response (greater than „normal" setting) it is recommended to set Parameter menu point **B** (Control behavior) to transmitter (Status-LED blue). Additionally you should only add a very small amount of Expo by the transmitter or don't use any Expo at all. Otherwise this feature may not show any significant effect!

Push the button to save the configuration and to proceed to Parameter menu point **H**.

H - Cyclic repsonse

Parameter point **H** allows you to setup the collective pitch boost function. This function causes that the faster you move the thrust stick, the more additional collective pitch will be exposed. This can be especially useful in 3D aerobatics when very rapid collective pitch changes are necessary for certain flight maneuvers, as hereby dynamically the required control stick deflection will be reduced. However, the maximum set pitch value (Setup menu point **K**) will not be exceeded.
When the setting is too high, this can cause the rotor blades to stall when giving very fast collective pitch commands. The collective pitch will feel slow and spongy, precisely causing the opposite effect as desired. Also note that a high setting can make the pitch control inprecise and more sensitive, as when giving fast stick input, the pitch will overshoot.
Start from the "low" setting, gradually increasing to the desired level, until you have found your ideal setting. How high this feature is adjustable without causing any adverse effects depends on many factors, such as maximum pitch values, pitch curve, swashplate servos, main rotor blades, system headspeed, pilot skills, ...
The choice is made by moving the rudder stick into one direction until the Status-LED lights in the desired color.

Status-LED	Collective pitch boost
purple	off
red flashing	low
red	medium
blue flashing	high
blue	very high
off	user defined

The option "user defined" allows you to choose your own setting that can be edited by using the StudioX software bundle and the separately available USB2SYS interface.

When no additional features are installed on your unit, pressing the button will save the setting and exit the Parameter menu. Now MICROBEAST PLUS is ready for operation again!

When using MICROBEAST PLUS Version 4 with RPM Governor or ProEdition upgrade, push the button to save the configuration and to proceed to Parameter menu point **I**.

I - Throttle response

Use Parameter menu point **I** to change the response of the RPM Governor control. This determines how fast and hard the system will open the throttle when the rotor rpm changes. Ideally the response is set as high as possible. If it is too low the main rotor may speed up in unloaded conditions as the system reduces throttle to slowly, and the RPM Governor will only increase throttle very cautious when loading the rotor head, so that the rotor rpm will break down. If on the other hand the response is set too high, the throttle may stutter audible and/or the motor rpm will kick in very hard and overshoot if the rotor head is loaded. This will make the rotor headspeed even more inconsistent than with a lower setting. The height of throttle response highly depends on factors such as heli size (blade size), motor power and performance and/or the throttle reponse behavior of the speed controller (when flying an electric heli). If you need to adjust the throttle response, we recommend to start with the lowest value and increase stepwise just until you get the most consistent rotor head speed. Having a heli with good motor power and/or a fast responding speed controller (on electric helis) typically allows to have high throttle response values (up to "aggressive" setting) which will give very consistent head speed. Helis with not so much power (small nitros, gasser, scale helis) prefer low throttle response settings for a softer throttle management.

The choice is made by moving the rudder stick into one direction until the Status-LED lights in the desired color.

Status-LED	Throttle response
purple	normal
red flashing	slightly increased
red	increased
blue flashing	fast
blue	aggressive
off	user defined

The option "user defined" allows you to choose your own setting that can be edited by using the StudioX software bundle and the separately available USB2SYS interface.

Push the button to save the configuration and to proceed to Parameter menu point **J**.

J - Slow rampup speed

When activating the RPM Governor this will not apply full throttle immediately but will increase the rotor head speed slowly until the desired preset head speed is reached. At menu point **J** you can determine how quickly this soft start occurs when the RPM Governor is activated initially. The speed is given in number of revolutions by how much the rotor speed is increased per second. The higher the speed the faster your preset head speed will be reached. Please note that the given rates only are indicative. Depending on the response of the speed controller and the inertia of the rotor system it can actually take longer or shorter until the desired speed is reached.
The choice is made by moving the rudder stick into one direction until the Status-LED lights in the desired color.

Status-LED	Spool up rate
purple	50 rpm/s
red flashing	100 rpm/s
red	200 rpm/s
blue flashing	300 rpm/s
blue	400 rpm/s
off	user defined

The option "user defined" allows you to choose your own setting that can be edited by using the StudioX software bundle and the separately available USB2SYS interface.

Push the button to save the configuration and to proceed to Parameter menu point **K**.

K - Fast rampup speed

If the RPM Governor is already enabled and you change the preset rotor head speed in the transmitter (i.e. by switching to a different flight mode), there will not be an abrupt change but the system will increase the rotor rpm with a given spool up rate that can be set at menu point **K**. This rate also determines how fast the rotor head speed will increase when reactivating the RPM Governor after an autorotation maneuver (Autorotation bailout). In this case the normal soft start (which is set at Setup menu point **J**) may take too much time until the rotor has reached full speed again as the heli is still in the air, so we use this faster spool up rate instead.

The choice is made by moving the rudder stick into one direction until the Status-LED lights in the desired color.

Status-LED	Fast spool up rate
purple	same as Spool up rate **J**
red flashing	300 rpm/s
red	500 rpm/s
blue flashing	700 rpm/s
blue	900 rpm/s
off	user defined

If you set „same as Spool up rate **J**" the spool up rate will then be the same as the rate set at menu point **J**.

The option "user defined" allows you to choose your own setting that can be edited by using the StudioX software bundle and the separately available USB2SYS interface.

⚠️A very high spool up rate can cause the throttle to be opened very fast. Especially when recovering from an autorotation maneuver this can cause the rotor blades to fold in or can damage the main gear in (especially electric models), so only increase the value stepwise and with care. With nitro helicopters in general using low values is recommended (even only the setting „same as Spool up rate **J**") as here an abrupt throttle change out of idle position can cause the engine to quit! Additionaly nitro motors react quite slow to throttle changes and it takes some time to speed up the rotor. So when the change rate does not fit to the mechanical speed up, it can happen that the motor is driven to full throttle during spool up by accident as the motor does not speed up immediately.

When the AttitudeControl feature is not installed on your unit, pressing the button will save the setting and exit the Parameter menu. Now MICROBEAST PLUS is ready for operation again!

When using the MICROBEAST PLUS ProEdition upgrade (including AttitudeControl), push the button to save the configuration and to proceed to Parameter menu point **L**.

L - AttitudeControl mode

At Parameter menu point **L** you can choose between five different AttitudeControl operation modes. This is done as usual by selection with the rudder stick. If one of the AttitudeControl operation modes is selected, the AttitudeControl function is enabled and it can be activated/deactivated in operation by using the previously assigned transmitter channel for AttitudeControl. The „AttitudeControl disabled" option specifies the AttitudeControl is completely disabled and actuating the AttitudeControl channel has no effect (in terms of the AttitudeControl). The assignment to the colors of the Status-LED is as follows:

The choice is made by moving the rudder stick into one direction until the Status-LED lights in the desired color.

Status-LED	AttitudeControl operation mode
off	AttitudeControl disabled
purple flashing	Bail out rescue mode
purple	Bail out rescue mode with collective pitch
red flashing	3D - Mode
red	3D - Mode with collective pitch
blue	Flight trainer mode

⚠️Firstly enable AttitudeControl when all initial settings in Setup menu and Receiver menu have been performed. Otherwise the servos may drive to the mechanical full stop, start binding and may get damaged, e.g. when AttitudeControl gets activated when leaving the menu and the system starts to try moving the heli.

⚠️(Only applies to MICROBEAST PLUS Version 4.0.0) If you repeat the adjustment in Receiver setup menu and setup the channel assignment again, the AttitudeControl operation mode at Parameter menu point **L** will be reset to „AttitudeControl disabled" for safety reason. So if you have previously used AttitudeControl you must enable AttitudeControl again after a reallocation of channels or switching the receiver type. In this regard check the settings of the transmitter and make sure that AttitudeControl can be activated/deactivated by the transmitter as before.

Bail out rescue mode

This operation mode can be used if the pilot becomes disoriented and would like to save the helicopter from crashing. In such case he just needs to let go the stick(s) for aileron and elevator and activate the AttitudeControl by flipping the assigned switch for AttitudeControl function. The helicopter then is rotated back into normal horizontal position by the shortest route over roll or pitch. The pilot must only operate the collective pitch function to control the height of the helicopter. Note that for safety reason there is a stick fading implemented. Even when AttitudeControl is switched on you can control aileron and elevator. The stick movements have priority over the AttitudeControl. The larger the deflection of the corresponding control stick, the less effect AttitudeControl has. On the other hand when both sticks are in center position AttitudeControl takes over full control of the aileron and elevator function.

Bail out rescue mode with collective pitch control

Bail out rescue mode with collective pitch control provides the same functionality as the „Bail out rescue mode" described above. In addition, here the AttitudeControl also controls the collective pitch function. During the rotation and after reaching the horizontal position, AttitudeControl inputs positive or negative collective pitch, making the helicopter turn (almost) without loss of height and maintain hover position (or slightly climbing up) when horizontal position is reached. So the pilot can completely let go all sticks as soon as he activates AttitudeControl and the helicopter is automatically brought into a (relatively) save location by AttitudeControl. Here it is possible to add some collective pitch and let the heli climb up even faster by moving the thrust stick beyond the point that is applied by AttitudeControl. But moving the thrust stick lower is locked as you can never apply less collective pitch than AttitudeControl does. So the helicopter can not be moved towards the ground by giving wrong collective pitch inputs by accident.

3D - Mode

In 3D - Mode MICROBEAST PLUS recognizes the current orientation of the heli (normal or inverted) and always rotates the helicopter to the nearest horizontal position when AttitudeControl is activated. This operation mode is well suited for practicing basic 3D - aerobatic maneuvers such as hovering or back flips. Since in 3D - Mode the stabilization can be fully overridden when actuating aileron or elevator function, it is possible to keep 3D - Mode activated for a longer period of time and to grope at an aerobatic maneuvers by only giving specific control inputs. Rolling and pitching back to horizontal position then does AttitudeControl for you. The pilot must only control collective pitch and rudder. In addition, you can use this mode as rescue mode to stabilize the helicopter in an emergency situation. It should be noted, however, that the heli is always rotated to the nearest horizontal position. Therefore you must be very careful in controlling the collective pitch function as it may happen by accident that you give a collective input to the wrong direction. If you want to use 3D - Mode exclusively as rescue function, it is recommended to use 3D - Mode with collective pitch control.

3D - Mode with collective pitch control

3D - Mode with collective pitch control provides the same functionality as the „3D - Mode". In addition, here AttitudeControl takes over the collective pitch function. When reaching horizontal position AttitudeControl gives a positive or negative pitch input, so that the heli is held in the hover position or climbs up slightly. Here, the thrust stick is locked into each „wrong" direction. Therefore the pilot can only give additional collective pitch input (in normal position positive, in inverted position negative pitch) to increase the climb rate of the helicopter. But he cannot move the helicopter towards the ground by accidentally giving wrong pitch inputs.

Flight trainer mode

In Flight trainer mode you can only tilt the helicopter to a certain angle by giving aileron or elevator stick input. Moving the helicopter even further is impossible, as long as AttitudeControl is active. This prevents the helicopter from being tilted into a lateral position that may cause a big loss of height. As soon as the stick(s) for aileron and elevator is (are) released, the helicopter will be brought back to horizontal position by AttitudeControl. Additionally the helicopter is stablized all the time, independant of any stick input. This together makes the helicopter fly very similar to a multirotor helicopter. The pilot does not have to focus on the constant need of correcting the helicopter's attitude and he can not bring the helicopter in a difficult attitude by making violent control maneuvers. Collective pitch and rudder are not affected by this operation mode.

⚠️Please note that the system is not capable of holding the helicopter over an absolute position. It is very likely the helicopter will drift to one side or another due to external influences or simply due to the instability of the helicopter. The system only keeps the helicopter in a nearly horizontal level position as long as you don't touch the cyclic sticks and brings it back to such position as soon as you release the sticks for cyclic input. This position may vary slightly due to sensor drift caused by vibrations or temperature change and the helicopter may be slightly tilted to one or another directions and not be perfectly level. So although the flight trainer mode can be used as aid for beginner training you mustn't fully depend on the system. A basic knowledge and skill of piloting a helicopter is mandatory. The system is not a autopiloting device, there will be situations that require control actions from the pilot. If you are a beginner pilot only use the system under supervision of an experienced pilot and in combination with a buddy box system.

If you selected **Bail out rescue mode with collective pitch** or **3D - Mode with collective pitch** pushing the button will save the configuration and lead to Parameter menu point **M** for adjusting the collective pitch for the AttitudeControl mode. Otherwise pushing the button will save the configuration and exit Parameter menu. Then the device is will be back in operation mode.

M - AttitudeControl pitch

If at Parameter menu point **L** a mode with collective pitch control was selected, briefly pressing the button at menu point **L** will lead to Parameter menu point M. Otherwise menu point M will be skipped as this setting is not used!

At Parameter menu point **M** the collective pitch will automatically be set to hovering position, which will be used when AttitudeControl is activated and the helicopter is oriented horizontally. Ideally the pitch angle is exactly as large as it is necessary to maintain a stationary hovering flight without ascending or descending. Typically this is somewhere in the range between 5 and 6 degrees. Depending on your personal preference you may also use a higher pitch, so that the heli climbs up and gains altitude when AttitudeControl is activated. But this is not recommended as you may easily get disoriented or loose sight of the heli when it climbs up fast. Also when the heli still is moving forwards, additional pitch will cause the heli to speed up.

By moving the aileron stick left or right the hovering pitch can be adjusted. The color of the Status-LED indicates the range which the pitch is in between at the moment. This range is specified as percentage of maximum positive/negative pitch which was set at Setup menu point **K**.

Status-LED	AttitudeControl collective pitch
off	> 20% of maximum collective pitch
purple	> 30% of maximum collective pitch
red	> 50% of maximum collective pitch
blue	> 70% of maximum collective pitch

⚠️ If the maximum positive/negative pitch is changed at Setup menu point **K** then also the hovering pitch will change! So after adjusting the maximum pitch also check and readjust the hovering pitch at Parameter menu point **M**.

⚠️ When using the „3D - Mode with pitch control" make sure that the maximum pitch range is symmetrical, i.e. the maximum positive and negative pitch are of same size. Otherwise the hovering pitch will differ in normal and inverted flight as the AttitudeControl pitch is calculated from the maximum pitch setting! The setting at Parameter menu point M affects both directions. A separate adjustment of the hovering pitch angles is not provided.

Push the button to save the configuration and exit Parameter menu. Then the device will be back in operation mode.

Governor setup menu

With MICROBEAST PLUS you have purchased an electronic control system that continuously detects and controls the commands from the pilot. As a result the system is constantly aware of how the drive system will be burdened. The **RPM Governor** system uses this advantage to control the motor rpm. Contrary to conventional motor control systems that only monitor the engine speed, MICROBEAST PLUS can thus react sooner to speed changes. A separate engine governor system is no longer required for nitro helicopters and electric models can be used with a simple (cheap) speed controller without additional features such as soft start or governor mode. The desired rotor speed is specified via the remote control transmitter and MICROBEAST PLUS controls the throttle servo or speed controller accordingly, so that the predetermined head speed is maintained from takeoff to landing. MICROBEAST PLUS offers an integrated soft start for spooling up the rotor before takeoff and a quick start to regain head speed in a controlled manner when practicing autorotation maneuvers. The system is suitable both for electric and nitro/gas helicopters. Using the proven „Easy Setup" concept no additional equipment is required for programming (apart from your remote control system) and the initial setup is done within minutes.

If the RPM Governor was activated at Setup menu point **N** (setting „electric" or „nitro") then you can access the Governor menu immediately afterwards. Here various helicopter specific information must be provided which is necessary so that the RPM Governor can function correctly. Moreover, the transmitter will be prepared for the use with the RPM Governor function and at menu point **A** a function test for the rpm sensor is performed.

Note: Setup menu point **N** and in consequence the Governor setup menu points are only accessible if you have installed the RPM Governor feature on your device and in case you're using a single-line receiver. The RPM Governor function is not applicable when a Standard receiver is used!

⚠️Pay attention to your own safety and the safety of other people and property in your vicinity when using our product. When using helicopters with nitro/gas engines make sure that the motor will not start when making adjustments to the system. When using a gas engine always keep the ignition system deactivated!

⚠️For electric helicopters remove the motor pinion from the main gear during initial setup. **Warning! Risk of injury!** Never touch the motor when it's running. Always keep a save distance to all rotating parts of the helicopter.

A - Test mode

Thus the RPM Governor of MICROBEAST PLUS can be used, the system must be able to detect the motor speed. This is done with the help of a rpm sensor that must be attached to the sensor input of MICROBEAST PLUS. For models with nitro/gas engines usually sensors are used that determine the speed signal magnetically or optically. These sensors are mounted next to the crankshaft or clutch bell and register the number of engine revolutions here. For electric motors the motor speed can be determined electronically. For this purpose a phase sensor (e.g. BXA76013) is connected to one or two of the motor phases. Some electric speed controllers also offer a direct signal output for the rpm signal, so that no additional sensor is required.

To see how the sensor is mounted in detail please refer to the instruction manual from the sensor or from the helicopter. The wire with the rpm signal is connected to sensor input pin at the sideport of MICROBEAST PLUS by using the optional adapter cable BXA76401. This sideboard also powers the sensor with the supply voltage, if necessary. Note that the height of the supply voltage corresponds to your receiver power supply voltage!

Here are some installation and connection examples. As described virtually all kinds of rpm sensors may be used. Unfortunately it is impossible to try and enumerate all types. If in doubt about whether a particular sensor can be used in conjunction with MICROBEAST PLUS ask your dealer to find out.

Electric drive system with external phase sensor

Connect the motor wires of the phase sensor with any two phases of the electric motor. It is recommended to solder those wires to the plugs of the speed controller. So for maintenance purposes it is easier to remove the motor from the model later. In some cases the use of only one phase wire is sufficient. Usually this is the case when the speed controller powers the system with a BEC thus there is no galvanic isolation between motor and receiver circuit. However, we recommend using both wires in any case! This ensures that the sensor provides an interference-free signal as possible.

The electronic speed controller is plugged into the [CH5] output.
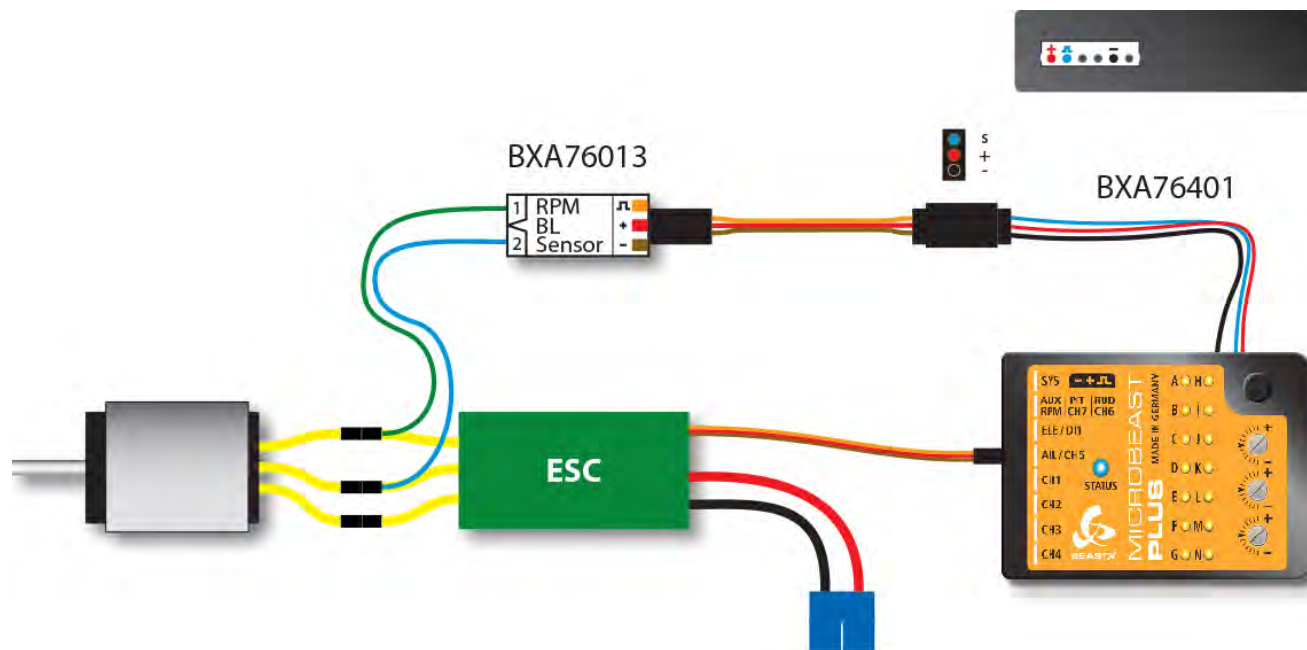
Electric drive system with rpm signal output from the speed controller

When a speed controller is used that provides a rpm signal output you can alternatively use the [RPM] sensor input on the front connection board of MICROBEAST PLUS (lowest pin of the tripple signal input). (RPM sensors can't be connected here as this pin header does not provide any power supply!) The speed controller's signal input wire is plugged into the output [CH5] as usual.
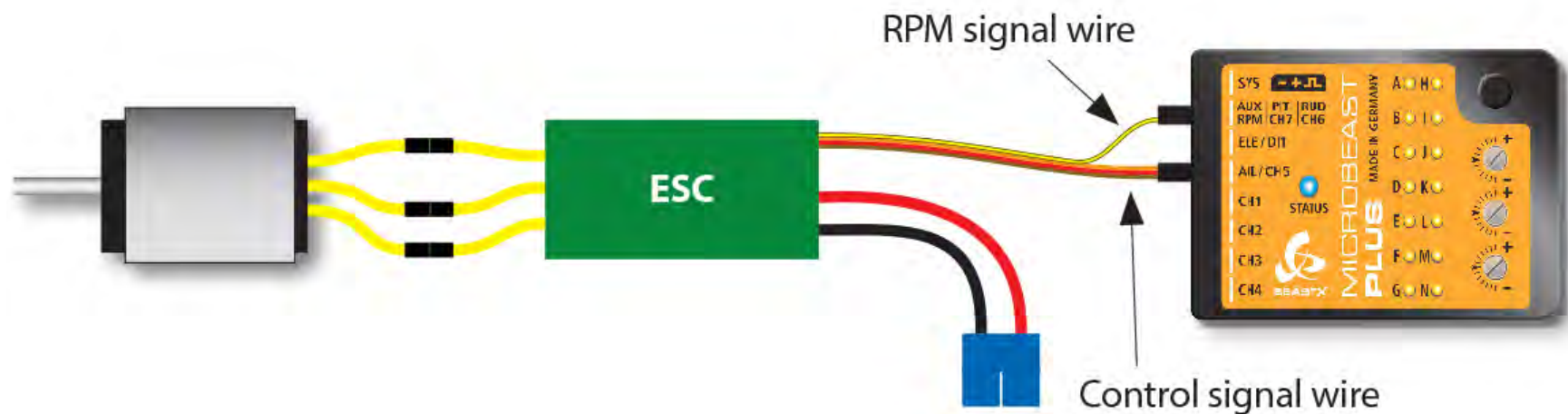
Combustion drive system (nitro/gas)

Particularly when using sensors for combustion engines check for correct polarity of the sensor power supply on the adapter cable BXA76401. Here commonly sensors are used that are designed for governor systems from other manufacturers and therefore have a special pin assignment. In this case the colors of the connecting cables may not follow the norm (The wire colors of the ALIGN governor sensor HE50H22 are swapped for example. Here red denotes the negative and black the positive pole!).
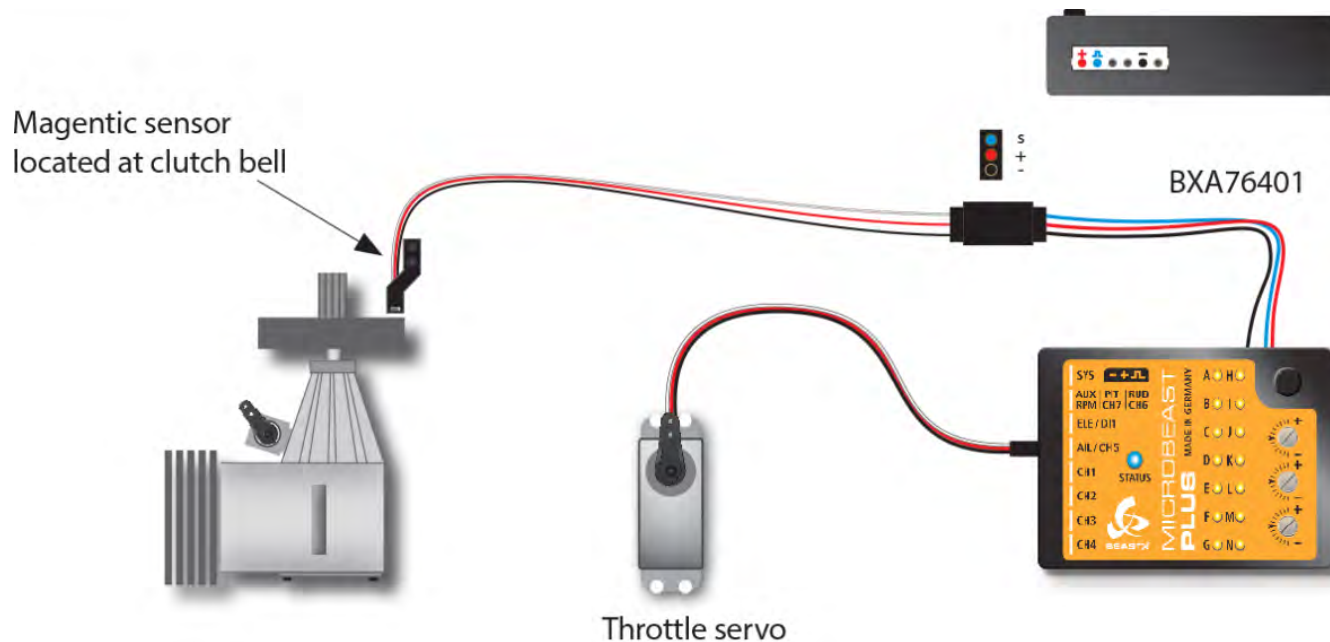
Sensor function test

At menu point **A** we check whether the rpm sensor is functioning properly and the rpm sensor wire is connected correctly and in general if there is a usable rpm signal. Watch out! At this menu point the throttle channel is unlocked. This means you have full control over the throttle output [CH5] with your remote control to control the speed controller or throttle servo.

When using an electric model it is necessary to increase the throttle until the motor starts to rotate and the phase sensor or the speed controller outputs a rpm signal. Once the motor is running the Status-LED on the MICROBEAST PLUS should light up in **red** color.

With a nitro/gas powered helicopter you can simply rotate the clutch or engine crankshaft by hand until the signal generator (magnet or similar) passes the sensor. Whenever

the signal generator is within the detection range of the sensor the Status-LED should light up in **blue** color.

If the Status-LED on the MICROBEAST PLUS does not light up as described please double check the wiring. Particularly pay attention whether the power wires of the sensor are of correct polarity (on some sensors the wire colors do not match the usual standard!). If you have a magnetic sensor check if the magnets are installed with the correct polarity and if they are passing the front of the sensor close enough. Using a crankshaft sensor make sure that the sensor is mounted close enough to the frame accordingly.

In addition to the function control of the sensor, check the throw setting for the throttle servo in the remote control and adjust if necessary: Set the throttle to mid stick position and attach the servo horn, so that the throttle linkage is at a right angle to the servo horn. Then adjust the length of the linkage according to the instructions of the helicopter, so that it also is positioned perpendicular to the linkage lever at the carburetor. Adjust the lever at the carburetor so that it is opened halfways (note the markings on the carburetor!). Now move the throttle stick towards full throttle and adjust the servo travel in the transmitter accordingly, so that the full throttle position is reached without binding. Lastly move both throttle stick and throttle trim on the transmitter to the „motor off" position and also adjust the servo travel in that direction until the carburetor is fully closed. If the servo travel must be greatly reduced in both directions, it is recommended that the linkage ball on the servo arm is mounted further in so that the servo can be moved over a wider range. For more information refer to the instruction manual for your helicopter.

Throttle at mid
stick position

Servo horn and throttle lever
parallel and perpendicular to
linkage rod
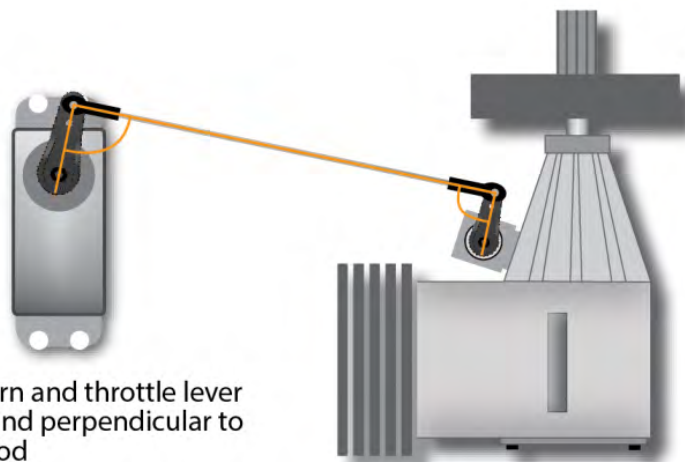
Also with an electric model, the control range of throttle is crucial. Usually here the throttle endpoints of the transmitter are fixed by an initial programming of the speed controller. But also speed controller exist that require adjusting the servo throw of throttle channel in the transmitter, so that the throttle range is in accordance with the specification of the speed controller. At menu point A there is the possibility to check again whether this setting has been performed correctly. Carefully apply some gas. The motor should start to turn immediately if you move the stick just a little bit and full speed should be reached when the stick just reaches full throttle position. If the engine turns much earlier at the maximum possible speed or only starts to turn at a very high stick deflection decrease the travel of throttle channel in the transmitter or repeat the programming of the speed controller. Thus the RPM Governor of MICROBEAST PLUS can operate correctly, the motor speed should increase as linear as possible when the stick is moved and there should be no ranges in that the motor speed does not change.

⚠ **Watch Out! Electric motors rotate at high speeds.** Keep a safe distance during the function test. We highly recommend to remove the motor from the main gear. However, please observe the manufacturer's specifications of the motor. Some motors may not be operated without load. In this case only let the motor run for a short time or let the motor stay attached to the main gear and only remove the main and tail rotor blades (Warning! Increased risk of injury).
If in doubt, do without the function test and throttle stick position check.

When finished briefly push the button to save the configuration and to proceed to Governor setup menu point **B**.

B - Throttle low position

Menu point **B** is used to set the lowest throttle position. **Watch Out! Output [CH5] can be directly controlled by the throttle stick.**

Using an electric model bring the throttle stick to the position at which the motor just does not start. If the stick throw has been correctly adjusted as described at menu point A (or the speed controller has been programmed to the stick throws), the necessary gas position should be achieved at the lowest position of the throttle stick. Some speed controllers provide a special mode that allows for a quick start-up in case of aborting an autorotation landing. Here there is a larger area between the actual „motor off" position of the speed controller and the point at which the motor actually starts. Also in this case move the throttle stick to the point at which the motor is just before to start, so that MICROBEAST PLUS can determine the effective throttle range correctly.

With a nitro/gasser model you bring the throttle stick to idle position or a slightly increased idle position (not „motor off"!) so MICROBEAST PLUS can determine the effective throttle range in the next step. Using the RPM Governor without an auxiliary channel to control the RPM Governor (see Receiver setup menu point **B** and following), this position additionaly will be used as idle position when performing an autorotation maneuver. So you should set the throttle as high as necessary here that the motor will maintain a stable run and doesn't quit during the autorotation maneuver.

When setting the low throttle position make sure the Status-LED lights up in **blue** color (both electrical as well as nitro). This means that a new valid throttle position has been detected. If the Status-LED lights up in **red** then the throttle stick is too close to the throttle stick center position. This is not considered optimal and therefore can not be used as throttle position. In this case check the setting of the transmitter and the programming of the speed controller or readjust throttle servo, carburetor position and throttle linkage rod.

When entering menu point **B** initially the Status-LED is off. As long as you do not move the throttle stick, the currently stored position will not be changed. So you can skip menu point **B** by a brief push of the button without changing the throttle position when performing subsequent adjustments in Setup menu or Governor setup menu. Conversely this means that you need to move the throttle stick at menu point **B** at least once to change the current throttle position!

When finished briefly push the button to save the configuration and to proceed to Governor setup menu point **C**.

C - Throttle high position

At menu point **C** you have to set full throttle position of your ESC or throttle servo. Here the output [CH5] can be only controlled by the throttle stick when the RPM Governor type is set to „nitro". In „electric" mode the throttle output will stay locked to your low throttle value. So you can set the full throttle position quite comfortable without the motor running high. Otherwise there are no differences between the modes „electric" and „nitro".

Move the throttle stick to full throttle position. The Status-LED must light up in **blue** color. This means that a new valid throttle position has been detected. If the Status-LED lights up in **red** the distance between the lowest throttle position and the full throttle position is too small. Since this will have a negative effect on the control behavior of the system, this throttle position can not be used. In this case check the setting of the transmitter and the programming of the speed controller or readjust throttle servo, carburetor position and throttle linkage rod. If necessary, set the lowest throttle position at menu point **B** again.

Similar to menu point **B** the Status-LED is off when entering menu point **C**. As long as you do not move the throttle stick, the currently stored position will not be changed. So you can skip menu point **C** by a brief push of the button without changing the throttle position when performing subsequent adjustments in Setup menu or Governor setup menu. Conversely this means that you need to move the throttle stick at menu point **C** at least once to change the current full throttle position!

When finished briefly push the button to save the configuration and to proceed to Governor setup menu point **C**.

D - Switch point display

Similar to menu point **A**, menu point **D** only serves to give you some status information. At menu point D the different activation points of the RPM Governor will be displayed based on color and state of the Status-LED. So you can prepare your transmitter for use with the RPM Governor function. The information conveyed by the Status-LED is basically the same in every Governor operation mode. However, the setup of the transmitter will be slightly different, depending on whether the mode **electric** or **nitro** is used.

Electric Governor

In **electric** governor mode the pilot does no longer control the speed controller with the transmitter. MICROBEAST PLUS completely takes over control of the ESC. With the transmitter you only specifiy the desired rotor rpm you want the helicopter to maintain. When setting a rpm higher than zero, MICROBEAST PLUS will speed up the rotor smoothly and ensure that the demanded rotor rpm is kept constant throughout the flight. To practice autorotation landings, additionaly you can keep MICROBEAST PLUS in a special mode that causes the speed controller to be switched off during the maneuver but speed up the rotor rpm fast when aborting the autorotation (faster than with the initial soft start).

The rotor rpm is set via the throttle channel of the transmitter. You may use the transmitter's throttle curves for instance, so you can switch the motor on and off and pretend different speeds using the flight mode system of the transmitter. Instead of curves you only have to set horizontal lines so that the rotor rpm value does not depend on the throttle stick position but is fixed in each flight mode. The flight mode switch then acts as a switch that switches between different speed settings.

Normal flight mode
- Motor off
- Throttle is 0% over the entire range

Status-LED **off**

Idle up 1
- RPM Governor active
- 1680 rpm = 42% throttle

Status-LED **red**

Idle up 2
- RPM Governor active
- 2200 rpm = 55% throttle

Status-LED **red**

Autorotation*
- RPM Governor on standby
- Motor off
- Throttle between 5% and 15%

Status-LED **blue**

Only effective when RPM Governor was active before.
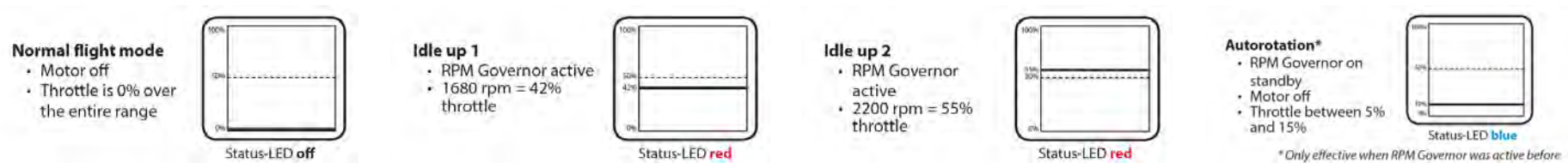
In **electric** mode the adjustable throttle range is 3400 rpm/min. The lowest rotor speed that can be set is 600rpm/min, the maximum speed is 4000rpm/min. To enable autorotation bail out mode the throttle must be set to a value between 5% and 15%.

Throttle position (scale depending on transmitter)		Rotor rpm	Status-LED
100%	+100	4000	purple
95%	+90	3800	red
90%	+80	3600	
85%	+70	3400	
80%	+60	3200	
75%	+50	3000	
70%	+40	2800	
65%	+30	2600	
60%	+20	2400	
55%	+10	2200	
50%	0	2000	
45%	-10	1800	
40%	-20	1600	
35%	-30	1400	
30%	-40	1200	
25%	-50	1000	
20%	-60	800	
15%	-70	600	
10%	-80	Motor off/ Autorotation	blue
5%	-90		
0%	-100	Motor off	off

Nitro Governor - with separate control channel

When the **nitro** Governor mode is used, the throttle servo can be controlled entirely via the throttle channel of the remote control as long as the RPM Governor is switched off. This is especially necessary to start and warm up the engine as well as to stop the engine after the flight. Only when the RPM Governor is switched on, the system will take over control of the throttle servo to spool up the rotor to the desired speed (if this is not yet reached) and ensure that the rotor speed is maintained during the flight. As some model engines react very sensitive in the lower throttle sector and abrupt engagement can cause the engine to quit, i.e. when the clutch is not fully engaged and/or the rotor is not yet turning, also the manual throttle control can be of advantage. The pilot can run the engine to speed "by hand" before control is passed over to the RPM Governor.

Depending on whether an auxiliary channel was assigned to control the RPM Governor in Receiver setup menu or not, the RPM Governor is either controlled separately via this channel or you can control both RPM Governor and throttle servo alone by using the throttle channel of the transmitter. In general the adjustable throttle range in „nitro" mode is 2400 rpm/min. The lowest head speed to govern is 600 rpm/min, the maximum head speed is 3000 rpm/min.

If a separate control channel is used for the RPM Governor the throttle servo can be controlled as usual via throttle channel and throttle curves of the transmitter. By switching the separate control channel in different positions, the RPM Governor can be activated and the desired rotor rpm can be preset. Note that for safety reason the throttle channel has priority over the RPM Governor when the output is below 25%. So you can always control the lower throttle servo positions by hand, even if the RPM Governor is already switched on. Then when the throttle is raised above 25% the RPM Governor intervenes and spools up the rotor. Also when you want to bring the throttle servo to idle position for autorotation or to shut off the engine you can always do this, regardsless of how the RPM Governor is switched. Anyhow keep in mind that MICROBEAST PLUS will be set to autorotation bail out mode if the RPM Governor is switched on and the throttle channel is brought below 25%. When throttle then is increased again, the RPM Governor will speed up the rotor faster than on initial spool up! Therefore if you make a stopover and the rotor is completely stopped, the RPM Governor must be completely disabled once by using the separate control channel. So the RPM Governor is reset and will perform an initial startup again. Otherwise if autorotation mode would still be active, the helicopter may tip over due to the abrupt speed up (this does not apply if you set the bail out spool up rate at Parameter menu point **K** as high as the initial spool up rate).

Normal flight mode
- Throttle curve controls throttle
- RPM Governor off (governor control channel below -90)

Status-LED **off**

Idle up 1
- RPM Governor on
- 1800 rpm = +5 throw on governor control channel
- throttle must be above 20% throttle output

Status-LED **red**

Autorotation*
- RPM Governor on standby (governor control channel stays above -90)
- Increased idle position (maximum 20% throttle output)

Status-LED **blue**

* Only effective when RPM Governor was active before
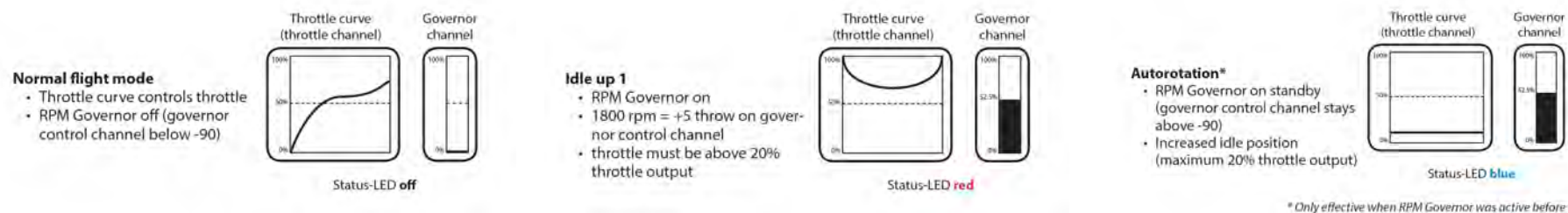
Throttle position (scale depending on transmitter)		
100%	+100	Manual control/ RPM control
95%	+90	
90%	+80	
85%	+70	
80%	+60	
75%	+50	
70%	+40	
65%	+30	
60%	+20	
55%	+10	
50%	0	
45%	-10	
40%	-20	
35%	-30	
30%	-40	
25%	-50	
20%	-60	Manual control/ Autorotation
15%	-70	
10%	-80	
5%	-90	
0%	-100	

Rotor rpm	Governor channel
3000	+100
2874	+90
2747	+80
2621	+70
2495	+60
2368	+50
2242	+40
2116	+30
1989	+20
1863	+10
1737	0
1611	-10
1484	-20
1358	-30
1232	-40
1105	-50
979	-60
853	-70
726	-80
600	-90
aus	-100

Nitro Governor - simple mode

If no separate control channel is used for the RPM Governor, throttle servo and RPM Governor are solely controlled by the throttle channel. For this purpose the control range of the throttle channel is divided into two parts: Below the center position, the throttle servo is controlled manually by the throttle channel. The RPM Governor is switched off and the servo output range is doubled, so that the throttle servo can be moved over the entire range. Once the throttle channel is moved (switched) to the upper area, the RPM Governor will activate, spool up the rotor and try to hold the preset rpm. Similar as it was described above for electric models you make the throttle curve a horizontal line, so that regardless of the position of the throttle stick MICROBEAST PLUS will always see the same throttle value and so the preset rpm will stays the same. So at least two flight phases are necessary. One that the throttle curve goes only up to the middle and in which the motor can be controlled by hand, i.e. for starting the motor and one flight phase that activates the RPM Governor and the throttle curve is used to preset the desired rotor head speed.

Normal flight mode
- RPM Governor off
- Throttle stick controls throttle servo
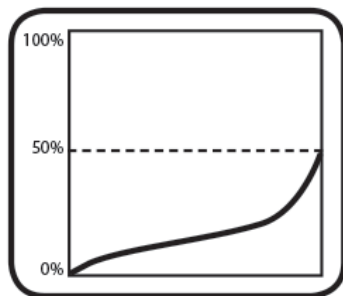
Idle up 1
- RPM Governor on
- 1800 rpm = 75%
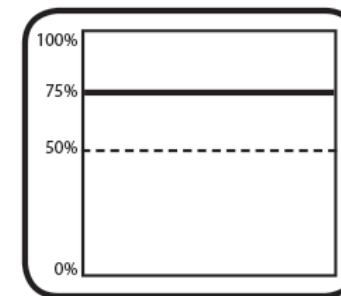
A third flight mode is used for auto-rotation: Here the throttle channel is constantly set to a value close below center position (between 40% and 50%) . When you switch to this flight mode once the governor was active, the throttle servo will be moved to the idle position set at menu point B. When switching back to governor mode, i.e. when you want to bail out from autorotation, the rotor will be spooled up at an increased rate (this does not apply if you set the bail out spool up rate at Parameter menu point K as high as the initial spool up rate - see chapter 8). Alternatively if it is switch back to the flight phase with manual control, autorotation mode is canceled and the next time you switch on the RPM Governor, the rotor is spooled up slowly.

Autorotation*

- RPM Governor on standby
- Increased idle position
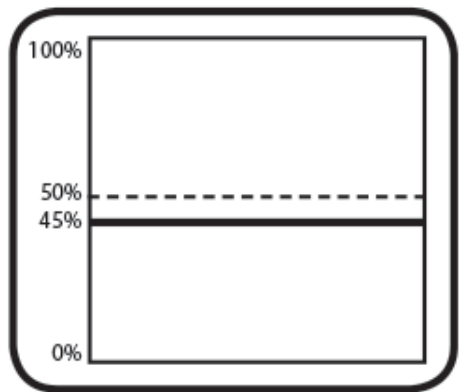
Only effective when RPM Governor was active before

Throttle position (scale depending on transmitter)		Rotor rpm	Status-LED
100%	+100	3000	purple
95%	+90	2760	red
90%	+80	2520	
85%	+70	2280	
80%	+60	2040	
75%	+50	1800	
70%	+40	1560	
65%	+30	1320	
60%	+20	1080	
55%	+10	840	
50%	0	600	
45%	-10	Manual control/ Autorotation	blue
40%	-20		

35%	-30	Manual control	**off**
30%	-40		
25%	-50		
20%	-60		
15%	-70		
10%	-80		
5%	-90		
0%	-100		

When finished briefly push the button to proceed to Governor setup menu point **E**.

E - Signal divider

When using electric motors the rpm sensor signal usually consists of the (electric) field speed. In order to obtain the actual engine speed the field speed must be divided by half the number of motor poles. Using a 2-pole motor thus the measured speed corresponds to the motor speed. With a 10-pole motor on the other hand the field speed is five times higher than the actual speed. Also for nitro/gas engines the measured speed of the sensor may be higher than the actual speed. For example when a magnetic sensor is installed and more than one magnets are used for measuring the rotational speed, the rpm output will be multiplied by the number of magnets. So when two sensor magnets are used the rpm signal from the sensor will be twice the engine revolutions.

At menu point **E** you must specifiy the factor by how much the incoming rpm signal must be divided to get the actual motor rpm. The currently selected division factor is represented by the color of the Status-LED. Use the rudder stick to switch between options.

Status-LED	RPM Divider
off	**no division** 2 motor poles (electric) or 1 magnet (nitro)
purple flashing	**2** 4 motor poles (electric) or 2 magnets (nitro)
purple	**3** 6 motor poles
red flashing	**4** 8 motor poles
red	**5** 10 motor poles
blue flashing	**6** 12 motor poles
blue	**7** 14 motor poles

The motor poles of an electric motor can be easily determined by counting the number of magnets built into the motor housing. Each magnet corresponds to one magnetic pole. Note that on some motors pairs of magnets are used rather than one single large magnet. These pairs together form just one magnetic pole! If in doubt refer to the datasheet of the motor or ask the manufacturer or your local dealer.

To determine the number of magnets that are used for a magnetic rpm sensor in a nitro helicopter, you can use menu point **A**. Each time a magnet passes the sensor the Status-LED will light up in blue color there, i.e. when you turn the clutch bell by hand. So you simply count how often the Status-LED lights up during one rotation. Then this is the divider you have to set a menu point **E**.

When finished briefly push the button to proceed to Governor setup menu point **F**.

F:G:H - Main gear ratio

The RPM Governor of MICROBEAST PLUS in general calculates with the rotor head speed of the helicopter. So (as shown at menu point **D**) you can set the desired head speed very easily and MICROBEAST PLUS will try to maintain this headspeed as close as possible. Thus the detected rotation speed of the motor can be converted into rotor head speed, you must specify the main gear ratio of the helicopter. This is done at menu points **F**, **G** and **H**. Menu point **F** sets the number of gear ratio before the decimal point, menu points **G** and **H** specify the first two decimal places. Compare the following table and set the Status-LED to the corresponding color and condition at each menu point so the desired gear ratio will result as a combination of all three menu points (**X.YZ:1**). The ratio can be adjusted in increments of 0.05. Choose the ratio that is the closest for your helicopter and set the menu points one after the other.

The gear ratio should be specified in the instruction manual for your helicopter. Especially with electric models it will vary depending on the motor pinion used. For helicopters with a single-stage gear drive the reduction can be calculated by dividing the number of pinion teeth from the main gear tooth count.
Example: Shape S8 - Main gear tooth count 130 teeth / 15 tooth pinion. Gear ratio apprx. 8.65:1. **F** - Status-LED purple flashing, **G** - Status-LED red flashing, **H** - Status-LED purple flashing.

To proceed to the each menu point briefly push the button. After menu point **H** the initial setup is finished and the button press will lead back to operation mode.

Status-LED	Menu point F (X)
off	user defined
purple flashing	8
purple	9
red flashing	10
red	11
blue flashing	12
blue	13
red/blue	14

Menu point G Status-LED	YZ	Menu point H Status-LED
off	.00	off
off	.05	purple flashing
off	.10	purple
off	.15	red flashing
purple flashing	.20	off
purple flashing	.25	purple flashing
purple flashing	.30	purple
purple flashing	.35	red flashing
purple	.40	off
purple	.45	purple flashing
purple	.50	purple
purple	.55	red flashing
red flashing	.60	off
red flashing	.65	purple flashing
red flashing	.70	purple
red flashing	.75	red flashing
red	.80	off
red	.85	purple flashing
red	.90	purple
red	.95	red flashing

Setting the option „user defined" at menu point **F** you can choose a custom gear ratio that can be edited by using the StudioX software and the optional USB2SYS interface. This allows to choose ratios smaller than 8.00:1 or greater than 14.95:1 or a ratio that is not a multiplier of 0.05. In this case the menu points **G** and **H** will be skipped when the button is briefly pressed at menu point **F**.

Flying and optimization

Tail gyro gain adjustment with transmitter

The tail gyro gain is adjusted by one of the transmitter's auxiliary channels. The more servo throw this channel produces, the higher the tail gyro gain will be. Additionally the direction of servo throw determines whether the gyro works in Normal-Rate mode or in HeadingLock mode. The color of the Status-LED indicates the selected mode when MICROBEAST PLUS is ready for operation. Purple indicates Normal-Rate mode and blue indicates HeadingLock mode. Additionally while adjusting the gain or shortly after the first start up, the current amount of gain is displayed by one of the menu LEDs for about 10 seconds. When the gain channel is centered, this will correspond to 0% gain indicated by LED **A**. In both modes, the maximum adjustable tail gain is 100% and will correspond to LED **N**. Please note that the actual percentage and sign of servo throw in the transmitter will depend on its brand and/or type.

For the first flight we suggest to start with medium gain not higher than LED **G** (LED **D** for 450 size helicopters and smaller) in HeadingLock mode. Low gain will cause the tail rotor control to feel weak and it will stop with overshoots. Increase the gain step by step and you will feel the tail having more and more precise stops, and hold better and better on jerky pitch inputs. If the gain gets too high, the stops will bounce back quickly and wagging will appear in fast forward or backward flight. In this case immediately reduce the gain! For optimum performance set the gain as high as possible, just before the tail rotor starts to wag in fast forward flight.

- Operation without using the auxiliary channel for tail gyro gain is not possible!
- When gain is close to point **A** (0% gain) the rudder servo will not perform full servo travel as the gyro is switched off. Do not attempt to fly in this condition!

Menu-LED	N	M	L	K	J	I	H	G	F	E	D	C	B	A	B	C	D	E	F	G	H	I	J	K	L	M	N
Gyro gain	100%	96%	88%	80%	72%	64%	56%	48%	40%	32%	24%	16%	8%	0%	8%	16%	24%	32%	40%	48%	56%	64%	72%	80%	88%	96%	100%
Auxiliary channel	-100	-96	-88	-80	-72	-64	-56	-48	-40	-32	-24	-16	-8	0	8	16	24	32	40	48	56	64	72	80	88	96	100
Gyro mode	Normal-Rate mode														HeadingLock mode												

In **Normal-Rate mode** the tail gyro of MICROBEAST PLUS only acts as dampening that decelerates sudden rotations caused by external influences. Slow, constant rotational movements will not be compensated. Thus the tail does not drift in hover due to the main rotor torque, a perfect mechanical adjustment of the tail rotor is essential (see the section to Setup menu point **D**). But even with perfect mechanical adjustment you will always encounter some drift on the rudder axis due to crosswinds and the pilot has to constantly perform corrections when doing hovering flight. In high-speed flight on the other hand the tail will be aligned in flight direction by the wind, so curves can be flown very dynamically and the pilot doesn't have to constantly concentrate on controlling the rudder.

We recommend to use the **HeadingLock mode**. Here the tail is actively controlled by the gyro system. You will barely feel any external influences. By giving rudder stick

input, the pilot only commands the gyro how fast it has to turn the tail. When the stick is in center position the tail gyro will ensure that the tail keeps locked into position by any means. This simplifies the control significantly. In hovering flight the beginner can fully concentrate on the control of cyclic and collective pitch and the advanced pilot can perform 3D - flight maneuvers such as backwards flying quite easily. The only disadvantage of HeadingLock-Mode is that the rudder must be steered by the pilot when flying curves. Otherwise the gyro will try to keep the tail aligned with the initial direction.

To gain better tail gyro performance also check for correct servo horn length. If the tail gain in general is very low and the rudder tends to oscillate very easily move the linkage ball on the servo horn further inwards to the center. If on the other hand you have a very large amount of tail gain and the tail gyro still does not seem to be capable to hold the tail rotor in any flight condition, move the linkage ball on the servo horn further out from the center, to get faster response speed when the gyro needs to control the rudder. Also you may use different (larger) tail rotor blades or higher tail rotor speed to gain better holding force.

Adjusting the dials
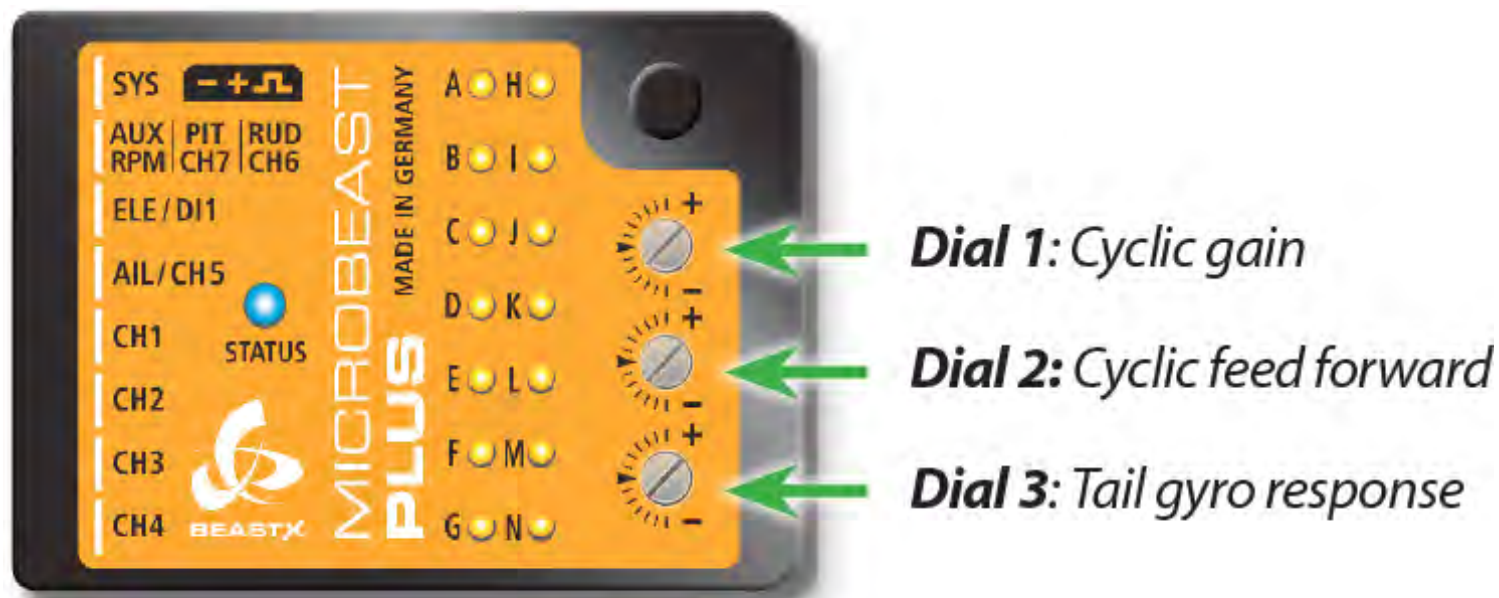
To adjust the dials please only use the supplied plastic BEASTX adjustment tool to prevent damage to the dials!

Dial 1: Cyclic gain

The swash gyro gain (cyclic gain) can be set by dial 1 from 50% up to 150%. Turn dial 1 clockwise to increase the gain. The factory setting is horizontal which corresponds to 100% swashplate gain. For your first flights we suggest not changing this setting. However, when using very small helicopters (such as 250 or 450 size), reduce the cyclic gain by 3 marks (=75% gain) as with such small helicopters the control loop tends to overcompensate more easily.

In general the higher the gain the harder the helicopter will stop after cyclic moves and the helicopter will fly more stable and exact in the air. If the gain is too high, the helicopter will tend to oscillate at high frequency especially on the elevator axis. Due to their low mass, this behavior will occur sooner on small helicopters, so typically these do not need as much gain as large helicopters.

If the gain is too low the helicopter does not stop precisely and overshoots the more or less after a cyclic movement. Additionally it feels unstable and sluggish in fast forward flight and when hovering. In general low gain will allow the helicopter to have more life of its own and so it will not react to stick inputs as precise and immediate as the pilot expects it.

Dial 2: Cyclic feed forward

This part mixes some amount of stick input directly to the servos, bypassing the control loop. If correctly adjusted, this relieves the control loop which will work more efficiently by only having to make residual corrections. Factory setting of the dial is horizontal which provides a good setup in most cases. Turn dial 2 clockwise to increase the cyclic feed forward. This will cause more cyclic stick input going directly to aileron and elevator on the swashplate. Decreasing the direct stick feed forward will do the opposite.

If the cyclic feed forward is too high the stick input will over control the cyclic input. Eventually the control loop needs then to steer back and compensate the unwanted cyclic movement. Even though you get the impression to have a more direct and immediate control over the servos with high feed forwared values, unwanted side effects may appear, like pitch backs on cyclic stops and imprecise fast forward flight that show the control loop not working properly.

If the direct cyclic feed forward is too low, the helicopter will feel softer, slower and less direct. The optimal point depends of many factors like blades, servos, head speed, size and mass of the helicopter. Ideally you can increase the feed forward just as high as possible without any side effects happening. So you get a quite natural stick feeling and on the other hand the control loop is supported as good as possible. At delivery the dial is in the middle which should be a good starting point for most helicopters. Before adjusting the cyclic feed forward you should try to find the optimal maximum cyclic gain first (dial 1). Then adjust the cyclic feed forward and after that, you may have to adjust the cyclic gain once again, as both parameters interact to each other.

The cyclic feed forward does not affect the maximum rate of rotation! If the helicopter turns too slow, you should check the settings of the swashplate limiter in Setup menu point **L**, change the control behavior at Parameter menu point **B** or increase the servo travels or "Dual Rate" setup of your transmitter.

Also to get a quicker and more aggressive response, increase the control behavior at Parameter menu point **B** (reducing expo and increasing the maximum rotation rate) and increase the cyclic response at Parameter menu point **G**. It is not recommended to increase the feed forward in this case, although it may produce a quicker servo movement and more direct stick feel at first glance. As described above this value is part of the control loop and you will get side effects as the control loop will not perform optimally,

if you do not adjust this part as intended.

Dial 3: Tail gyro response

Turn dial 3 clockwise to increase the tail gyro response. Turning dial 3 counter clockwise will decrease it. Increasing the tail dynamic will lead to harder stopping behavior and more aggressive response to rudder stick inputs. If the response is too high the tail will bounce back shortly after a hard stop and feel spongy when making fast direction changes. If the dynamic is set too low the tail feels dull and stopping might be too soft. Ideally the tail should stop perfectly to the point without making any flapping noises. Factory setting of the dial 3 is horizontal which provides a good setup in most cases. You have to make sure the maximum possible tail gyro gain has already been determined (see above) before adjusting the tail gyro response. Then after adjusting the tail gyro response you may have to adjust the tail gyro gain once again, as these parameters interact to each other.

Flying

After turning on the receiver power supply wait until MICROBEAST PLUS has fully initialized. This is displayed by a short movement of the swashplate servos. For initialization it is irrelevant whether the helicopter is leveled horizontally! Only important is that it is not moved as long as the calibration of the sensor positions takes place (LEDs lights **A** - **G** running). Also the control sticks of the transmitter must not be moved as long as MICROBEAST PLUS calibrates the stick center positions (LEDs **H** - **N**). If the initialization is not completed even after several minutes, read the Trouble shooting guide.

Like mentioned above the three dials should be turned to factory setting (centered horizontally), when using in small helicopters for safety reason dials 1 and 2 should be set to slightly below the center position. The tail gain channel should be set so that point **G** lights up, similar to approx. 50% tail gain adjustment. In micro or mini helicopters experience has shown that the gain must be lower (set to point **D** or 30%). Select the control behavior at Parameter menu point **B** to fit your flying style. If you're a beginner or unexperienced with flying flybarless helicopters you should highly decrease the maximum rotation rate, so change Parameter menu point **B** to "normal" setting.

⚠️ **Before the first take off, make a stick direction check and again make sure that the sensors are correcting to the right direction when you tilt, roll or yaw the helicopter by hand.**

It is normal that the swashplate might move back to its original position only slowly after a stick input and that the servos don't run at the same speed as your sticks. In comparison to a flybared heli you are not directly controlling the servos anymore but controlling rotational rates like for fly-by-wire. The control of the servo is left to the control loop of MICROBEAST PLUS. The system will try to move the heli to the commanded directions and as the heli will not move while standing on the ground, the system may give maximum servo input, even if you do not move the sticks or the heli anymore, as the system will "remember" the command for some amount of time. Thus it is also normal when the tail gyro is operated in HeadingLock mode, that the rudder servo will stay in its end position after a rudder stick input or tail movement and that it does not always react immediately to a stick input. And for the same reason, it is also normal that the rudder servo runs to the endpoints even with small stick inputs.

Just before lift-off make sure that the swashplate is horizontal and that the tail pitch slider is near center. You can shortly switch the tail gyro to Normal-Rate mode, in this mode the rudder servo will center itself if the rudder stick is released. To center the swashplate move the cyclic stick to full deflection once.

Avoid excessive steering during lift-off, otherwise the helicopter may tip over as it can't move as long as it's still standing on the ground (as decribed above the system tries to move the helicopter by applying more and more servo movement)! The best way is to give a fair and direct collective pitch input to lift the helicopter quickly up into the air. This demands some re-education if you have only flown flybared helicopters before.

Once airborne at first you should adjust and try to find the maximum possible amount of tail gyro and cyclic gain (dial 1). Then you may optimize the tail gyro by adjusting Parameter menu point **D** in case you're operating the tail gyro in HeadingLock mode and adjust the response of the tail gyro using dial 3. Additionally you may need to adjust the Cyclic feed forward (dial 2) and Parameter menu point **C**. If the helicopter does react very aggressive to stick inputs, change the Control behavior at Parameter menu point **B** to a lower adjustment and/or reduce stick throws (servo throws) in the transmitter for the specific functions. Likewise increase the stick throws and/or Parameter menu point B, if the reaction is too slow and gentle for you. When the control loop is well adjusted, you can additionally use Parameter menu points **G** and **H** to fit your flying style and stick feeling. To support the tail gyro you can activate the Torque precompensation at Parameter menu point F if necessary.

Usage of RPM Governor (optional)

Please note that the RPM Governor function is an optional feature and may not be accessible on all MICROBEAST PLUS devices.

⚠️In general the RPM Governor can only be switched on when MICROBEAST PLUS is ready for operation. During the initialization phase the signal from the throttle channel is passed directly to the throttle servo. Therefore (especially with electric models) make sure that during the initialization the throttle channel is set to „motor off" position at the transmitter (not „Autorotation"!).

⚠️Note that if your receiver does not send a valid control signal to MICROBEAST PLUS within two seconds after power up, the throttle channel will be locked for security reasons. In this case [CH5] output will be set to motor failsafe position (set at Receiver menu point N). Only when MICROBEAST PLUS gets a valid signal from the receiver and the throttle stick is moved to the programmed failsafe position (or below) the throttle channel will be unlocked.

⚠️With nitro helicopters always ensure that the RPM Governor is disabled when you start the model. Otherwise the RPM Governor would drive the throttle servo up to the full throttle position and stay there as it tries to reach the demanded head speed. So always check the throttle servo position before starting the engine very carefully!

As described above at Governor menu point **D** set your throttle curves or the auxiliary channel in the various flight modes as high as necessary, so that the desired head speed will be approached and observed. Keep in mind that the head speed should not be higher than 80% of the maximum head speed that is possible with this motor and this gear ratio. If the chosen head speed is too high, the RPM Governor will constantly give full throttle input and no effective govering will be possible because there is not enough room left to open the throttle for compensating the rotor head load.

Some transmitters offer a special setting that allows to automatically switch the auxiliary governor channel together with the flight mode switch. So the motor can be started in the first flight mode, you can spool up the rotor by applying throttle manually and hover the helicopter. With the second flight mode the throttle curve is switched to a „V"-shaped curve and simultaneously the RPM Governor is turned by the auxiliary channel. In this case pay special attention that the two throttle curves overlap as good as possible in the point at which the transfer between the two flight modes takes place. Otherwise the throttle servo would make a jump before the RPM Governor will take over control as you still may be in manual mode for a short amount of time. So in this type of operation it is not possible to activate the RPM governor from the get go and let the rotor spool up autonomously. If you want this, you must activate the RPM Governor before switching to your second flight mode!

Usage of AttitudeControl (optional)

Please note that AttitudeControl is an optional feature. It is only available on devices with MICROBEAST PLUS ProEdition software installed.

Once AttitudeControl was enabled by choosing one of the five AttitudeControl types at Parameter menu point **L**, AttitudeControl can be activated and deactivated in flight by using the switch on the transmitter with the channel that was assigned as actuator for AttitudeControl in Receiver setup menu. When MICROBEAST PLUS is ready for operation check whether activation of AttitudeControl works as expected:

Similar to the tail gyro gain display you can determine the status of AttitudeControl by watching the yellow Menu-LEDs. These light up each time after the initialization sequence as well as when the amount of AttitudeControl gain is changed respectively when AttitudeControl is activated/deactivated. To distinguish the tail gyro gain display from AttitudeControl the Status-LED lights up in red color when the status of AttitudeControl is displayed. When AttitudeControl is deactivated Menu-LED A starts to flash. If one of the Menu-LEDs B − N lights up, AttitudeControl is active. The individual Menu-LEDs signal the amount of AttitudeControl gain: The larger the deflection of the switch channel for the AttitudeControl is, the farther the Menu-LED will go in the direction of point N and the stronger the effect of AttitudeControl will be. In particular this determines how fast and violent the helicopter will be rotated back to horizontal position. For the first flight it is recommended to adjust the throw of the AttitudeControl channel just until Menu-LED G lights up when AttitudeControl is activated. If using a small helicopter like 450 size or below typically you can set the gain even higher (until Menu-LED I lights up).

AttitudeControl with separate switch channel

When a separate channel for AttitudeControl was assigned at Receiver setup menu point J (or when the default assignment has been loaded) throw and direction of the AttitudeControl channel determine whether AttitudeControl is active or not and how strong it reacts. A deflection into one direction will activate AttitudeControl. Typically Menu-Led N (maximum gain) will light up when activating AttitudeControl for the first time, as the throw of the channel will be 100%. Adjust the deflection of this channel, i.e. by reducing the servo throw in the transmitter, so that one of the Menu-LEDs lights up next to point G (or point I when using a small helicopter) as described above. When the switch channel is moved into the other direction Menu-LED A will light up and flash. In this case AttitudeControl is deactivated. Here it doesn't matter how big the deflection of the channel is as only the sign of the deflection determines whether AttitudeControl is on or off.

Menu-LED	A (flashing)													B	C	D	E	F	G	H	I	J	K	L	M	N
AttitudeControl gain	-													8%	16%	24%	32%	40%	48%	56%	64%	72%	80%	88%	96%	100%
Auxiliary channel	-100	-96	-88	-80	-72	-64	-56	-48	-40	-32	-24	-16	-8	0	8	16	24	32	40	48	56	64	72	80	88	96	100
AttitudeControl Status	off													on												

AttitudeControl with combined switch channel

If the tail gyro gain channel is also used for AttitudeControl (see chapter 4), then there is the following difference to the operation mode with separate channel as described above: In the switch position where AttitudeControl is off, the channel deflection determines the amount of tail gyro gain as usual. Increase or decrease the (servo) throw of this channel to adjust the tail gyro gain. The amount of tail gyro gain is indicated by the yellow Menu-LEDs each time after initialization procedure and always when the gain changes. Here the Status LED lights up in blue color. When you flip the switch and the channel is deflected to the other direction, MICROBEAST PLUS will keep the current tail gyro gain and activate AttitudeControl. When adjusting the height of deflection of the channel into this direction you can specify the AttitudeControl gain like described above. So here one channel is used for two functions. Depending on the direction you can either adjust tail gyro gain or AttitudeControl gain and by switching between directions AttitudeControl is activated or deactivated.

Menu-LED	N	M	L	K	J	I	H	G	F	E	D	C	B	A	B	C	D	E	F	G	H	I	J	K	L	M	N
Tail gyro gain	100%	96%	88%	80%	72%	64%	56%	48%	40%	32%	24%	16%	8%	0%	last value												
AttitudeControl gain	-														8%	16%	24%	32%	40%	48%	56%	64%	72%	80%	88%	96%	100%
Auxiliary channel	-100	-96	-88	-80	-72	-64	-56	-48	-40	-32	-24	-16	-8	0	8	16	24	32	40	48	56	64	72	80	88	96	100
AttitudeControl Status	off														on												

⚠️ When using AttitudeControl with combined switch channel make sure AttitudeControl is at least deactivated once before take off. Otherwise the tail gyro gain would be minimal as the system would not have been able to determine your tail gain adjustment after initialization.

⚠️ In this mode it is absolutely necessary to use a switch that changes the control directions directly and without intermediate steps. In particular, do not use a slider on the transmitter! Otherwise, when you activate AttitudeControl the tail gyro sensitivity would be decreased to 0% before the system turns on the AttitudeControl. So you would have 0% of tail gyro gain when AttitudeControl is active.

Note for software versions before 4.1.x: When AttitudeControl is enabled in general the tail gyro can not be used in Normal-Rate mode. If operating AttitudeControl with separate switch channel (see above) the channel for tail gyro gain activates HeadingLock - Mode in both directions. The sign of deflection is not relevant here, just the amount of deflection is important. When you also want to use the tail gyro in Normal-Rate mode (as described here) you must disable AttitudeControl at Parameter menu

point **I** (by setting the Status-LED to „off" state).

Functional test of AttitudeControl

When activating AttitudeControl you should be able to see an immediate impact on the swashplate control: If the heli is tilted to one side, MICROBEAST PLUS permanently steers the swashplate opposed to the inclination. In the region around horizontal position the swashplate will always stay nearly horizontal to the ground. The system constantly tries to bring the helicopter back to the horizontal position as long as the helicopter is oblique.

Tilt the heli forward

The swashplate is tilted backwards and stays in this position...

... until the heli is brought back to horizontal again.
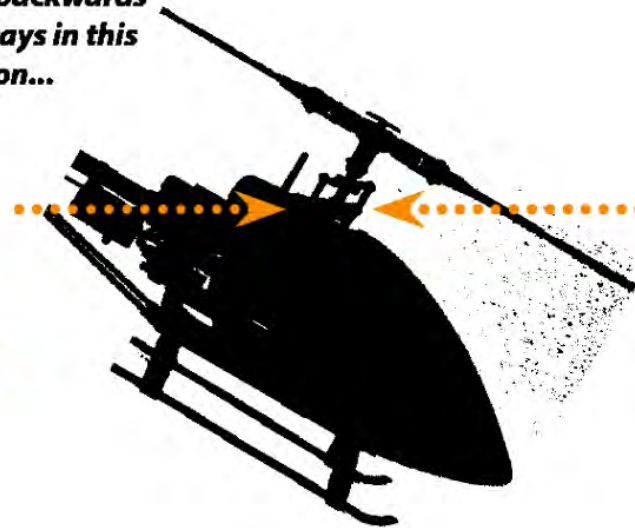
When AttitudeControl is deactivated on the other hand, the swashplate will always be moved back to neutral position (perpendicular to main rotor shaft) as soon as the helicopter is standing still for a few seconds, independant of the current leveling. Here the system only corrects currently occurring rotational movements, but does not regulate the absolute deviation from horizontal position.

Tilt the helicopter forward

The swashplate briefly steers against the rotation but then goes back to neutral when the helicopter is not moved anymore.

When using an AttitudeControl mode with collective pitch control (see Parameter menu point **L**) additional to the cyclic movement also the collective pitch is moved in positive or negative direction when AttitudeControl is activated and the helicopter approaches the horizontal position. The pilot can add collective pitch in the same direction by using the thrust stick, but not in the opposite direction. Check to see if this works correctly and whether the control directions are correct. If the helicopter is kept in hovering position, some positive collective pitch must be applied by AttitudeControl and you can use the thrust stick to add more positive pitch, but not less. Analogous this must work when the heli is in inverted hovering position if using the „3D - Mode with collective pitch control". Here AttitudeControl will apply some negative collective pitch and you can only add more negative pitch, but not positive.

Flying with AttitudeControl

If not done already, for the first flight keep AttitudeControl deactivated and adjust all flight parameters like tail gyro gain, cyclic gain and so on as described under Flying and optimization.

If the heli is setup well you can familiarize yourself with the effect of AttitudeControl. For this we suggest to use the „Bail out rescue mode" (see Parameter menu point **L**). Fly the helicopter in a sufficient amount of height in a stable hover and activate the AttitudeControl by using the appropriate switch. The helicopter should continue to hover in approximately the same position. Now give some aileron or elevator stick input and release the stick when the helicopter reached some oblique position. AttitudeControl

should bring the helicopter back to the horizontal position more or less rapidly.

Deactivate AttitudeControl and again tilt the helicopter by giving some stick input. Now the helicopter will stay tilted if you release the stick. Only when AttitudeControl is activated by flipping the switch again, the helicopter will be rotated back to horizontal position as before.

⚠️ If using an AttitudeControl operation mode with collective pitch control (see Parameter menu point **L**), moving the thrust stick does not have any effect in some area as AttitudeControl takes over collective pitch control as long as the thrust stick is in this area and AttitudeControl is activated. Therefore make sure the thrust stick is in a position that will roughly produce the same amount of collective pitch, before and while deactivating AttitudeControl. Otherwise when deactivating AttitudeControl the helicopter would make a leap down, if the thrust stick controls a smaller pitch angle than AttitudeControl.

⚠️ For safety reason you should never take off or land with activated AttitudeControl. As AttitudeControl actively gives control commands to the control loop of MICROBEAST PLUS, the swashplate may tilt to one side if the helicopter is not placed perfectly level on the ground. This may cause the helicopter to tilt and crash when trying to take off or when the motor is switched off and the main rotor is running out.

Fine tuning of AttitudeControl

- The amount of deflection of the AttitudeControl switch channel controls the AttitudeControl gain. This determines the speed and roughness of the control input from AttitudeControl. If the effect of AttitudeControl is too low resp. the heli rotates back to horizontal position too slowly, increase the AttitudeControl gain by increasing the deflection of the AttitudeControl channel (i.e. by using the servo throw adjustment for this channel in the transmitter). If on the other hand the heli overshoots after reaching neutral position and bobs briefly, maybe the AttitudeControl gain is set too high. Reduce the gain accordingly. In such case also make sure that cyclic gain (dial1) and cyclic feed forward (dial 2) are well adjusted. It is recommended to adapt the AttitudeControl gain to the preferred application. If you would like to use AttitudeControl as emergency rescue then set the gain as high as possible. On the other hand when using AttitudeControl mainly as a training aid, for example in 3D - mode, then make the effect of AttitudeControl rather weak, so that the system does take over control gently.

- If the helicopter is not aligned horizontally as desired with active AttitudeControl, i.e drifts to one side in hovering, the artificial horizon can be readjusted. This is done at Parameter menu point **A**.