BAVARIAN Demon

INSTRUCTIONS

AXON

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Congratulations on owning a bavarianDEMON stabilization system.
This system enables huge performance from your model. The head gyro eliminates all undesired flybarless head characteristics, resulting in optimal control and precision. By incorporating the latest generation of high-quality MEMS gyros, this system offer full 3D capability, whilst boasting a top-quality, ultra-fast tail gyro. In addition, it has in-built symmetrical torque control (revo mix). This results in a further increase in ‚lock-in' ability, made possible by coupling the tail gyro internally with the coll.pitch data of the rotor head control. With this latest generation system, the AXON increases the existing performance to a new level, not only in regards to the additional horizon and rescue features, but with the enhanced overall feature and characteristic set.
Of course, the AXON remains perfectly suitable for all kinds of helicopter, no matter whether flybared or flybarless, trainer or scale helicopter (twin- and multi-bladed), as well as flybarless helicopters such as turbine powered trainers, etc.. The AXON can be used without limit for all different power unit types, no matter whether electric, nitro or gas, as well as for gas turbines too.
Supported servo types include all analog, digital and brushless servos, including narrow-pulse servos (760µs) on the tail at 500Hz. Moreover, all current swashplate variants, including four swashplate servos and virtual swash rotation, CCPM/H1, H3-90°, H3-120°, H3-140°, H4-90°, H4-90°+45° are supported.
Direct USB connection for fast programming via Win and MacOS software as well as Android- and iOS Apps in combination with the separate Bluetooth module, or via any Jeti radio's device explorer (Tx firmware 4.23 or higher), bank switching of complete parameter sets, as well as clear separation of the gain (sensitivity) settings for head and tail gyro in independent auxiliary channels, reduce the setup work to a minimum. The absolutely independent Horizon channel provides activation and tuning of the multiple Horizon and rescue modes.
The AXON's firmware can be updated via the internet (software only, not via app). For hints and instructions, please see the software.

TECHNICAL SPECIFICATION

Dimensions:	40 x 30 x 14mm
Supply voltage:	4…10V (2S-LiPo-compatible, min. 5.5V using Spektrum satellites)
Current drain:	ca. 70 mA
Temperature range:	-15°C…+55°C, 5°F…130°F
Max. roll & pitch rotational speed:	500°/s
Max. tail rotational speed:	650°/s
Tail servo output:	Analog (55Hz) / Digital1 (166Hz) / Digital2 (220Hz) / Digital3 (333Hz) / 760µs (500Hz)
Head servo output:	Analog (55Hz) / Digital1 (166Hz) / Digital2 (220Hz) / Digital3 (333Hz)
Throttle output (for serial input only):	64Hz analog (from firmware 1400 on, 55Hz for lower firmware versions)
Maximum combined servo currents:	total 15A (continuous load, 18A short time load)
Weight:	approx. 27g (without cable loom)
Length of connecting cables to receiver:	150mm (longer cable optionally available, see "accessories")

SCOPE OF DELIVERY

- Main unit (sensor)
- One mounting pad each, 'Acro' and 'Soft' ACP
- Cable loom for receiver connection (150mm)
- Mini USB cable
- Product information

Software (Win / MacOS) available for download at www.bavarianDEMON.com. Apps (iOS / Android) in the designated stores.

QUICK INTRODUCTION

INSTALLATION

MOUNTING POSITION

Important is an orientation exactly aligned with the level of the main rotor or rotor shaft in all 3 axes, i.e. the assembly surface must be orthogonal (90°) or parallel to these. Contrary to normal tail gyros, this is particularly important to ensure that the head stabilization maintains constant attitude, even during pirouettes. All four main orientation directions are possible (see software), plus mounting it inverted or even vertical. So alltogether, 24 options for the installation orientation are possible.

AVOIDING VIBRATIONS

The mounting surface must be sturdy and vibrate as little as possible. The closer the unit is fitted to the rotor shaft, the less vibrations is usually present.
In the case of internal combustion engines, it is particularly important to take care with this issue to reduce invisible vibrations. If the housing should noticeably vibrate extremely while the engine is running, we recommend choosing a different installation position that is protected better against vibrations.

AVOID CLOSE PROXIMITY TO HEAT SOURCE

Keep a distance from the exhaust tube, ESC and motor. Using the system inside a fuselage, make sure to supply plenty of fresh air.

USE THE SUPPLIED MOUNTING TAPE

Clean the mounting surface properly. Use the thicker and softer tape for internal combustion engines only, and the thin tape for all other models.
Do not additionally lash the housing as this will restrict the damping effect of the foam tape. For the same reason, do not tightly lash the connecting cables (servos and receiver) and do not lay them under tension in a straight line, but in a gentle bend leading to the system.

PREPARING THE REMOTE CONTROL

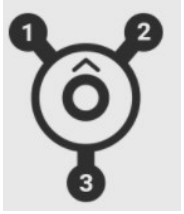
Switch off ALL mixers in the transmitter. The swash type / mixer is set only in the system and in accordance with the linkage type. In the transmitter, select an unmixed standard program (CCPM/H1), and disable the collective-to-tail mix.
All functions like gyro menu, AVCS menu and pitch-throttle curve remain in the transmitter. Moreover, Expo and Dual Rate settings are allowed to be used in the transmitter, but only after the initial setup has been completed.

SERVO ENUMERATION

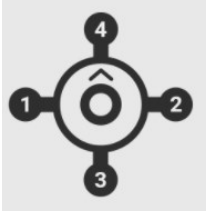
The following diagrams show the enumeration of the servos, and thus the correlation in connecting them to the AXON, dependent on the swash type. Note: 3-servo swash types may have the center servo linkage located either to the front or rear of the main shaft. The servo enumeration remains the same: #1 is left, #2 is right, and #3 is center.

H3-120°

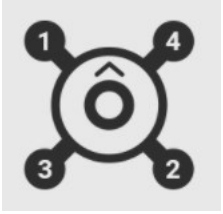
H3-140°



H3/H4-90°



H4-90°+45°



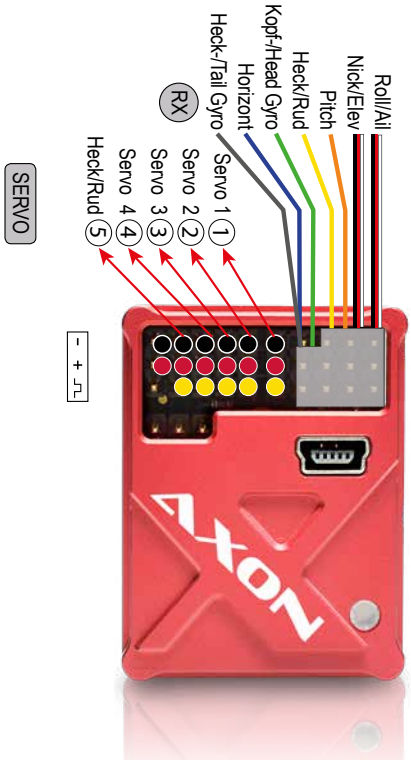
CONNECTION

VIA CABLE LOOM (STANDARD RECEIVER, PWM SIGNALS)

Connect each cable of the cable loom to the appropriate channel on the receiver, according to the diagram.

Example: Yellow cable → Rx port for tail servo

Connect servos to ports 1-5. Throttle/ESC stays with the Rx. Leave unused channels unplugged.
Note: Single-line cables must be plugged into „signal pulse“.



VIA SERIAL INPUT (SEE SOFTWARE FOR OPTIONS)

If the receiver features a serial output, it can be connected via this port, so only one patch cable is needed. Setting the designated signal type is done via software. In this case, the throttle channel is looped through by the system, its output supplied at port 6, according to the diagram.

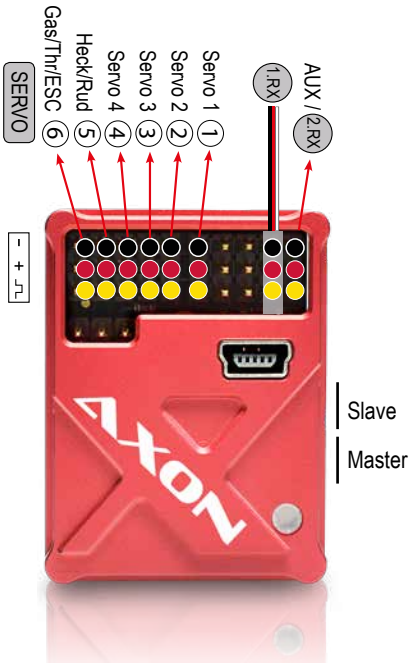
DualRX-Option:

Port A can be used either to output another servo channel (AUX, e.g. for illumination accessories, retractable gear, etc), or to connect a secondary receiver for redundancy, by activating the DualRX option via software or app. This secondary receiver has to use the same protocol as the primary on port B, per selection for input type.

Note: For programing the unit via a Jeti radio, the EX.bus protocol must be used (not PPM serial!), as data can only be sent via the bus system.

VIA SATELLITE RECEIVERS (SPEKTRUM)

Up to 2 (diversity) receivers can be connected on the side of the system. If only one satellite is used (technically possible, but not recommended), the port closer to the LED is to be used (Master).
Setting this input type, as well as binding the receivers to the radio, is carried out via the software. No main receiver is needed to bind or use the satellites directly on the device.
The usual input ports (when using the cable loom) for tail gyro and head gyro as well as horizon channel must be idle, i.e. not connected to any signal source (see diagram for cable loom connection).
When using Spektrum satellites, the system needs to be supplied with a min. 5,5V. 4,8V batteries are not sufficient, the receivers may fail under load or not bind at all. We recommend a voltage controlled output to supply the system, such as a BEC, with a capable LiPo or LiFe pack.



CONNECTION NOTES

As high servo currents can occur, a voltage supply should be routed directly to the device, this is also the case with a master-slave supply (BEC with 2 or more supply cables, all routed to the device). In this way the receiver will be supplied via the system, and not vice versa.
When using the supplied cable loom and an ESC's internal BEC, which must be connected to the receiver's throttle output, the power supply via the cable loom is sufficient. In this case any slave supply should be routed to the receiver, not split between receiver and device.

Use one of the following options to supply power directly to the unit (also see port marking on the unit):

a) All output ports 1-6

b) Ports A and B, if a serial input is used

In both cases, and if the number of available ports is not enough, make use of a Y cable to achieve the power source connection.

- Never use the governor port to supply power to the system! It could take severe damage.
- Do not connect servos until the device has been set to the correct servo type via software.
- Do not move the model/device for the first few seconds after powering on (LED flashes red). The system runs a self-test and needs standstill to perform this, as otherwise it will not initialize, activate the servos, and start to flash 3x red → power-cycle.
- When using the cable loom: route all cables as a common bundle. Single wires must not lie separately.
- The additional channels for head gyro, tail gyro, and horizon modes serve to set the respective gain (sensitivity) and mode in flight. A potentiometer or slider on the transmitter should be assigned one each for the gain channels. As an alternative, and recommended for final set-up, a fixed value can be programmed on a switch, the radio's gyro menu can be used, or the values can be set in the software (in this case, the corresponding channel must not see a transmitter input).

LED DISPLAY

GENERAL OPERATION

Do not move model and sticks during initialization after power-on.

The status of initialization can be seen on the servo's reaction: are these not following any Tx inputs, or does the LED not light up constantly, one of the following errors shows up:

Waiting for input signal: LED pulses red

Failure: system not initialized due to movement!

After successful initialization, servos respond to stick inputs and gyro corrections when tilting the helicopter.

Constant LED light → ready for operation.

GYRO MODE

Bank yellow

Bank blue

Bank red

Horizon mode: contant green LED light

Rescue mode: LED flickers green

GOVERNOR MODE

LED blinks fast, with motor running at increased idle, or after jump from Normal to Idle1:

→ Sensor detects over 7000rpm, rpm too high!

→ Jump from Normal to Idle1 too high!

Constant LED light with motor running at increased idle:

→ ready to go.

SETUP / ADJUSTMENT

After installation, the device must be tuned to both the helicopter and transmitter, which first includes adaptation of the transmitter to the system, followed by setting up the system to the model. The software includes a setup wizard guiding you swiftly and easily through all the required steps without missing any. Additionally there is helpful information available for each parameter in the info ('i' buttton) on the top right of every window.

At this point, please install and open the software and start the setup wizard.
Prior to this, do read the following notes!

1. IMPORTANT BEFORE FIRST FLIGHT AND AFTER ANY CHANGES! EXTENDED CONTROL CHECK INCLUDING A DIRECTION TEST FOR ALL 3 GYRO AXES

a) When the model is ready to fly, check the neutral position and direction of all stick functions and servos. If the swashplate shows an increasing tilt while increasing the head gyro gain, this must be related to inaccurate transmitter neutral trim.
Check in DIAGNOSE page.

b) Check directions of all three sensor axes, as an incorrect direction would definitely result in a crash.
Briefly tilt and turn the model in the directionof all three axis. The swashplate and tail must initially respond with the opposite action. In the event of this not happening correctly, incorrect programming is the source of the error, either in the direction of the bars in the DIAGNOSE menu or in the mounting orientation setting.

c) RC range check.

2. DASHBOARD MENU: BACKUP OF ALL SETTINGS IN THE PC

Data backup is optional, since all settings are stored permanently in the device, unless they are overwritten by new values or are subject to a factory reset.

It does, however, make sense to save settings when carrying out tests with various parameters. If the result is not satisfactory, then it is easily possible to restore the previous data by loading the backup into the device.

In this case, the bank switching is very helpful too. Define one main parameter set and conduct any testing using the other 2 banks only, so that it is easy to switch back to the "safe" bank at all times. Whichever bank you use as the "safe" bank is up to your preference.

TUNING

! It is mandatory to have tested all sensor directions!
! At first, fly with considerably moderate gain settings for tail and head gyro (35-45% recommended).
! Control check prior to every lift-off. Never lift off before the servos respond correctly to stick inputs, as only in this case has the initialization been successfull.

PAY ATTENTION DURING LIFT-OFF

! In general, pay attention to the horizontal position of the swashplate.
Similar to a tail gyro, it may happen that slight, inadvertently issued stick deflections are amplified by the stabilization before the model is in the air.
! Especially on 3D acro helis with hard head-damping, these helis must not be spooled up on, and lifted off from hard asphalt, unless the skids are dampened. Otherwise, while the motor is spooling up, resonances can occur, risking the heli tilting over, because in this state it cannot correctly follow the system‘s control commands.

BANK SWITCHING

The AXON includes the option of up to 3 banks of different parameter sets. This means that not only can head gain and tail gain be adapted from the radio, but complete parameter sets can be defined and accessed via the head gain channel’s position. This includes all parameters from the HEAD/TAIL menu, and also the governor’s gain control (separate bank buttons for the two menus).

Therefore, the software contains bank buttons „yellow“, „blue“ and „red“ for HEAD/TAIL as well as GOVERNOR menu.
Every single button opens the available parameter for the chosen bank separately, i.e. all settings, for example, made while the blue bank is active are only saved under the blue bank. When switching to another bank, the corresponding parameters for this bank are visualized and subject to change.

The banks are engaged via head gyro channel as follows:

Bank red → Default bank, also available if no signal is received via the head gyro channel. This is otherwise triggered by a center signal on the head gyro channel.

Note: the head gain needs to be set in software only for this bank.
Attention: when activating bank red (neutral signal on the head gyro channel), the internal gyro gain value in the HEAD menu is valid, although the Diagnose shows the current signal status ‚0‘!

Bank yellow → Activated by supplying a negative signal to the head gyro channel. The signal’s travel setting (servo travel) defines the head gain.

Bank blue → Activated by supplying a positive signal to the head gyro channel. The signal’s travel setting (servo travel) defines the head gain.

Examples:
1) Signal -57% = Bank yellow, 57% head gain
2) Signal +73% = Bank blue, 73% head gain
3) Signal 0% (Center) = Bank red, head gain defined via head gain parameter in the software

The tail gain is always defined by the tail gain channel from the radio, also for bank red, as long as a signal is provided via the radio.
If there is no signal from radio to tail gain channel, the tail gain is defined in the software, and for all three banks separately.

TAIL GYRO OPTIMIZATION

SENSITIVITY (GAIN) SETTING

As usual, set the gyro gain as high as possible, at which point the tail does not yet tend to oscillate, not even at high flight speed. The tendency to oscillate, and thus the holding force, mainly depends on the speed of the tail servo, but also on a mechanism free of play, with an easy moving linkage, as well as an optimum drive (without belt slipping, or breakdown of the motor controller at full coll.pitch, etc.). You can additionally optimize the gyro's performance to the model by tuning further parameters of the TAIL menu. In the case of high-performance acro helicopters, the following tuning procedure has proven successful:

P-GAIN

Search for the setting at which the tendency to oscillation is at its lowest (referred to the same tail gain), and you may then further increase the overall gain to some extent.

- You prevent fast oscillations (fine dithering) by a lower tail gain.
- You prevent slow oscillations (wag) and bouncing back by a higher P gain.

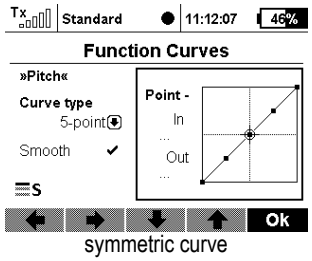
LOCK-IN DELAY

Use this parameter to optimize the lock-in behavior when the stick is released quickly, with the result that the tail stops without bouncing back or overshooting. Before adjusting the delay, adjust the tail gyro gain to the highest possible value.

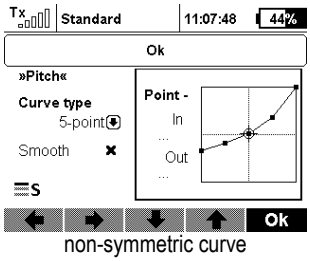
REVO MIX

Improve tail stability (particularly with slower tail servo) by generating a direct anticipated correction for the tail with every torque change caused by increasing coll.pitch, even before any measurable drift occurs, which the gyro would have to first detect in order to counter-act. Therefore, no matter if 3D-flying using a symmetric collective setup or for scale flying with collective hover setup at stick center (asymmetric collective setup), the coll.pitch curve has to be set up so that the curve diagrams center is passed.

Examples:



symmetric curve



non-symmetric curve

Now either adjust the pushrods to receive the desired blade angle for hovering (usually around 5°) at stick center, or use the Offset parameter in the software („Servo travel" page). A mix of both, mechnically as well as using the Offset parameter, is also possible.

Test method: give sharp coll.pitch inputs and see what the tail does. If it can't hold the increasing torque, i.e. moves in the opposite direction to the main rotor rotation, then increase the Revo mix.

OPTIMIZING THE ESC

If the tail moves clearly after a coll.pitch change, the source mostly is a sluggish responding motor controller that does not allow to keep the rpm up at maximum torque and accelerates too late, thus applying a high load to the tail. In this case, generally, an improvement is achieved by increasing the overall rpm.

HEAD GYRO OPTIMIZATION

The attitude stabilization („head gyro“) for the flybarless head maintains any attitude and prevents disturbances, such as ballooning, if the pilot does not apply any further control input. On the ground, the function is visible on the swashplate: when giving control input and subsequently letting go of the stick, the swash moves slowly back to level, maybe even staying in the controlled position for a short moment.
This head gyro function can also be used for flybared heads, to assist the the mechanical stabilization, but with a caution not to set the gain too high. An unmatched interaction between mechanical and electronic stabilization is definitely not desired.

AN EFFICIENT WAY TO OPTIMIZE THE RIGID SETTINGS

- We suggest to initially use a pot or slider on the radio for gain tuning. Use the head gyro channel or, in case no signal is supplied from the radio, the corresponding gain parameter in the HEAD/TAIL menu, to set the gain as high as possible, approx 5-10% below any oscillations occurring. For safety reasons, begin with low values. Too high a gain may provoke oscillations, for example like a shiver on aileron or a fast wobble on elevator.
- Then set the desired agility in the software.
- Usually at this point, the performance is close to the optimum or even perfect. If further improvement is necessary, you can test sudden stops (lock-in) after abrupt and fast stick control stops:

In case of a tendency of wagging in elevator axis:
- increase ‚Elevator Filter‘.

In case of slight bounce-back after abrupt stick control stop:
- Reduce ‚Direct Control Portion‘, increase head gain.

In case the tail continues to move on a short while, even after the end of stick input:
- for avoiding a sluggish reaction: increase ‚Direct Control Portion‘, possibly also increase the head gain and/or carefully increase the travels in the SERVO TRAVEL menu.
- for avoiding harsh reactions: reduce ‚Agility‘ in the HEAD menu, and carefully increase the travels in the SERVO TRAVEL menu.

If aileron and elevator impulses cause mixed movements, this might be caused by an incorrect ‚Swash Phasing‘ setting. Test with reduced head gain. For example, if the tail moves downwards when ‚right‘ aileron is input, then increase ‚Swash Phasing‘ in the positive direction.

Test response to long stick inputs
- In the case of a fast first reaction and then decreased turn rate: reduce ‚Direct Control Portion‘ and, if needed, increase ‚Agility‘.

Test high-speed flight
- Against slow ballooning or undercutting: reduce or respectively increase ‚Decay Rate‘.
- Against temporary nose-up („dolphin“) during sharp coll.pitch inputs: increase head gain as far as possible. Make sure the servo travel is set optimally (value between 65 and 85 in SERVO TRAVEL menu).
- Against lasting ballooning after hard coll.pitch input: use ‚Attitude Hold Range‘.

In case of tilting or tumbling motion during pirouettes:
- Align the sensor perfectly in all 3 axes.
  Trim the swashplate exactly level while there is a connection to the DIAGNOSE/TRIM menu (necessary to have all servos at neutral), and trim the heli mechanically to the optimum during the first flight.

TRIMMING

Using an electronic head stabilization, trim adjustment on the transmitter is not allowed (and not necessary). The system interprets any trim as a control input.
Helicopters equipped with flybar, even though they would not need an electronic head stabilization, can still use it in order to correct any minor trim differences and drifts. To do so, start with very low head gain and increase carefully.

FAILSAFE

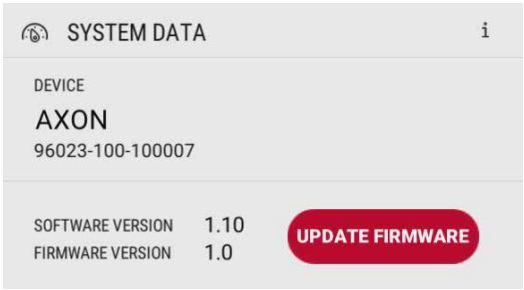
There are 3 options for the failsafe settings, and for each channel of Coll.pitch, throttle, Horizon and AUX separately:

BLANK: no failsafe action by the system
HOLD (Factory default): the last properly received signal will be held
FIX: a personally defined failsafe value/signal can be set, by adjusting the parameter, appearing below the channel assignment, to the desired value. Alternatively, you can teach all 4 from the radio currently received parameter values by clicking ‚learn failsafe values'.
ATTENTION: All 4 values will be teached, even if one or more parameter are not set to FIX. In case, set the channels, that are not meant to be FIX, back to the desired option.

Note: The internal failsafe will only be activated, if there is no „proper" signal received from the receiver (e.g. connection cut between receiver and system). Thus, if there is a failure in the link between transmitter and receiver, and the receiver's failsafe is activated, the system's failsafe will not activate.

FIRMWARE UPDATE

To carry out a firmware update, or check if your unit is up to date, connect the system to the software (Windows or MacOS), using the supplied USB cable.The unit does not have to be supplied by an external power, but is powered via the USB cable.
In the ‚DASHBOARD' menu you will find the ‚System data' window, containing the update button. Push this button, and the update window will open up, supplying information about possible new firmware available for the connected device incl. the download button, as well as the option to update the unit at any time with a loaded firmware file.



For informationen about the update process, please use the info (‚i') button at the right top of the system data window.

Note: Do not double-click the firmware file, trying to open or execute it! This can corrupt the file, which, in effect, may not let the updater process recognize the file as valid data any more. The file is only meant to be supplied to the updater by supplying the file's path.

SPECIAL FEATURES

HORIZON AND RESCUE OPTIONS

Important: no exceptions are allowed regarding the setup of Horizon and Rescue modes, in particular:

- The coll.pitch travel must reach its 100% marks as displayed in the DIAGNOSE menu, positive and negative, with correct signal direction.
- For using the horizon modes 'Acro' and 'Upright' and the corresponding rescue modes, the main blades' angle of attack must be set to exactly 0° when connected to the DIAGNOSE/TRIM menu, otherwise the proper function of the system's horizon and rescue features cannot be ensured.

Self-leveling can be used for various purposes: primarily as a training aid ("safety net") for beginners, but is also useful for advanced pilots. Self-leveling remains useful from the initial learning phase right up to practicing to master complex maneuvers. Self-leveling stabilization may be used wither purely as a „rescue switch" in an emergency, or in a permanently activated ("Coax mode") state. Self-leveling can act as an invaluable support during aerial photography flights, for example, particularly at greater distances, as an in-real-life orientation-training tool, or in deed in many other ways.

HOW TO ACTIVATE THE HORIZON STABILIZATION

First optimize the head gain setting. We suggest using a pot or slider on the transmitter for instant adjustment access in tuning.
This should only be done with deactivated Horizon modes, as these would interact in such that a perfect head tuning would not be possible.
Now choose the desired option from the HORIZON/RESCUE menu. Afterwards you can tune the gain (assistance) and engage the desired mode of the Horizon stabilization via the Horizon channel in flight.
It is recommended to use a switch for the Horizon channel, to activate and switch between modes.
Note: in 'Acro' and 'Upright' mode the mode (Horizon or Rescue) depends on the signal's polarity (direction) on the Horizon channel (see next page for more details).

FLYING WITH HORIZONTAL STABILIZATION

Begin with a low stabilization gain and increase carefully. Too high a gain may increase the tendency to oscillate. A very hard set up head stabilization can also increase the tendency to oscillate in Horizon modes.
Usually lift-off and landing is possible with activated self-leveling. This should be tested first at a gain not higher than 30%, and definitely not in Rescue mode. The tendency to oscillations may also be increased before lift-off, if standing on a hard surface, and during high speed flight.

IMPORTANT

When flying with permanently engaged self-leveling, do not reduce servo travels for aileron and elevator at the transmitter too much (no exessively low Dual Rate setting), otherwise, the priority of the manual control (override) may get lost.
The Horizon stabilization can also make pirouettes out-of-round, since it wants to bring the main rotor disc into its neutral hover attitude.

HORIZON/RESCUE MENU

Select the desired mode of operation using the 'Horizon Options'.
'Rescue Climb Rate' defines the climb speed in Rescue modes. The higher this value, the more coll.pitch is applied for rescue (only available for ‚Acro' and ‚Upright').

Explaining the options:

1 [SCALE] LED green = ON, red/yellow/blue = OFF

Not suitable for 3D flying and allowed only for helicopters which, due to their coll.pitch range (asymmetric), are not capable of inverted flight. Here, the Horizon channel works in positive signal direction only, +10% to +100%.

The following modes provide the option for Rescue functions. These options are allowed only if the model is set up with a symmetric coll.pitch range (e.g. -12° to +12°, center 0°).

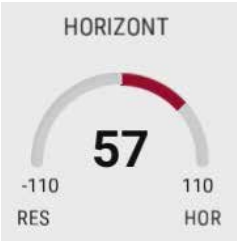
2 [ACRO] LED green = ON, red/yellow/blue = OFF

The most recommended option for 3D flying with highest accuracy. The model will be self-leveled to the closer horizontal attitude (normal or inverted).
For activation choose [ACRO] mode and apply a positive signal to the Horizon channel, i.e. signal travel to the right according to the DIAGNOSE menu, and in between 10% to 100%. The higher the gain value, the stronger the stabilization.

2b [ACRO+coll.pitch] LED flickering green = ON, red/yellow/blue /green = OFF

Similar to [ACRO] mode, but additionally coll.pitch will automatically be applied and set for climbing ("escape into the sky").
For activation choose [ACRO] mode and apply a negative signal of -100% (or higher) to the Horizon channel, i.e. signal travel to the left according to the DIAGNOSE menu

3 [UPRIGHT] LED green = ON, red/yellow/blue = OFF



Always levels the heli in upright attitude, even if initially fully inverted.
For activation choose [UPRIGHT] mode and apply a positive signal to the Horizon channel, i.e. signal travel to the right according to the DIAGNOSE menu, and in between 10% to 100%. The higher the gain value, the stronger the stabilization.

3b [UPRIGHT+coll.pitch] LED flickering green = ON, red/yellow/blue /green = OFF

Similar to [UPRIGHT] mode, and additionally coll.pitch will automatically be applied and set for climbing ("escape into the sky").
For activation choose [UPRIGHT] mode and apply a negative signal of -100% (or higher) to the Horizon channel, i.e. signal travel to the left according to the DIAGNOSE menu.

AUTOMATIC COLL.PITCH

The automatic coll.pitch action of the rescue feature overrides the coll.pitch stick commands more and more with increasing gain setting on the Horizon channel. A signal of -100% (according to DIAGNOSE menu) completely overrides the coll.pitch stick, which is the highly recommended setup. Furthermore, the rescue mode should be triggered only by a spring loaded momentum switch, so that the pilot re-gains full control by releasing the switch.

NOTE ABOUT THE HORIZON MODE'S RESCUE OPTIONS

The described rescue options provide an extremely high reliability, even during extreme 3D and acro maneuvers, based on following our rules for setup and handling.
We see this feature as a highly efficient rescue option, as well as a training aid for new maneuvers.

However, we warn against taking any uncalculated risks, particularily against activating the rescue modes for test flying without sufficient safety altitude, unless in a real emergency situation. Likewise, nobody would use an emergency-only parachute for regular skydiving. As with any complex system, even in model flight, unpredictable influences have to be accounted for at any moment.
Also, naturally, please note that the self-leveling cannot perform a stop from high speed. The heli may climb sidewards in a slightly tilted way.

GOVERNOR

The AXON includes an internal governor, suitable for electric and gasser/nitro use, which takes over the rpm control from the external governors/ESCm and is able to do this with high efficiency due to additional information about the current flight status.
For use with electric helis, either a special, separately available sensor (see accessories) needs to be used, which will simply be run over one of the motor wires, or use a standard hall sensor with corresponding magnet. In case the ESC supplies a standard rectangular signal with no special serial protocol structure, this signal can also be fed directly into the AXON.
For use with gasser/nitro helis, always use a standard hall sensor.
The parameter „Control gain“ is banked and thus can be set separate for each bank in the software.

ATTENTION:

- In combination with a Kontronik ESC, this needs to be set to Mode 2 (normal throttle mode), as otherwise parts in the ESC's control may act strangely!
- The internal governor needs to see a jump on the throttle curve to activate correctly. So do not programm a ramp, but only straights in the radio's throttle menu!

Configuration options in the software

The governor can be activated and deactivated as well as configured via software.

Waiting Time:

For gasser/nitro and electric in normal throttle mode, always set to ‚4'.

For electric with soft spool-up from the ESC, set this parameter to the ESC's spool-up time, plus 4s buffer to make sure the final rpm is properly detected.
Important: The heli must not be lifted off before the defined rpm is reached and therefore the internal rpm logging process has acknowledged the rpm. Too early a load, and the resulting drop in rpm, would lead to an inaccurate detection and the internal governor might not work correctly.

Stop Position (Electric only):

Defines the motor's OFF position.

Spool-Up Time:

With gasser/nitro (or ESC without own soft start), this is where you define the spool-up time, meaning the time from powering on until reaching the set rpm.
For electric with external soft spool-up in the ESC, this must be set to ‚0'. Otherwise the start of the spool-up would be delayed by the time set in here.
Important: This is mandatory for gasser/nitro, no delay must be used from the radio! A signal jump must be detected.

Increased Idle Position (gasser/nitro only):

A throttle signal jump from this point to Idle1 activates the internal spool-up, as defined in „Spool-Up Time“.
It's particularily important to initiate the signal jump (switching from Normal to Idle1) from exactly this point, and nowhere else.

Max. Throttle Position (gasser/nitro only):

Must be set to the throttle servo's maximum position, to achieve full throttle of the motor, as well as insure that this position will never be overrun.

Example for gasser/nitro

Connect the rpm sensor of your choice to the AXON's governor port. Make sure to get the polarity correct (according to the labling on the housing, ground facing to the outside). The sensor can be checked for proper function when the AXON is connected to the software's Diagnose page: the unit's LED will shortly go dark when a magnet / sensor signal is detected.

Throttle curve setup

At least 2 throttle curves are needed, one for running idle on the ground (Normal), as well as one each per rpm setup. An example for running idle on the ground is shown in the illustration ‚Normal' on the right. The other two illustrations, Idle1 and Idle2, show 2 possible throttle curves (straights) for using 2 different rpm setups in flight.

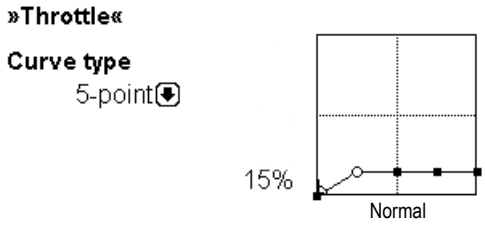
IMPORTANT:

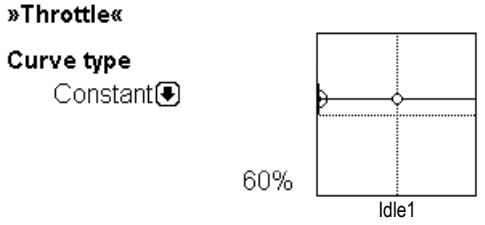
- For optimal resolution, resulting in best governor performance, make sure to run your throttle servo setup at a largest possible signal range, e.g. -90 (OFF) to +90 (max. throttle).

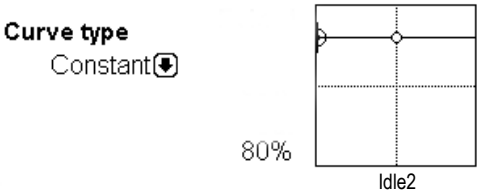
A setup like -70 (OFF) to +30 (max. throttle) shoul be avoided.

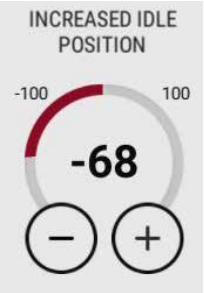
- For correct activation of the governor, it needs to see a fair signal jump of at least 40% (according to the Diagnose page) on throttle, when switching from ‚Increased Idle Position' to Idle1. Therefore, get the collective/throttle stick to a position where it fits the increased idle value prior to switching. In case the jump was too low, the LED will switch to a blinking light while spooling up.
- When using multiple (more than one) rpm setups, always jump to the lowest rpm first. In this example, do not switch from Normal to Idle2 directly, as this would result in a non working governor function for the lower rpm setup(s). So, always make sure to first jump from Normal to Idle1, and once the defined rpm is reached and the governor locked in, then you are good to switch to higher rpm setups, as well as back and forth between the different Idle setups.
- The frequency supplied to the governor by the rpm sensor must not exceed 7000 rev/min whilst in ‚Increased Idle' position! Make sure that only one magnet is detected per revolution on the motor. This can be ensured by using the Diagnose page's sensor detection check: 1x blink per revolution = 1 magnet detected = ok. Multiple blinks = failure, multiple magnets detected, and therefore false sensor information.

Additionally, when in indreased idle position with motor running, make sure that the unit's LED shows a constant light, no blinking light. If blinking, the rpm detection is too high at that point.









Software parameter

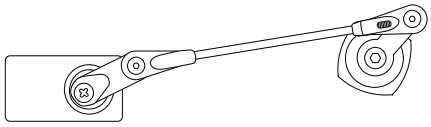
Now set the parameter „Increased Idle Position" to the value that equals the maximum throttle position in Normal, according to the DIAGNOSE's display ‚Throttle/ESC'; in this example ‚-68' (equals the Tx value 15%).

Then set the „Spool Up Time" to define the ramp-up time for the throttle servo from Normal to Idle1 (soft start).

The parameter „Waiting Time" is set to ‚4' with gassers/nitros. This is the buffer time to ensure a properly spooled up rpm prior to the governor taking over control. 4 seconds is, by experience, the best setting to achieve a perfectly reached and, therefore, governed rpm.

Throttle servo linkage

Make sure to link the throttle servo in the most perfect way to the motor. The picture on the right shows how to do this best, and marks the OFF position. All other throttle positions result from this basic setup.



Bailout (applies for gasser/nitro and electric)

To use the bailout function (immediate return of flight rpm after autorotation), the autorotation signal must be programmed in a window between ‚Increased Idle Position'+5% and +25%. In this example this would be between 20% and 40% (Note: radio-specific, depending on throttle range).
When disabling autorotation mode, the flight rpm will be regained within approx 1.5 to 2 seconds. This rpm setup must be exactly the one from before the autorotation. Switching between rpm setups during the autorotation is strictly forbidden.

Example for electric

The basic approach equals the setup for gassers and nitros, especially if the ESC is run in throttle/airplane mode. Only difference is that only the stop position needs to be defined. No running idle or maximum throttle position. The parameter „Waiting Time" and „Spool Up Time" are also set the same way: Waiting Time to ‚4', Spool Up Time to the desired value to achieve the soft start.
When using the external soft start, so the one in the ESC itself, the values are to be set as per the previous page's explanation: Spool Up Time to ‚0', Waiting Time to the time the ESC needs to spool up, plus 4 seconds buffer.
Example: ESC's spool up time is 13 seconds ➜ set AXON's Waiting Time to ‚17'.

VIBRATION ANALYSIS

This page shows the result of the vibration analysis, divided into head, tail and motor sections.
If all sections are green, no critical vibration has been detected.
If critical vibration is detected, the section with the highest vibration will be marked first.

Example:
Tail and head have too high a level of vibration, but the tail is worse. In this case tail would be marked first (yellow or red, depending on the strength of the vibration). Once this issue is solved, in the next step the head would be marked. Once all issues are solved, this will be shown by all sections marked green.

This is how to use this feature: the heli must be flown for 30-60 seconds. It is sufficient to hover or do slow flying. Then connect the system to the software, open the vibration analysis and see the result, as explained above.

Important:
Do check the vibration analysis in the software prior to the next lift-off, as data will be overwritten with the new flight's data at this time.

APPENDIX

TROUBLESHOOTING

SERVOS DO NOT RUN AND LED FLASHES RED

See chapter LED

FINE MOVEMENTS WITH DIGITAL SERVOS ARE HEARD

No problem, these result from the control loop, made audible by modern super-fast servos.

JERKINESS OF TAIL SERVO

If the tail gyro‘s auxiliary channel is at neutral position, it will stay around the switching point between heading hold and normal mode, and may randomly switch it on and off. Use either a positive or a negative signal in the tail gyro channel to define the mode and obtain a “useful” gyro gain.

NO CALM FLIGHT ATTITUDE ON THE TAIL AND/OR HEAD

Extreme vibrations (visible or tangible only) on the housing (especially with gasser/nitro motors) → Observe installation notes. Or non-correct center signals (check in DIAGNOSE).

TILTING DURING PIROUETTES (LURCHING OR TUMBLING MOTION)

- Housing not mounted exactly perpendicular (or aligned with) to the rotor shaft?
- With a neutral signal (when in DIAGNOSE), swashplate not levelled exactly perpendicular to the rotor shaft?
- Self-leveling active?

TILTING DURING PIROUETTES, ONLY DURING STRONG WIND OR IN HIGH SPEED

- Equalize aileron and elevator travel.
- Use similar gain setting for aileron and elevator.

WEAK HOLDING TAIL

- Travel limit and gyro gain correctly set?
- Rpm high enough?

TAIL UNEXPECTEDLY SWINGS OUT TO THE SIDE

- Tail drive (belt or shaft) slipping?
- Too high an angle of attack on tail (stall)?
- Enough power on the tail (rpm high enough)?

WE RECOMMEND FOR YOUR SAFETY

- Always observe a sufficient safety distance from persons and objects, including yourself.
- Do not underestimate the inertia and momentum of rotating rotor blades.
- Always observe legal regulations.
- Keep your distance from radar stations, transmission masts and other radio interference sources.
- When passing on the model to third parties, always pass on these warning notes as well!

DISCLAIMER

Installation, adjustment and operation of the autopilot and a helicopter require appropriate skills. Errors and lack of attention can result in accidents involving severe personal injury and/or property damage, or even traffic accidents. As the manufacturer and seller have no influence on correct handling, these risks are expressly pointed out. Liability for all manner of damage resulting from operation, even due to disruptions of the built-in instruments or signal transmission, is fundamentally ruled out, insofar as legally possible.

WARRANTY

We assume a warranty of 24 months for this device.
Any repairs performed will not extend the warranty period. During the warranty period, we will remedy any occurring malfunctions or manufacturing or material flaws free of charge. Further claims, e.g. in the event of consequential damages, will be ruled out. The unit must be transported to us at no expense to us, and it will also be returned at no expense to us. We cannot accept unpaid consignments. We cannot assume any liability for transportation damage and loss of your consignment. We recommend appropriate insurance.

THE FOLLOWING PREREQUISITES MUST BE MET FOR PROCESSING OF YOUR WARRANTY CLAIMS:

- Purchase receipt included with the consignment.
- The devices have been operated in compliance with the operating instructions.
- The device has not suffered any moisture damage, unauthorised tampering, excess voltages, overloads or mechanical damage.
- If possible, include a description or symptoms of the perceived fault.

NOTE

The content of this document can be amended or adapted without prior announcement.

The bavarianDEMON may be modified at any time on the basis of ongoing tests and resulting improvements. Please inform yourself regularly about current versions of the instructions, bavarianDEMON firmware and any software.

The manufacturer provides no warranty for operability and usefulness in specific applications

The manufacturer is not liable for errors in this documentation and resulting damages in connection with equipment, performance or use of the material.

ACCESSORY

Foam tape ‚Acro' ACP (3 pcs)	No. 96097
Foam tape ‚Soft' ACP (3 pcs)	No. 96098
Cable loom L150 ACP (150mm)	No. 96099
Cable loom L250 ACP (250mm)	No. 96100
GOV Sensor E8 (Electric rpm sensor)	No. 96585
B module	No. 96845

IMPRINT

SERVICE AND INQUIRIES

and lists of authorised dealers, e-mail contact, etc.: see our webpage www.bavarianDEMON.com.

VERSION 1.8

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