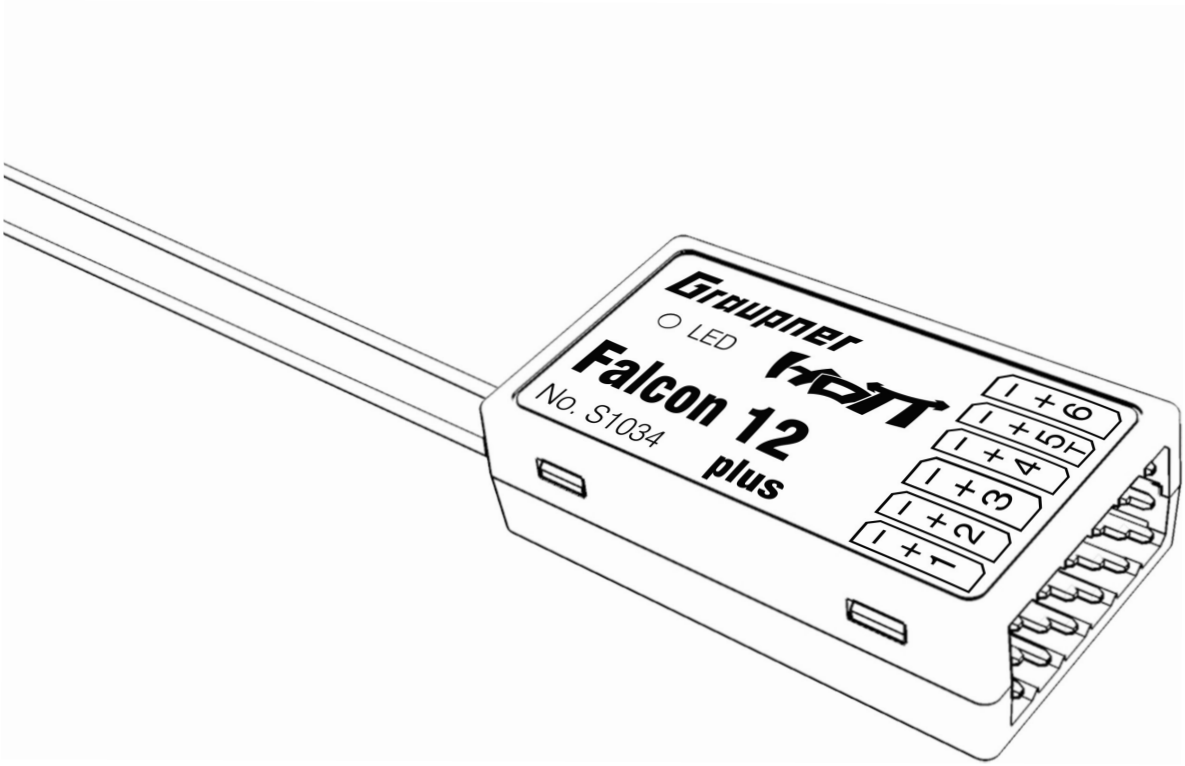
EN

Manual

Falcon 12 plus

HoTT 2.4 GHz diversity receiver with 3 axis gyro, vario and compass

No. S1034



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Graupner

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Introduction

Thank you very much for purchasing the ***Graupner*** **Receiver Falcon 12 plus HoTT 2.4 GHz 3 axis gyro with vario and diversity antennas**. This receiver is extremely versatile. It could be also flashed with a Quadrocopter flight control software and together with the GPS S8437 it does activate the functions Autopilot, Coming home and waypoint flying.

Read this manual carefully to achieve the best results with your receiver and first of all to safely control your models. If you experience any trouble during operation, take the instructions to help or ask your dealer or ***Graupner*** Service Centre.

Due to technical changes, the information may be changed in this manual without prior notice. Keep updated by regularly checking our own website, ***www.graupner.de*** to be always updated with the products and firmware.

This product complies with national and European legal requirements.

To maintain this condition and to ensure safe operation, you must read and follow this user manual and the safety notes before using the product!

Note

This manual is part of that product. It contains important information concerning operation and handling. Keep these instructions for future reference and give it to third person in case you gave the product.

Service Centre

Graupner Central Service

Graupner/SJ GmbH
Henriettenstrasse 96
D-73230 Kirchheim / Teck

Servicehotline

☎ (+49) (0)7021/722-130
Monday- Thursday:
9:15 am- 4:00 pm
Friday:
9:15 am- 1:00 pm
✉ ***service@graupner.de***

Graupner USA
3941 Park Dr Suite 20-571
El Dorado Hills, CA 95762

Website: www.graupnerusa.com
Phone: +1 855-572-4746
Email:service@graupnerusa.com

Graupner **in Internet**

For the service centers outside Germany please refer to our web site ***www.graupner.de***

Intended use

More punctual information about receiver can be found in the Technical data section.

The receiver is designed exclusively to be used in battery-powered, radio controlled models, any other use is not allowed. For any improper use no warranty or liability is accepted.

Read through this entire manual before you attempt to install or use the receiver.

Graupner/SJ constantly works on the development of all products; we reserve the right to change the item, its technology and equipment.

Target group

The product is not a toy. It is not suitable for children under 14 years. The installation and operation of the receiver must be performed by experienced RC models enthusiasts. If you do not have sufficient knowledge about dealing with radio-controlled models, please contact an experienced model builder or a model club.

Package content

- **Falcon 12 plus HoTT 2.4 GHz 3 axis gyro** receiver
- Manual

Technical data

	Falcon 12 plus
Temperature range	- 15...+70 °C
Antenna length	2 x wire 145 mm
Total weight	approx.: 9 g
Frequency	2400 ... 2483.5 MHz
Range approx.	4000 m
Dimensions approx.	36 x 21 x 10 mm
Modulation	2.4 GHz FHSS
Power consumption	70 mA
Operating voltage	3,6 ... 8,4 V

Symbols explication

Always observe the information indicated by this warning sign. Particularly those which are additionally marked with the **CAUTION** or **WARNING**. The signal word **WARNING** indicates the potential for serious injury, the signal word **CAUTION** indicates possibility of lighter injuries.

The signal word **Note** indicates potential malfunctions.

Attention indicates potential damages to objects.

Safety notes

These safety instructions are intended not only to protect the product, but also for your own and other people's safety. Therefore please read this section very carefully before using the product!

Do not carelessly leave the packaging material lying around, since it might become a dangerous toy for children.

- Persons, including children, with reduced physical, sensory or mental capabilities, or lack of experience or knowledge, or not capable to use safely the receiver must not use the receiver without supervision or instruction by a responsible person.
- Operation and use of radio-controlled models needs to be learned! If you have never operated a model of this type before, start carefully and make yourself familiar with the model's reactions to the remote control commands. Proceed responsibly.
- First, always perform a range and function test on the ground (to do so, hold your model tight), before you use your model. Repeat the test with running motor and with short throttle bursts.
- Before you start using the remote control model, you have to check the further relevant laws and regulations. These laws you must obey in every case. Pay attention to the possibly different laws of the countries.
- The insurance is mandatory for all kinds of model operation. If you already have one, please inform yourself if the operation of the respective model is covered by your insurance. If this is not the case, conclude a special liability insurance policy for models. We recommend to provide your model with a label, where your personal data are indicated. So that the model can be clearly assigned in the event of a crash.

- Due to safety and licensing reasons (CE), any reconstruction and/ or modification of the product is prohibited.
- Only use the components and spare parts that we recommend. Always use matching, original Graupner plug-in connections of the same design and material.
- Make sure that all of the plug-in connections are tight. When disconnecting the plug-in connections, do not pull the cables.
- Protect the receiver from dust, dirt, moisture and foreign parts. It must be protected from vibration as well as excessive heat or cold. The models may only be operated remotely in normal outside temperatures such as from-10°C to +55°C.
- Only operate all your components using the current software version.
- If you have questions which cannot be answered by the operating manual, please contact us or another expert in the field.

WARNING

Also while programming, make sure that a connected electric motor cannot accidentally start. Risk of injury by rotating propellers or rotor!

Avoid shock and pressure. Check the receiver regularly for damages to the housings and cables, specially after model crashes. Damaged or wet receiver, even if re-dried, should no longer be used!

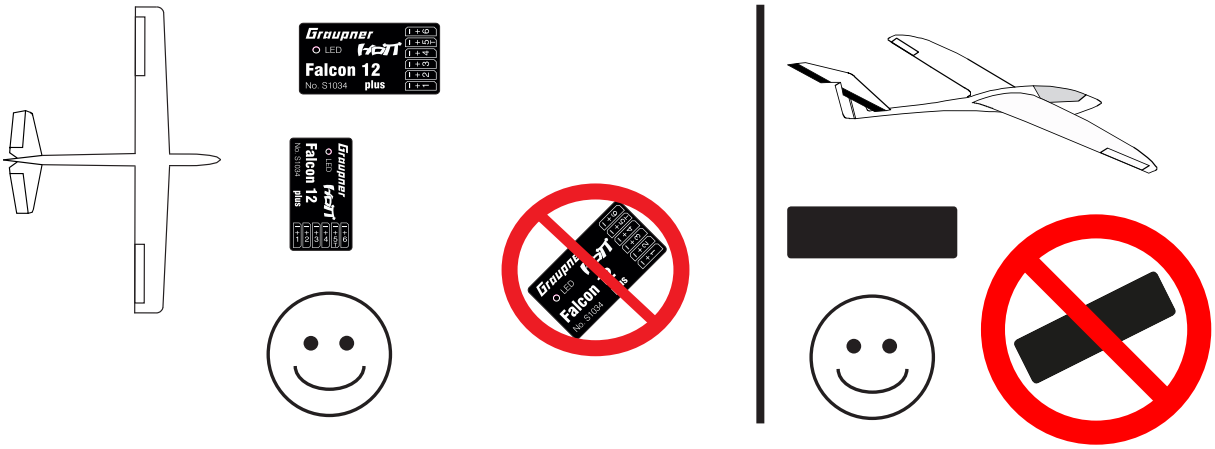
Installation

Fixed-wing model

The receiver must be aligned at right angles to the model on the receiver platform.

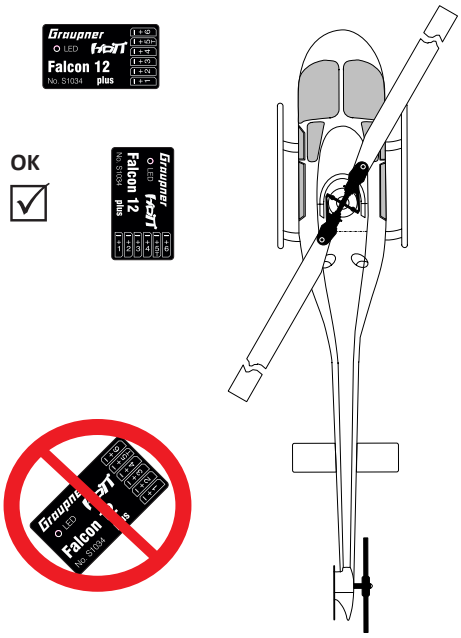
The lower surface of the receiver must always be parallel to one of the model sides.

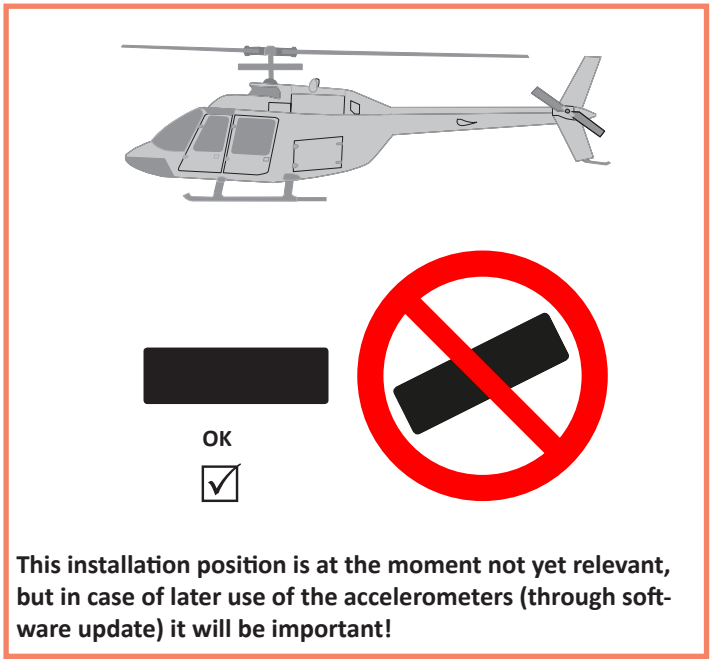
Prior to installation, remove the sticker on the back of the receiver. We recommend using double-sided tape No.: S8376 for Gr-18 to fix the receiver in place. Also the so-called mirror adhesive tape is suitable.



Helicopter model

The receiver must be aligned at right angles to the helicopter on the receiver platform. Prior to installation, remove the sticker on the back of the receiver. We recommend using double-sided tape (No. S8376 for Gr-18) to fix the receiver in place. The receiver must be connected to a stable power supply with at least two power cables. Comply with the maximum power consumption permitted by the servos. All connections can be used for this purpose.





This installation position is at the moment not yet relevant, but in case of later use of the accelerometers (through software update) it will be important!

Binding

The binding is only possible if, since the switch-on of the receiver, it has not been bound to any transmitter (red LED on).

If you want to bind the receiver to a new model memory, proceed as follows:

- Switch off the RF module in the transmitter's "Model base settings" (see transmitter's manual)
- Distance between transmitter and receiver, minimum 1 meter
- Switch the receiver on (red LED on), wait about 15 seconds until the red LED blinks, the receiver is now in binding mode
- Start the binding in the transmitter's "Model base settings" menu
- If the red LED of the receiver switches off within about 15 seconds, the binding process has been concluded successfully. Your transmitter/receiver combination is now ready for use.
- If the red LED is still blinking, the binding has not been successful. In this case please repeat the entire procedure.

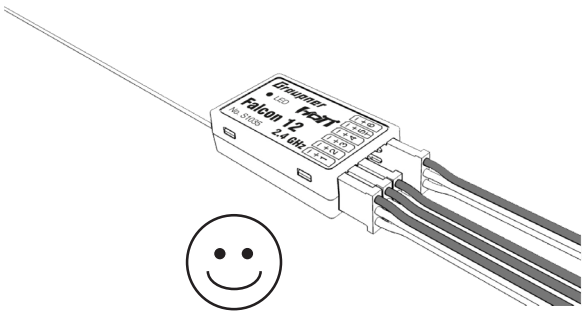
Interfaces

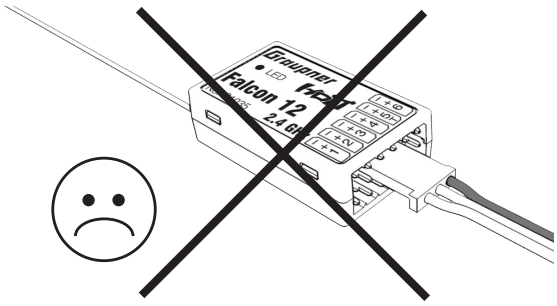
Connect the servos to the row of sockets on one end of the receiver. The connectors are reverse polarity protected: note the small chamfers on the sides. Never use force – the connectors should engage easily. The polarity is also printed on the receiver; the negative wire (-) is brown, the positive (+) red and the signal orange. The servo sockets of Graupner-HoTT 2.4 receivers are numbered sequentially.

The socket for channel 5 can also be programmed to deliver a (digital) sum signal (see receiver settings section).

Attention

Never connect a battery with voltage higher than 8,4V directly to the receiver! The receiver and the connected servos would be destroyed.





Power supply

The receiver does not feature specific sockets for connecting the battery. We recommend that you connect the power supply to the socket(s) close to the servos already connected to the receiver. If you wish to connect multiple separate batteries, the batteries must be of the same nominal voltage and capacity. Never connect different battery types or batteries with strongly different charges since this can cause an effect similar to a short circuit. In such cases for safety reasons, insert voltage stabilizing elements such as PRX-5A (No. 4136) receiver power supplies between the batteries and receiver.

Programming the receiver settings

The receiver can be programmed with a suitable HoTT transmitter or in connection with the SMART-BOX.

```
 RECEIVER 2.0    <
>LANGUAGE:     English
 Ant1: 100% Ant2: 94%
 Model type:      HELI
 ALARM VOLT       3,8V
 ALARM TEMP:      70°C
 Alt max:        100 m
 CYCLE:           20ms
 SUMD at C5:        No
 C5:            Sensor
```

The receiver setup menu appears in the “Telemetry“ menu under SETTINGS / DISPLAYS or if you are using a SMART-BOX under SETTING & DATAVIEW. How to access this menu is described in the operating instructions supplied with your transmitter or Smart-Box.

Ant1 - Ant2

This display shows the received packets / total number of packets in% at the two antennas. The display is used to find the best position of the antennas after the range tests and the flights.

Model type

Setting "HELI" or "Fixed-wing". The following specific setting menus will appear depending on the model type selected. Factory reset for heli settings: Switch from heli to fixed-wing then disconnect the power supply and reconnect it.

Then switch from fixed-wing to heli, disconnect the power supply and reconnect it.

Low voltage warning (ALARM VOLT)

If the receiver voltage or the external voltage at channel 5 falls below the set value, a low-voltage warning is generated by the transmitter's RF module in the form of a "general alarm tone" (regular beeping at a rate of approx. one beep per second) or the "receiver voltage" speech output message.

Temperature warning (ALARM TEMP)

If the receiver temperature exceeds the set temperature, a warning is generated by the transmitter’s RF module in the form of a "general alarm tone" (regular beeping at a rate of approx. one beep per second) or the "receiver temperature" speech output message.

Maximum altitude (Max. altitude)

This is where you can specify a maximum altitude. When the model reaches this altitude, an alarm is triggered either by the transmitter's RF module in the form of a "general alarm tone" (regular beeping at a rate of approx. one beep per second) or the "altitude" speech output message. Note: When the receiver is switched on, the model's current altitude is set to 0; the displayed altitude is therefore the altitude relative to the launch point.

Cycle time (CYCLE)

If your system is used exclusively with digital servos, you can set a cycle time (frame rate) of 10 ms. If your system includes some or uses exclusively analogue servos, you should always select 20 ms, as many analogue servos cannot process the higher frame rate and may respond by "jittering" or "growling".

SUMD (Sum signal) at channel 5

If you activate the digital sum signal at channel 5, a sum signal containing 8 channels is present at this socket, instead of a servo signal. The HoTT receiver configured as SUMD constantly generates a digital sum signal from 8 control signals from the transmitter and makes this signal available at the specified servo socket, which is receiver-specific. This type of signal was being used by some of the newest flybarless systems and power supplies.

Channel 5 (C5)

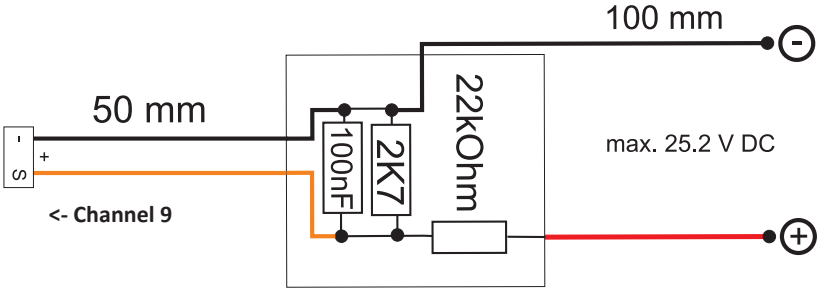
This socket allows you to use either for telemetry "Sensor" or for an extra channel servo 5 "Servo" or or for measuring the voltage "Voltage".

Attention! It is only possible one function at the same time!

Only through the unit described in the introduction it is possible to measure a voltage up to max. 25.5 V DC. This voltage will be shown in the display of the transmitter instead the receiver voltage. This way it is possible to monitor the main battery voltage without using external sensors.

Note

If the voltage measurement is active, the following described switch (see sketch) must be used to measure a maximal voltage of 25.5 V through this output. Never connect a battery to this telemetry port without this switch!



This voltage devider is included in the ESCs S3082 and S3083.

Programming a fixed-wing model

Free mixers

```
FREE MIXER      < >
>MIXER:           1
 FROM CHANNEL:    1
 TO CHANNEL:      6
 TRIM:          +0%
 TRV - :      +100%
 TRV + :      +100%
```

Note

If you wish to use the gyros, you must always set the tail type to ‘normal’ in the transmitter’s model type menu.
If your model is a delta, features a V-tail, or has two elevator servos, you must use the receiver mixer - not the transmitter mixer - to control these control surfaces, since the gyro stabilization system will have no effect on these servos otherwise.
The four receiver mixers work ‘downstream’ of the gyros.
If you have already programmed mixer functions in the “Wing mixers” or “Free mixers” menu of your HoTT transmitter, you must ensure that those mixers do not overlap with those available in this menu!

Mixer

Up to four mixers can be contemporaneously programmed . You can switch between Mixer 1, Mixer 2, … and mixer 4 in the “Mixer” line.

The following settings only affect the mixer selected in this line.

From channel

The signal source (or source channel) is mixed in to the target channel (TO CHANNEL) with a programmable amount. The method of setting up the values is analogous to the “Free mixers” menu in HoTT transmitters.

To channel

TO CHANNEL: part of the source channel signal (FROM CHANNEL) is mixed into the target channel (TO CHANNEL). The mixer ratio is determined by the percentage values entered in the “TRAVEL-” and “TRAVEL+” lines. Select "0" if you do not want to activate any mixer. Mixer ratio (TRAVEL-/+): in these two lines you can define the mixer ratio in relation to the source channel (FROM CHANNEL); the value is set separately for both directions.

Programming examples

V-tail with rudder differential

```
FREE MIXER    < >
>MIXER:          1
 FROM CHANNEL:   3
 TO CHNNEL:      4
 TRIM:         +0%
 TRV - :     +100%
 TRV + :     +100%
```

```
FREE MIXER    < >
>MIXER:          2
 FROM CHANNEL:   4
 TO CHANNEL:     3
 TRIM:         +0%
 TRV - :      -60%
 TRV + :     +100%
```

```
FREE MIXER     < >
>MIXER:          3
 FROM CHANNEL    4
 TO CHNNEL:      4
 TRIM:         +0%
 TRV - :     +100%
 TRV + :      +60%
```

Differential is not normally necessary with this tail type. Mixer 3 is not required if you do not need rudder differential, and TRAVEL for mixer 2 must then be set to-100%.

Alternatively you may prefer to carry out the programming using the transmitter menu.

A ‘Rudder / elevator’ mixer can be set up at the transmitter instead of ‘Free mixer 3’ at the receiver; the mixer should be set up asymmetrically, e.g. +30%, -30%. This option frees up one mixer at the receiver.

Delta with aileron differential (1 aileron)

```
FREE MIXER    < >
>MIXER:          1
 FROM CHANNEL:  2
 TO CHANNEL:    3
 TRIM:         +0%
 TRV - :    +100%
 TRV + :     +60%
```

```
FREE MIXER    < >
>MIXER:          2
 FROM CHANNEL:  3
 TO CHANNEL:    2
 TRIM:         +0%
 TRV - :    -100%
 TRV + :    -100%
```

```
FREE MIXER    < >
>MIXER:          3
 FROM CHANNEL:  2
 TO CHANNEL:    2
 TRIM:         +0%
 TRV - :     +60%
 TRV + :    +100%
```

In this example aileron differential is set to 40%. Alternatively you may prefer to carry out the programming using the transmitter menu. A ‘Aileron-> elevator’ mixer can be set up at the transmitter instead of ‘Free mixer 3’ at the receiver; the mixer should be set up asymmetrically, e.g. +30%, -30%. This option frees up one mixer at the receiver.

Two elevator servos

(channel 6 for the second elevator servo)

```
FREE MIXER     <  >
>MIXER:           1
 FROM CHANNEL:    3
 TO CHANNEL:      6
 TRIM:           +0%
 TRV - :      +100%
 TRV + :      +100%
```

Only for transmitters without a butterfly (crow) mixer

If a butterfly (crow) mixer is required, you will not be able to use one of the two functions ‘differential’ or ‘landing flap’ adjustment, as 2 mixers are needed for this.

Programming examples

```
FREE MIXER    < >
>MIXER:          1
 FROM CHANNEL:   1
 TO CHANNEL:     2
 TRIM:          +0%
 TRV - :     +100%
 TRV + :     +100%
```

```
FREE MIXER    < >
>MIXER:          2
 FROM CHANNEL:   1
 TO CHANNEL:     5
 TRIM:          +0%
 TRV - :     -100%
 TRV + :     -100%
```

Programming examples

```
FREE MIXER    < >
>MIXER:          1
 FROM CHANNEL:   1
 TO CHANNEL:     2
 TRIM:          +0%
 TRV - :     +100%
 TRV + :     +100%
```

```
FREE MIXER    < >
>MIXER:          2
 FROM CHANNEL:   1
 TO CHANNEL:     3
 TRIM:          +0%
 TRV - :     -100%
 TRV + :    -100%
```

Gyro assignment

```
Axis assignment < >
>AILERON SERVOS: 2
DO SETUP:        yes
AILE: (right)    +2
ELEV:(push)      +0
RUDD:(right)     +0
```

→

```
Axis assignment < >
>AILERON SERVOS:  2
DO SETUP:        No
AILE: (right)    +2
ELEV:(push)      +1
RUDD:(right)     -3
```

Aileron servos:

You should enter the value 2 in this line if your model has two aileron servos. In this case the gyro for channel (servo) 2 also acts on servo 5. If the ailerons are also used as flaperons or speedbrakes, gyro suppression is based on the sum of both channels.

Note

The servo reverse setting must be the same for both aileron servos, i.e. either both 'normal' or both 'reverse'. If this is not possible, on no account should you reverse one servo in the transmitter menu. The only option is to re-install it in the model by turning it round physically.
However, if your model is fitted with programmable servos (e.g. Graupner DES, HVS or HBS types - see the instructions for the update program 'Firmware_Upgrade_grStudio - then it is possible to reverse the direction of rotation at the servo itself.
Please read the installation notes on page 8 of these instructions. The first step is to define the three gyro axes and the orientation of the receiver. This is accomplished by switching on the transmitter and model, and selecting 'DO SETUP: yes' in the receiver's 'Gyro settings' menu.

- Now move the stick for any control surface to full travel (in the servo display at least 25%) in the indicated direction; in the following example we use the aileron channel.
- The detected axis (aileron) is highlighted (black background). (In the receiver's default state the value for all axes is shown as '+0'; the axes can also be set manually to '+0'. 0 = inactive)
- Now turn the model through at least 45° in the direction corresponding to the stick movement. For example, if you moved the aileron stick to the left, you must simulate a left turn with the model-> move the left wing down through at least 45°.
- This process defines the one axis and direction; now you must repeat the procedure for the other two axes.
- The gyro axis 1, 2 or 3 is now displayed in the 'Aileron / Elevator / Rudder' display; a negative prefix will appear if servo reverse is activated.
- Once all three axes are defined, the display automatically reverts to 'New setting: no'.

CAUTION

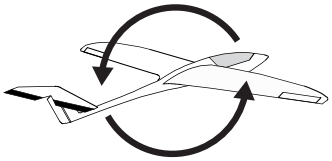
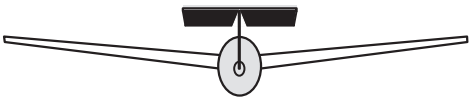
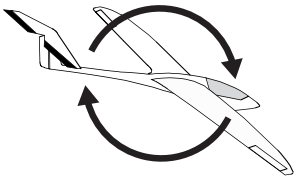
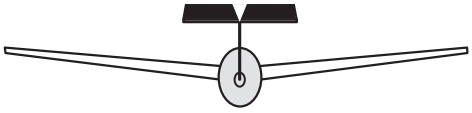
Check that all the gyros are working in the correct direction!

Move the model in all axes directions. Check the movements and travels.

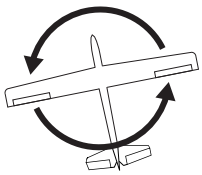
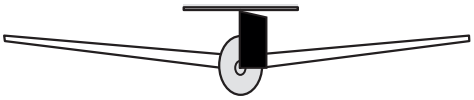
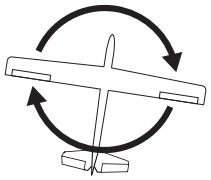
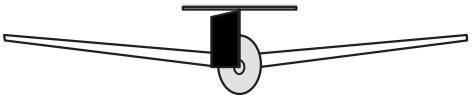
Now check the control surface deflections - see diagrams below.

You must not fly the model before doing this: crash hazard!

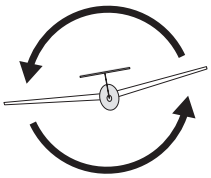
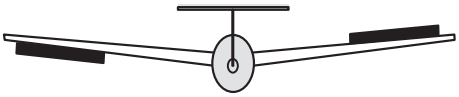
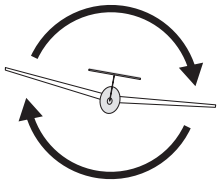
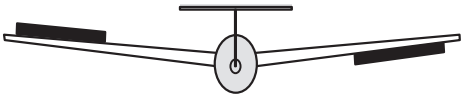
Elevator

Movement of the model	Control surface action (tail view)
	
	

Rudder

Movement of the model	Control surface action (tail view)
	
	

Aileron

Movement of the model	Control surface action (tail view)
	
	

Note

Before you start entering settings for a new model, it is essential to select the number of aileron servos in the Aileron servos menu point, and to define the gyro axes and orientation in the New settings menu point.

Programming the regulation

Gyro setting display

```
GYRO SETTINGS< >
MODE AIL/ELE (2)CH7
MODE RUDD    (2)CH7

>Aileron:          0
 Elevator:         0
 Rudder :          0
 Factor : (44%)C10
```

MODE

In this point you can select the gyro correction mode (0-3):

0- no gyro correction

1- normal gyro correction (P and D parameter)

2- heading lock mode (I parameter) with suppression
(Outside the suppression area the gyro control is active, in stick center position acts the heading lock)

3- Rate mode
(Heading lock acts in stick center position through the entire area)

Note

In Heading lock mode the servos are moved to the center position if the factor is set to 0%.

Mode switching

The mode can be set separately for AILE/ELEV and RUDD. The mode can be set permanently or it can be switched through an assigned channel. Program the selected channel in your transmitter with a switch, the following positions switch the related mode:

Mode 0	- 100%
Mode 1	- 50%
Mode 2	0%
Mode 3	≥ 50%

Preparation step by step:

1. Trim the model with the gyro correction off
2. Switch the receiver off and on to save the values as standard
3. Activate the gyro correction
4. **The phase trim should not be used!**
5. Set the factor for gyro correction, eventually check the values for the single control surfaces

Note

If the model is too agile in mode 3, it is then recommended to set in the transmitter DUAL RATE and/or EXPO for this mode. Thus the model will react in a more docile way. In the Rate mode the model tries to reach the controlled rate. Also in mode 2 EXPO can be useful.

Aileron/elevator/rudder:

Shows the programmable factors for the corresponding control surface.

The gyro correction can also be disabled by setting the value to "OFF". Do not exceed 4 - 5 as maximum value for the normal flight phase, 2 - 3 for speed, 3 - 6 for landing. The maximum value of 10 should be reserved for torque-rolls only.

Factor (general sensitivity)

Setting this value the 3 parameters will be influenced contemporaneously.

General sensitivity for all gyros, action grade settable through a controller between 0 and 200%

Move the cursor to the Factor line. Move the cursor to reorder the factor for aileron, elevator and rudder by using a proportional control (adjustment range up to 200%; channel value -100% means a factor of 0%, channel value 0% means 100%, and +100% means 200%). This makes it a very easy matter to match the gyro's corrective effect to the model's airspeed. In particular, higher gyro gain can be used for the landing approach- without the need to switch flight phases.
Once you have found the optimum settings, you can set up a transmitter switch to control the gyro, i.e. for switching between gain settings. For example, you could assign a 3 position switch to "Factor", and then use it to switch the values between 0% and 100% (OFF) so as 200%. In the transmitter the servo display for this 3 functions switch must indicate -100, 0 and +100%.

Note

The OFF value means a gyro action of 100%!

Good to know!

The standard factor should cause the gyros to correct the model's attitude quickly when it is upset by an outside influence. Without causing oscillation, but in practice the optimum values for a particular model can only be found by flight-testing. If the model shows little or no automatic stabilization with the default settings, the value should be raised; on the other hand. If the model oscillates (wave-like movements in flight), the value should be reduced.

Some transmitters allow the corrective factors to be altered during a flight using the proportional controls, whereas others allow fixed values only.

Flight phase specific settings

It is possible to use a channel to control the factor value by setting up flight phase specific transmitter control settings, but only with some transmitters; please see the instructions supplied with your transmitter and refer to the “Transmitter control settings” and “Flight phase settings”.

Programming the axes sensitivity

```
GYRO SETTINGS< >
MODE AIL/ELE (2)CH7
MODE RUDD    (2)CH7

>Aileron:     (2)C9
 Elevator:    (3)K8
 Rudder :          6
 Factor : (44%)C10
```

Programming through transmitter with proportional controls

If your HoTT transmitter is equipped with proportional controls, it is also possible to adjust the value for each axis during a flight: what you might call ‘flying the settings’. You need to assign proportional controls to any channel in the range 5 to 16 (in this example channel 9); now you can alter the value using these controls. The current value is shown in brackets.

Procedure, using the ailerons as an example: step by step:

1. Move the cursor to the appropriate line, in this case “Ail” for aileron.
2. Press the SET button to activate the "Channel" field.
3. Select the appropriate channel and save the setting with pressing the SET button again
4. Move the related proportional control to change the value (range between 0 and 10, where 0 means no gyro correction for the related axe).
5. This value can also be changed by pushing the left or the right button. This frees up the channel previously occupied by the proportional control, So that it can be used for some other purpose, e.g. for elevator or rudder.
6. Move on to elevator and / or rudder, and select the channel and value (you can either select the same channel, in order to alter all the axes simultaneously, or different channels, allowing you to program the axes individually).
7. Now test-fly your model and fine-tune the values one by one until your preferred stabilising effect is achieved without the model oscillating.
8. It may be sensible or easier to activate the gyro for one axis only at first, and then to establish the optimum setting for that axis, rather than for several axes simultaneously.

```
GYRO SETTINGS< >
MODE AIL/ELE (2)CH7
MODE RUDD    (2)CH7

>Aileron:         2
 Elevator:        4
 Rudder :         6
 Factor :       Off
```

Programming by transmitter without proportional controls

1. Select by mode "0"; this function is only possible in case of transmitters with proportional controls.
2. Move the cursor to the appropriate line, in this case “Ail” for aileron.
3. Press the SET button to activate the input field. Select the appropriate value (1-10 or OFF) and save the setting with pressing the SET button again.

4. First select a low value (see value section for starting points) and carry out a test-flight. If gyro stabilization is not sufficiently pronounced, increase the value step by step until the level of correction is as required; if the model already oscillates, reduce the value step by step.
5. Move on to "elevator" or "rudder" and select the desired value (or OFF).
6. Leave the settings for “Factor” to OFF.
7. Activate the gyro for one axis only at first, and then to establish the optimum setting for that axis, rather than for several axes simultaneously.

Initialization of the gyro

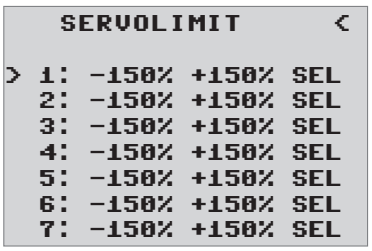
Once the model has been switched on, the gyro immediately becomes active but still needs to be initialized. To initialize the gyro, keep your model still when you switch it on. After approx. 2 seconds in still position, the ailerons move briefly in both directions. These "wiggles" indicates that initialization has been successful and that calibration is complete. Only now the model can be moved again.

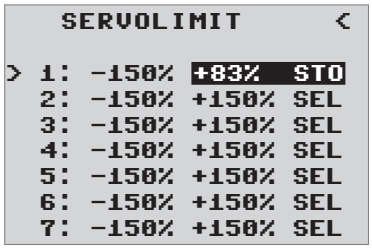
Al the sticks must be left in the central position!

Note

During the initialization the neutral position will be detected, for this reason it is very important that the model is not moved during the activation!
In the same way during the gyro initialization also the central position of each control channel is saved. By gyro suppression the gyro correction is reduced with increasing control deflection, at +/- 100% of the gyro is deactivated.

Adjust servolimit for channels





In this menu, you can limit the servo travel for all channels. Limit the servo travel to the maximum possible deflection, so that the servos can not run in the stop in the gyro operation. Move the cursor to the desired line (by further downward move of the cursor will be displayed further channels), here “1” for channel 1 Pressing the SET button is pressed the “SEL” field in “STO”.

Now move the stick of channel 1 in the desired direction and position, while the corresponding percentage display is shown inverted. Now press the SET button again and the set value is displayed and stored. Go through the procedure for the other channels.

Programming a helicopter model

Preparing the helicopter

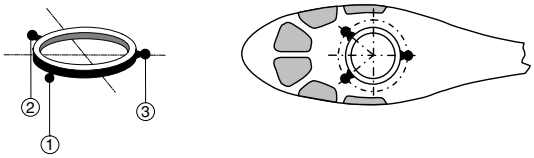
Set all servos to neutral; the arms must be at right angles and the swashplate must be in the neutral position (perpendicular to the main rotor axis). The swashplate pushrods must be the same length.

Transmitter presettings

Select the free/deleted model memory and activate the helicopter model. Set the pitch front/back according to your personal preferences and do not change it anymore.

All trims must be set to 0 (Servo display 0%) and must not be altered in flight under any circumstances. If possible, trims should therefore be deactivated in the transmitter (set the trim steps to 0).

- Activate or retain the servo for swashplate type 1 (the swashplate mixer is implemented in the FBL system of the receiver).
- The settings for the servo travel and direction remain at first to standard, 100% and not reversed.
- Do not connect the tail servo if it does not have a mid-point of 1.5 ms (standard).
- Swashplate servo arrangement at 120/135/140°:
- front left = 1, front right = 2, back =3



- If the swash plate is turned of 180° and the nick servo is forward, the connection sequence does not change. The left roll servo is always 1.
- Bind the receiver to the transmitter.

Initializing the gyro (helicopter)

Once the model has been switched on, the gyro immediately becomes active but still needs to be initialized. To initialize the gyro, keep your model still when you switch it on. The calibration process can only be performed when the receiver is absolutely still. After approx. 3 seconds in the idle position, the swashplate moves briefly three times. These "wiggles" signal that initialization has been successful and that calibration is complete. Always wait until the calibration process has finished before starting to fly the model.

Procedure

1. Once the transmitter and helicopter have successfully been prepared, call up the Telemetry menu in the transmitter (see transmitter instructions).
2. Set in the receiver the model type "Hely" (see section "Receiver settings"). Then change to the menu "Base setup contr.".
3. Scroll past the swashplate/tail setup menus; these will be used later on.
4. **You must work through each item of this menu in order from top to bottom:**

Base setup controller

```
 BASE  SETUP CONTR.<v>
>Rotating dir     right
 Swp Type       120 deg.
 Swp Frequency    200Hz
Swp direction        +0
 Swp Roll Trim       +0
 Swp Nick Trim       +0
 Swp Pitch Trim      +0
```

↓ ↓

```
 Swp travel 8d     +80
 Collective_B      +80
 Cyclic max        +80
 Swp rotate         +0
 Tail servo      1.5ms
 Tail frequency 333Hz
 Tail mid           +0
 Tail limit B      +50
 Logging            +3
 Expertmode         No
```

When a value is activated in the basic setting control, the gyro control and partly the control are deactivated! Therefore, settings must not be carried out in the air, but must be carried out on the ground without speed!

Rotation direction

Here you can set the direction of the rotor rotation, seen from above the helicopter. Right or left

Swp type

Swashplate type: select the correct swashplate type. 90°, 120°, 135°, 140°.

Default setting 120°

Swp frequency

Swp frequency: frequency for the swashplate servos

50-200, default setting: 200 Hz

Warning: Analogue servos may only be operated at 50 Hz. If they are not, the servos will be destroyed. Many digital servos can be operated at a higher frequency. (Use at your own risk). This allows the model to be controlled more quickly. With HBS servos, we recommend setting the frequency to 200 Hz.

Swp direction

0-3, default setting: 0

Here, a fixed servo-combination of the Swp servos is selected, in which the Swp does not tip during "pitching". (pitch direction is set under C1 in the transmitter's servo menu with servo reverse, if required).

Now check the direction of rotation of the swash plate for pitch, roll and nick. If one of the control functions is reversed, the servo reversal must be performed as follows in the transmitter's servo settings: Reverse for pitch = C1, for roll = C2 and for nick = C3.

Aile trim, Elev trim and Collective trim

-400 - +400, default setting: 0

The swashplate must be aligned as far as possible at right angles to the main rotor axis and with 0° pitch. By activating one of these 3 values, the gyro control switches off and the servos move into their neutral position. After that, the swash plate can be aligned optimally with Elev trim, Aile trim and Collective trim. A perfect setting is achieved when the rotor plane does not move in flight when the pirouettes are performed.

Swp cyclic travel 8

50-125, default setting: +80

Set the Swp cyclic travel 8° if the menu value is activated so that the rotor blade located above the tail tube is as accurate as 8° by full roll-over stroke. To do this, the field must be selected (highlighted field) so that the swashplate can be controlled and adjusted in direct mode when gyro gain is switched off. This is the only mode in which the travel can be set correctly.

It is very important that the travel is set correctly. It plays a major role in terms of acquiring the correct gyro gain.

Collective_A/B

50-120, default setting: 80

It is selected automatically based on the pitch stick travel on the transmitter. Use the pitch gauge to measure the required pitch travel when the full commands are applied (+-100%) and set it in this menu. All of the other settings can be made later on the transmitter for the pitch curves in the respective flying phase.

Swp limit

50-200, default setting: +80

Swashplate limit. The swashplate limit must be set so that it is not possible for a servo to reach its mechanical limits, while ensuring that the servo's travel is as large as possible. No humming should come from any of the servos when full travel commands are applied.

Swp rotate

-90-90, default setting: 0

"Swp rotate": a virtual Swp rotation (in degrees) can be set here (for certain systems with several blades). Normally for rotor heads with up to a 3 bladed no rotation is necessary.

The Swp (swashplate) is now fully set up and you can move on to the tail:

Tail servo

Default setting: 1.5 ms

"Tail servo": select the correct mid-point for your tail servo here.

Mid pulse: 1,5ms, 760µs or 960µs.

Default setting: 1.5 ms. 1.5 ms is generally the default setting for tail servos. Narrowband servos (generally special tail rotor servos) may however require a different mid pulse width. You must locate this value in the servo manual and set it correctly. If a value has not been specified, it is probably a standard servo set at 1.5 ms. If you have a DES, HVS or HBS servo, this value can sometimes be programmed. However, we recommend sticking with the default setting.

The control direction of the tail rotor can now be checked. If it is reversed, the servo reversal of channel 4 must be performed in the transmitter's servo settings.

Tail frequency

"Tail frequency": the tail frequency can be set to between 50 and 333 Hz.

Default setting: 333 Hz

Warning: Analogue servos may only be operated at 50 Hz. If they are not, the servos will be destroyed.
Many digital servos can be operated at a higher frequency (use at your own risk).

This allows the model to be controlled more quickly. With HBS servos, we recommend setting the frequency to 333 Hz.

Tail center

-100 - +100, default setting: 0

If the value "Value tail center" (inverted field) is activated, the tail servo moves to the neutral position. The tail servo arm should be at a 90-degree angle to the tail linkage pushrod.

The fine trim is then adjusted based on the mid-point of the tail. When the servo is set to neutral, the tail rotor should have a pitch angle of approx. 2 to 3° against the torque. Check whether the control direction is correct, if not then reverse the servo channel of C4 in the transmitter.

Tail limit A/B

50-200, default setting: +50

Limits the tail servo travel. Select the direction by moving the tail stick to its endpoint. The display shows the values for A and B for both endpoints, which are set separately. It must be set so that it does not reach its mechanical limits but so that the full travel can be used. Values that are suitable in terms of aerodynamics should be selected here. If the travel is too large, this may cause the servo to stall.

Logging

Default setting: +3

logs the corresponding servo to SD card of the transmitter for later evaluation and error analysis with active flight timer.

0 = no logging

1 = roll and nick logging

2 = roll logging

3 = nick logging

4 = tail logging

We recommend always logging at least one function.

Expertmode

"Expertmode" is set to "No" by default. Even experts should stick with this setting when carrying out the first steps with the new system. There are much fewer options in the Swp and tail menu and they should only switch to Expertmode and its additional options if they need to and when they have got used to the system.

Axis assignment

```
  Axis assignment   <

>DO SETUP:        Yes
 Roll (right):     +2
 Nick (push)       +0
 Tail: (right      +0
```

```
  Axis assignment   <

>DO SETUP          No
 Roll (right):     +2
 Nick: (push):     +1
>Tail (right):     -3
```

DO SETUP

DO SETUP: Yes/No

Assignment of the gyros and their operating direction.

If you have not already done so, you must now set the C1-4 servo directions so that everything works correctly.

In the receiver's "Axis assign" menu, go to the "Setup" option and set it to "Setup: Yes". Now assign the axes as follows:

On the transmitter, briefly set the roll command fully to the right; the roll axis is highlighted. You will then have both hands free again to operate the helicopter.

Roll the helicopter more than 45° to the right → the identified axis with the required prefix is displayed, the field is no longer highlighted and identification of this axis is complete

Now do the same for nick: on the transmitter, briefly set the nick command so that it is fully forward.

Roll the helicopter more than 45° forwards; the axis is displayed, the field is no longer highlighted and identification of this axis is complete

Finally complete the procedure for the tail: on the transmitter, briefly set the tail command fully to the right

Turn the helicopter so that the nose turns more than 45° to the right; the axis is displayed, the field is no longer highlighted and identification of this axis is complete.

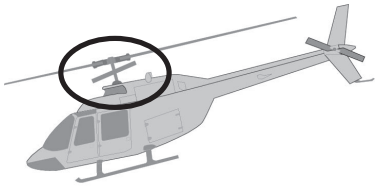
The assignment of the axis assignment automatically adjusts the pirouette optimization. If the tail servo direction is subsequently changed, the axis assignment must be performed again.

The gyros and operating directions have now been assigned. Now check to make sure that the operating directions are correct. See the illustrations below.

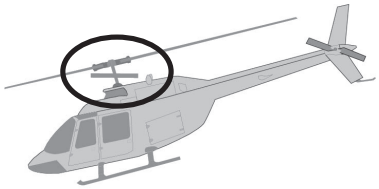
Checking nick

Tilt the helicopter so that its nose is facing downwards; the swashplate moves consequently backwards.

Incorrect!



Right!



Checking roll

Tilt the helicopter to the right; the swashplate moves consequently to the left.

Checking the tail direction of operation

This effect depends by the helicopter, the left-hand or the right-hand rotator, as well as the side and the direction of rotation of the tail rotor. Refer to the heli's instructions for this information.

If one of the directions of operation is wrong, you must repeat the axis assignment process. As a result of the control, the servos no longer return to their zero position or move slower. This is not a mistake and it will not be noticeable in the air, since then the regulation can work freely.

Note

However, we strongly recommend flying your model first using the settings without Expertmode. If the directions are changed on the transmitter due to any modifications being made to the helicopter (e.g. new servos) or if the receiver is installed in a different position, the axis assignment procedure must be fully repeated.

Swashplate setting without Expertmode

```
SWASHPLATE ADJUST<v>

Swp sense      (5)C9
Swp rate       +100%
Expo Swp          +1

Direct stick R +100
Direct stick N +100
```

SWP sensitivity

1-100, min or C5…C16

Default setting: 70

The "SWP sensitivity" row allows you to specify a sensitivity setting either using the values 1 to 100 or by assigning a channel (C5 to C16) with a proportional control, which is used to control the value.

Different settings can then be used through the HoTT transmitters to adjust the sensitivity based on specific flight phases, eg through the control settings or the "Gyro" in the hely mix menu.

If the values are too high:

The heli oscillates around the rotor shaft. In this case, the sensitivity should then be reduced somewhat until vibration-free flies are possible in all flight situations.

If the values are too low:

Helicopter no longer hovers in a stable manner, susceptible to wind.

Swp rate

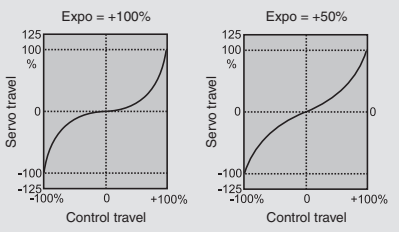
50-120, default setting 85

Sets the max. potential rate of rotation in Rate mode for roll and nick.

Expo Swp

0-50, default setting 15

You can set here an exponential curve (0 - 50%) for the rate of roll and nick. Low percentages result in a linear increase in the rate of rotation. High percentages a strong curve, the heli then no longer reacts so sensitive to the center of the stick. We recommend to use the Expo in the GR18 or in the transmitter. When using the expo in the transmitter, the value here must be set to 0, otherwise the two Expo settings overlap.



Direct stick R (Roll), Direct stick N (Nick)

20-150, default setting +115

The direct stick setting allows you to set the direct response of the helicopter to the pilot's commands. If the nick command stops abruptly, the helicopter will oscillate if the value is set too high.

Swashplate setting with Expertmode

```
SWASHPLATE ADJUST<v>
>SWP sensitivity(5)K9
 Swp rate        +85
 EXPO Swp        +15
 Direct stick R +125
 Direct stick N +125
 P swp          +100
```

```
 I Swp            +70
 D Swp            +25
 Speedflight      +20
 Stop optimizer    +6
 Anti-ballooning   +0
```

(See above for swashplate sensitivity menu item)

(See above for Rate and Expo menu item)

(See above for direct stick menu item)

P swp (proportional) swashplate

Swashplate P-factor

40- 125, default setting: +90

The P swashplate option is responsible for effecting a harder stop with the swashplate. Higher values result in a faster stop. If the P values are too high, the helicopter and/or the swashplate will start to "oscillate". In such cases, the value must be reduced again.

I swp (integral) swashplate

Swashplate I-factor

30- 125, default setting: +85

The I-factor ensures constant rolling/nicking. Start with low values and only increase them until the roll and nick rates are constant.

D swp (differential)

D-factor for swashplate

0- 70, default setting: +40

The D swp D-factor influences the how the swashplate is stopped.

If the helicopter bounces somewhat when nick is stopped, this parameter should first be increased in small increments to test the nick stop. If the optimization was unsuccessful, return to the factory defaults and continue with the Stop Optimizer setting.

Swp dynamic

10-100, default setting: 90

Higher dynamic values provide a more direct control feeling, lower values result in a smoother control feel. If the values are too high, the swashplate does not stop and it can overflow. If the values are too low, the control behavior becomes softer.

Speedflight optimisation

10- 40, default setting: +15

When the helicopter is flying quickly in a straight line, it should fly precisely in one line/at one altitude and not in a wave form. If the helicopter flies in a wave form, the value can be increased until the helicopter flies straight. This parameter should generally not be changed.

Stop optimizer

0- 10, default setting: 0

The value 0 means that the default stop optimizer is activated. The values 1-10 are provided for the individual adjustment of the extended stop optimizer. If the value is too low, the helicopter jerks up during the fast pitch stop. If the value is too high, the system can oscillate or the stop can be executed in two stages.

Anti-ballooning

0- 50, default setting: 0

During an extreme fast flight, the heli can suddenly rebound without control inputs. This is due to physical factors and depends on the rotational speed of the main rotor and the pitch angle of the rotor blades (pitch).

Pilots who want to fly safely in this border area can also activate this parameter.

The default value is "0", the compensation is switched off by default. The "Anti-ballooning" parameter can be adapted to each heli individually.

If you want to use the Anti-ballooning compensation, start with the value "30". A reduction of the parameter eg to the value "25" increases the "rearing" tendency. An increase to, for example, "35" reduces the tendency but can also adversely affect the final speed.

You need to find an optimal compromise between safe flight behavior without rearing and maximum speed. For this, first start in 5 steps and then make the fine tuning in 1 steps.

Tail rotor setting without Expertmode

```
   TAIL ADJUST<v>

>Tail sensitiv.   65
 Tail rate      +85
 EXPO tail      +40
```

Tail sensitivity

1-100, min or C5…C16

Default setting: 65

The "Tail sensitiv." row allows you to specify a sensitivity setting either using the values 1 to 100 or by assigning a channel (C5 to C16) with a proportional control, which is used to control the value.

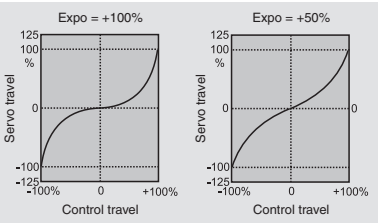
The max. tail sensitivity is first determined at the highest speed and it should be flown individually for each speed. It can be increased until the tail begins to swing up. Afterwards, the tail sensitivity has to be reduced a little, until in all flight positions no swinging of the tail is recognizable anymore.

Different settings can then be used through the HoTT transmitters to adjust the sensitivity based on specific flight phases, eg through the control settings or the "Gyro" in the hely mix menu.

Tail rate

50-120, default setting: 85

Sets the max. potential rate of rotation in Rate mode for the tail.



Tail Expo

0-50, default setting: 40

You can set here an exponential curve (0 - 50%) for the rate of the tail. Low percentages result in a linear increase in the rate of rotation. High percentages produce a strong curve, the heli then no longer reacts so sensitive to the center of the stick. The Expo setting can also be adjusted in a phase-related manner at the transmitter. But avoid a overlapping of GR18 Expo and transmitter Expo.

Tail rotor setting with Expertmode

(See above for tail sensitivity menu item)

```
Tail rotor adj.<v>
>Tail sensitiv.(5)C9
 Tail rate        +85
 EXPO tail        +40
 P tail           +80
 I tail           +70
 D tail           +15
 Pitch->Heck      +25
```

```
 Swp-> Tail        +4
 Swp dynamic      +65
 Anti ballooning. No
 Stop damp.   R   +5
 Stop damp.   L   +5
```

P tail

Tail P-factor

40-125, default setting: +80

The P tail option is responsible for effecting a harder stop with the tail. Higher values result in a faster stop. If the P values are too high, the tail will start to "oscillate". In such cases, the value must be reduced again.

I tail

Tail I-factor

20-100, default setting: +70

The I-factor ensures constant pirouetting. Start with low values and only increase them until the pirouettes are constant. If the values are too high, this will cause the tail to oscillate slowly.

D tail

Tail D-factor

0- 50, default setting: +15

The tail D-factor influences how the tail is stopped. If the tail bounces somewhat when the tail is stopped, this parameter should first be increased in 5-degree increments to test the tail stop.

Pitch->tail

Pitch->tail
0- 80, default setting: +25

Swp->tail

Swp->tail
0-40, default setting: +4

Static torque compensation for pitch and cyclic.

These two functions work best when they are set together.

Pitch>tail: In the event of fast pitch pumping and swashplate movements, the tail should remain stable even when load is applied. If the tail swings out briefly, the "Collect. torque" setting can be increased until the tail stops.

On the ground, you can easily check whether the tail is working against the torque.

Swp->tail is useful with slow-speed tail rotor with less tail power and is then set to 1/3 of the value of pitch-> tail. With high speeds and good rear power the value can be set to 0.

Tail dynamic

10-100, default setting: 65

Higher dynamic values provide a more direct control feeling, lower values result in a smoother control feel. If the values are too high, the tail does not stop and it can overflow. If the values are too low, the control behavior becomes softer.

Vibration damping

YES-NO, default setting: NO

The vibration damping automatically detects emerging vibrations at the tail rotor, e.g. at extreme speed flights (wind flag effect) or strong speed changes in some 3D maneuvers (over-speed) and prevents an extremely strong swing-up. The tail rotor should be set free of vibrations without active vibration damping in 3D and normal flight situations, only with a solid basic setting it makes sense to activate the vibration damping.

Stop damping R / Stop damping L

0-20, default setting: 5

The rear stop parameter on the right and left optimizes the stop behavior after a yaw movement. The tail should stop as quickly as possible without moving back. Select the value so low that the tail does not move back at when stopping. The higher the value, the more the stop is dampened. Determine the value in steps of 1.

Firmware update

Updates to the receiver's firmware are made via the output channel 5 / telemetry socket using a PC running Windows. You will also need a USB interface, order No. 7168.6, and adapter lead, order No. 7168.6A or 7168.S, which are available separately.

The programs and files required can be found in the Download area for the corresponding products at:

www.graupner.de

Connect the adapter lead to the USB interface No. 7168.6. The connectors are reverse polarity protected: note the small chamfers on the sides. Never use force – the connectors should engage easily.

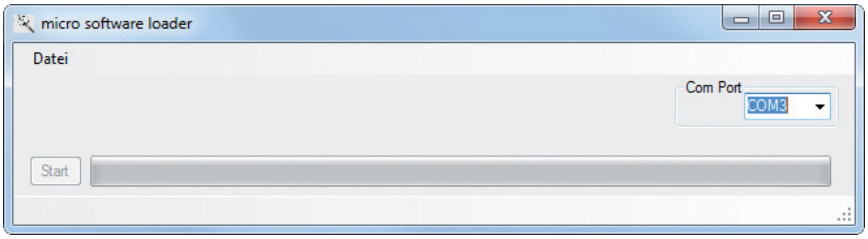
Connect the adapter lead to the receiver's telemetry socket. The connectors are reverse polarity protected: note the small chamfers on the sides. Never use force – the connectors should engage easily.

Starting the "Slowflyer/Gyro receiver update"

We recommend accessing the "Slowflyer/Gyro receiver update" program from the "Firmware_Up-grade_grStudio" program. Click on the "Receiver Downloader" item under "Link" in the left function menu. (Alternatively, select the "Micro Receiver Upgrade" under "Menu").

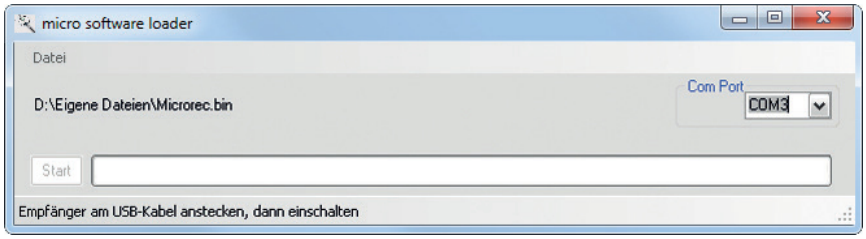
It is also possible to start the associated application program directly. By double-clicking on the file "micro_gyro_swloader.exe". You will find this .exe file in the "Graupner_ PC Software" folder of the "HoTT_Software VX" package.

A program window will now appear in which you should first set the "correct" COM port for the USB interface No. 7168.6 in the selection window. (See following picture)

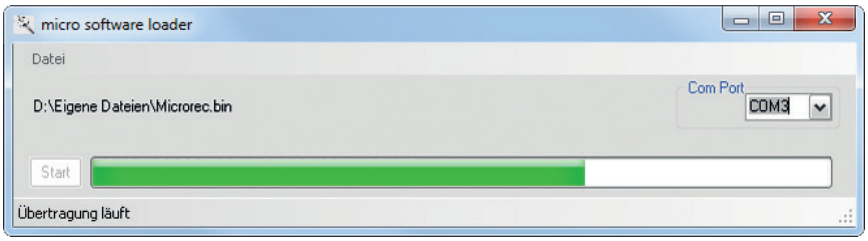


If you are not sure which port to use, check the COM port in the "Select Port" window in the "Menu" of the "Firmware_Up-grade_grStudio" and note down the COM port number for the "Silicon Labs CP210x USB to UART Bridge" entry – in this case "COM03". (If you select the wrong port, you will be alerted to this when you read out the receiver data). Click on "File" to load the corresponding firmware file named e.g. "GR12_33577_V_XX.bin" from the hard disc ("XX" stands for the version number).

When the file has loaded, click on start...



... connect the receiver and switch it on.



The progress bar shows that the transfer is running normally. The receiver LED lights up red during this process and flashes once the transfer is completed.

Please refer to the detailed update instructions for the item in question in the Download area at ***www.graupner.de***.

EN - SIMPLIFIED EU DECLARATION OF CONFORMITY

Hereby, Graupner declares that the receiver equipment type S1034 Falcon 12 plus is in compliance with the Directive 2014/53/EU.

The full text of the EU declaration of conformity is available at the following internet address: www.graupner.de

Manufacturer:

GRAUPNER Co., Ltd

POST CODE : 14557

8th F, 202 Dong, Chunui Techno-Park II, 18, 198 street, Bucheon-ro, Wonmi-Gu, Bucheon-Shi, Gyeonggi-do, SOUTH KOREA.

Destribution Europe:

Graupner/SJ GmbH

Henriettenstr. 96

73230 Kirchheim/Teck

Notes on environmental protection

Disposal notes

This symbol on the product, user manual or packaging indicates that this product must not be disposed of with other household waste at the end of its life. It must be handed over to the applicable collection point for the recycling of electrical and electronic equipment.

The materials are recyclable as marked. By recycling, material reusing or other forms of scrap usage you are making an important contribution to environmental protection.

Care and maintenance

Notes on care

The product does not need any maintenance, it works so as it is without any special care. In your own interests protect it from dust, dirt and moisture.

Clean the product only with a dry cloth (do not use detergent!) lightly rub.

Warranty

The Graupner/SJ, Henriettenstrassee 96, 73230 Kirchheim/Teck grants from the date of purchase of this product for a period of 24 months. The warranty applies only to the material or operational defects already existing when you purchased the item. Damage due to wear, overloading, incorrect accessories or improper handling are excluded from the guarantee. The legal rights and claims are not affected by this guarantee. Please check exactly defects before a claim or send the product, because we have to ask you to pay shipping costs if the item is free from defects.

The present construction or user manual is for informational purposes only and may be changed without prior notice. The current version can be found on the Internet at ***www.graupner.de*** on the relevant product page. In addition, the company ***Graupner/SJ*** has no responsibility or liability for any errors or inaccuracies that may appear in construction or operation manuals.

No liability can be accepted for printing errors.

FCC Warning

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) this device may not cause harmful interference, and

(2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Note 1: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

—Reorient or relocate the receiving antenna.

—Increase the separation between the equipment and receiver.

—Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

—Consult the dealer or an experienced radio/TV technician for help.

Note 2: 1.Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

2. The minimum separation generally be used is at least 20 cm.