User Manual for GlowControl 1_2 LiPo V_3

incl. receiver battery monitor and automatic power control

Thank you for decide on a product from rainbow-tronic. We developed an intelligent system which already satisfied lots of model pilots.
Since we are active model-builders too we know where it depends on: Safe technology, universal use, low power consumption, and all this to favourable price.

This manual should help you to take pleasure in and profit from our product. Please read the manual carefully before use to find the correct configuration of **GlowControl** for your application.
GlowControl meets the valid European norms and EMC rules.

Description

By the use of **GlowControl** the current through the glow plug is adapted to the requirement of the combustion of the motor. This creates a smooth run of the engine in the lower speed range, especially in idle mode. In addition the transition from low to high speed is positive influenced.
GlowControl 1_2-LiPo is designed for 1- and 2- cylinder engine applications. The necessary battery type is 1 LiPo cell (3,7V).
In addition **GlowControl** is monitoring the receiver battery and warns the pilot correspondingly.

Functions

1. Connection of **GlowControl** to 4 or 5 cell receiver batteries possible without any configuration.
2. The glow battery should have 1 cell (3,7 LiPo). The capacity of the glow cell depends on the glow time you would like to have (>= 800 mAh, 15C).
3. No additional switch necessary in the glow circuit.
4. At **GlowControl** the glow range can be freely chosen. It is programmed once and is always present until it will be re-programmed.
5. The AUTOBOOST function releases additional glow energy when the throttle is opened rapidly. This cares for a good response of the engine.
6. **GlowControl** has a START MODE (see later description) which can help to start the engine or to re-start a "lazy" cylinder.
7. In case of reduced glow battery voltage **GlowControl** automatically adapt the power to the glow plugs.
8. Via the ultra- bright Status-LED **GlowControl** informs you about the actual status. A brief description you will find below. Please install the LED in an "easy to see" position inside the cockpit or in the fuselage.
9. For security reasons the POSM® function keeps **GlowControl** in stand-by mode after the receiver voltage is switched on even if the throttle stands in idle position. To release the glow function the throttle has to be moved slightly.
10. **GlowControl** monitors the receiver battery voltage. If the voltage falls below 4,5V (4 cell battery) or 5,5V (5 cell battery) for more than 0,5 s the status-LED will invert the optical image and keeps it until reset of battery voltage. The number of cells will be detected automatically during programming **GlowControl**.
11. **GlowControl** monitors also the glow battery voltage in real time. If the voltage falls below 3,1V the status-LED will indicate it. The glow function will be aborted.

Operating and control devices

After programming **GlowControl** do not need any further handling. Here are brief descriptions of the components:

On the board

Item	Function	Description
J1	Program-ming release	Release for programming GlowControl. If the jumper is disconnected the programming is released, when connected it is interlocked.
J2	No. of glow plugs	refer to topic CONFIGURATION
J3	Glow current	refer to topic CONFIGURATION
J4	Glow current	refer to topic CONFIGURATION
T1	Store button	Stores the values for glow begin and idle position

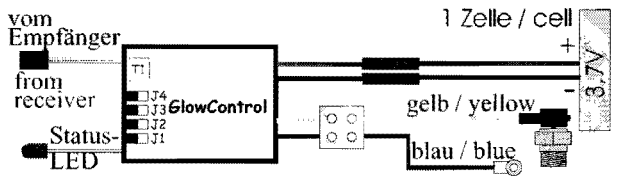
Status-LED

Through different flash sequences the status-LED informed:

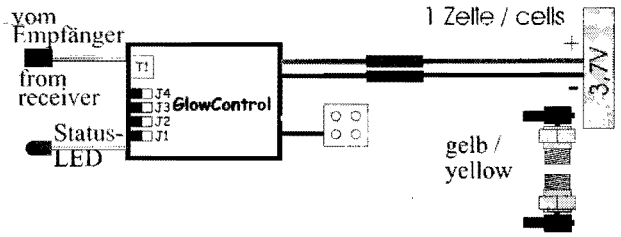
Sequence	Description
Flash cycle 1,5 s	receiver voltage on, no glow function
Flash cycle 0,5 s (2x per second)	Glow function active, throttle position inside glow range
Constant flash cycle 0,25 s (4x per second)	Start mode active for max. 1 minute
Short flash cycle 0,25 s	Auto boost active for 1 s
Constant ON or flickering	Transmitter is switched OFF or invalid signals appear.
Constant OFF	Receiver voltage OFF or J1 disconnected
Double flash every 2,5 s	No signals from the receiver, transmitter OFF
Inverted optical image	receiver battery falls below 4,5V/5,5V for min. 0.5 s
	Glow battery empty, voltage below 3,1V
Flash cycle 2,5 s	No glow battery connected or voltage below 2,7V

***Warning**: Ultra-bright special LED! Do not look direct into the light from short distance. It can harm your eyes!*

Connection of GlowControl 1_2_LiPo V_3



Anschlussschema **GlowControl** für 1 Zylindermotoren
Connection diagram **GlowControl** for 1 cylinder motors



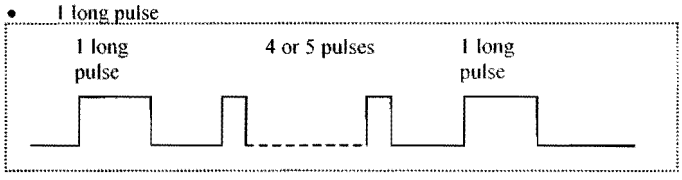
Anschlussschema **GlowControl** für 2 Zylindermotoren
Connection diagram **GlowControl** for 2 cylinder motors

Connect **GlowControl** to engine and glow battery according to the sketch.
The status-LED should be installed in an "easy-to-see" position inside the cockpit or in the fuselage.
For damping of vibration **GlowControl** should not covered in foam or similar. Please fix it with Dual Lock tape or similar.
The **GlowControl** unit should be installed most far away from the receiver and the glow plug cable should run direct to the motor and should not cross or run parallel to servo cables.
Note: In case you connect the battery and/or the glow plug via terminals please check frequently if the screws are tightened.
An untightened contact can be responsible for radio interferences in the receiver system.

Detection of receiver battery voltage

GlowControl is equipped with an automatic detection of the no. of cells of the receiver battery pack. The detection in done during the programming of **GlowControl**. It has to make sure a 5 cell battery is above 6V during the programming. Therefore the battery should be fully charged.
The no. of detected cells will be indicated during every power-up of **GlowControl** by the status LED:

- 1 long pulse
- 4 or 5 short pulses (No. of cells)
- 1 long pulse



*Note: An empty 5 cell battery could be detected as a 4 cell battery! Please charge the battery and re-program **GlowControl**.*
A wrong detected receiver battery does **not** affect the function of **GlowControl**. Just the receiver battery monitor does not indicate correctly.

Start-Mode

Because of the unique start-mode of **GlowControl** you can lift up the glow power to the set maximum (depending of J3 and J4). This can be necessary if your motor will not start in idle position (i.e. needs 1/3 of throttle). In this position the glow power is already slightly lower than the maximum and your motor possibly will not start. If you now activate the **start-mode** the max. glow power will be present as it normally will be just in idle position.

Activate start-mode
You can activate the start-mode:

- Move the throttle stick 3 times fast forward/retard. The last movement has to end inside the glow range.

Note: The start-mode can only be active while the throttle stick is inside the glow range!

Cancel start-mode
The start-mode can be cancelled in 2 different ways:

1. Move the throttle stick out of the glow range
2. Automatic cancellation app. 1 minute after activation.

Configuration

GlowControl has to be configured before use!
ON ➔ Jumper is set, OFF ➔ Jumper is NOT set.

The jumper J2 sets the boost function!

Jumper J2	Configuration
OFF	1 glow plug connected
ON	2 glow plugs connected (i.e. boxer engine)

GlowControl can be adapted to the required glow power.
J3 and **J4** determine the glow power.

Jumper J3	Jumper J4	Configuration
OFF	OFF	80 % glow power
ON	OFF	90 % glow power
OFF	ON	95% glow power
ON	ON	100% glow power

Attention: A wrong configuration can destroy your glow plugs! Please always start configuration with the lowest glow power set up (J3+J4 NOT set)!
In order to save energy the glow power can be reduced. This is depending of the motor and the environment. Please try to find out the best configuration for your application.
Note: A change in configuration will be accepted after re-power the receiver voltage!

Glow battery monitor and power control

The voltage of the glow battery is monitored in real time mode. In case of voltage drop the power to the glow plugs will be automatically adapted to ensure a constant behaviour over the voltage range of the glow battery.
If the voltage drops below 3,1V the glow function will be aborted in order to save the LiPo cells. To cancel the limitation please move the throttle out of the glow range.
The status LED will also indicate if no glow battery is connected to **GlowControl**. A glow battery with less than 2,7V is not detected.

Safety instructions

- Please note **GlowControl** heats the glow plug. Turning the propeller while glowing is active can start the engine. Therefore
- Do not reach in the range of the propeller.
- Keep children away from the engine.
- Switch off the receiver voltage while not using the engine.

Programming of GlowControl

Preparations
To prepare the programming of **GlowControl** please program first your transmitter and all relevant servos, especially the range and direction of the throttle servo. Connect the glow plug cables to the engine and set the trim lever to "0".

Programming
1. Connect **GlowControl** to the receiver by use of a Y - cable or a free channel of the receiver with mixer.
2. Switch on the receiver voltage. The status-LED flashes according to the described sequence.
3. Remove J1. Status-LED stops flashing when throttle stick was moved after the system was powered on.
4. Put throttle stick in position where glowing should start (i.e. 50%)
5. Press button T1 at the **GlowControl** board. The position is stored, status-LED flashes 1 time.
6. Move throttle stick into idle position.
7. Press again T1. This position will be stored too. Status-LED flashes 2 times.
8. Replace the jumper J1 properly.
9. Switch off the receiver voltage for min. 5 seconds.
10. **Finish!** The programming is now complete and the stored values are present after each "power on" of the receiver voltage. A re-programming is, of cause, possible at any time.
11. Connect the glow battery with **GlowControl**. Please take notice of the polarity! A wrong connection can destroy **GlowControl** and is no guarantee case.
12. Place all components inside the fuselage. Please pay also attention to the centre of gravity.
13. Please check the range of your radio system (with active glowing) as you should do it after installation of any electronic device.

Now GlowControl is ready to use.

Daily start of the engine

- Switch on receiver voltage. **GlowControl** do not heat the glow plug at this time.
- As usual draw in the gas. Put the throttle in full speed position. The status-LED flashes in 1,5 s cycle. Glow function is off. Turn the propeller some revolutions while keeping the carburettor closed.
- Move the throttle stick in start position (idle pos.). Glow function is now active.
- Start the engine in the usual way. Is the throttle stick not in idle position and the glow power is not sufficient activate the **START-MODE**.
- Now you can start your model. On own interest you should warm-up the engine before start.

Stop the engine at ground

Stop the engine in the usual way:

- Put the throttle in idle position.
- Move the trim lever to close the carburettor completely. **GlowControl** switches off the glow power. The engine stops. Status-LED flashes slow.
- Switch off the receiver voltage.

Technical Data GlowControl 1 2 LiPo V3

Receiver voltage	3,6V to 8V (4 – 5 cells NiCd oder NiMH)
Consumption	2 mA
Receiver impulse	Positive
Receiver connection	Universal connector for Futaba/Graupner, MPX (other on request)
Connection glow battery	Open or 2mm gold plugs
Recommend glow plug type	All known glow plugs can be used
No. of glow plugs	1 - 2 (other on request)
No. of cells of glow battery	**1 cell LiPo 3,7V** (4,2V max.)
Switch-off voltage glow battery	3,1V
Min. glow batt. voltage	2,7V

Trouble shooting

In general **GlowControl** is a reliable system. In case something do not work like expected you will find the cause in the following table:

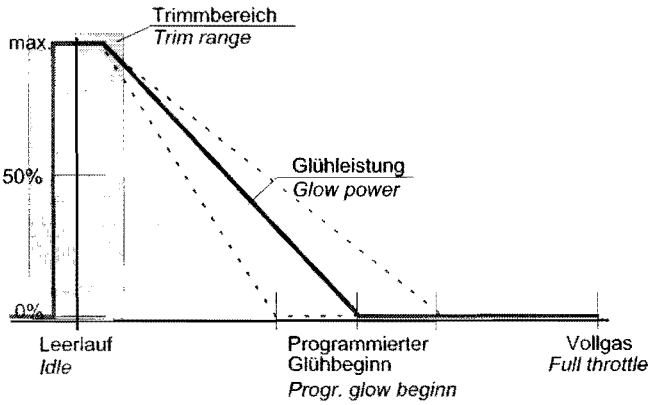
Problem	Cause	Action
Status-LED do not flash	Receiver voltage switched off / receiver battery empty	Switch on voltage / Charge battery
	J1 not set.	Set J1 proper
Status-LED flashes, image do not change while moving throttle stick via full range	Glow range not programmed	Re-program the glow range (i.e. mid to idle position)
Status-LED shows correct behaviour, plug do not glow	Glow battery almost empty	Charge battery
	Mixer for throttle servo not set to 100%.	Set mixer correctly
Status-LED lights constantly, flickers or double flash signals every 2,5 seconds	Transmitter not switched on	Switch on transmitter
Throttle position inside glow range but no glow power, status-LED flashes slow	After power on the receiver voltage the throttle stick was not moved slightly (safety function)	Move throttle stick slightly
Programmed values will not be stored	Jumper J1 was not removed before programming	Remove J1 before programming
	Receiver voltage was not interrupted for min. 5 s	Switch off the receiver voltage for min. 5 s
Engine do not start even glow battery is fully charged	Throttle stick not in idle position, glow power is not sufficient to start engine	If possible move throttle stick closer to idle position
		Activate start-mode
Status-LED lights up with short interrupts, radio system and **GlowControl** works	Receiver voltage was fallen below 4,5V/5,5V for more than 0.5 s	Switch off and on again will reset this function, recharge battery.
	Glow battery is empty	Charge glow battery
Status-LED flashes in 2 second cycle	No glow battery detected	Connect glow battery
	Glow batt. connected while **GlowControl** was powered on.	Move throttle stick out of glow range temporary.

Handling of the Jumper

Please handle the jumper with care. Pull and stick them by use of fingers or tweezers.
Pick them only at the foreseen flat end. Keep the unused jumper safe.

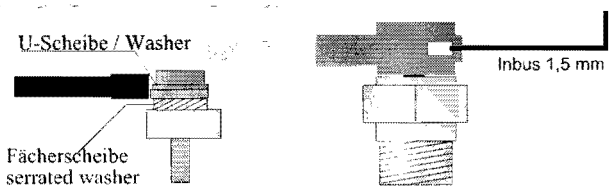
Definition of glow range

The glow range is calculated by the micro controller from different values. The basic information are the programmed values. **GlowControl** computes from this the glow range. It starts at the programmed value and ends in idle position plus app.50% of trim range.
The "autoboost" function can be active also out of glow range.



Connection of glow plug cable and ground cable

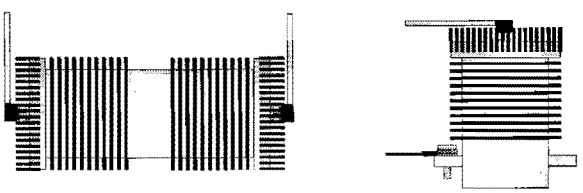
(if in supply range included)
The glow plug cable **GPC** should be connected to the glow plug as shown in the sketch. It will be fixed with a locker screw. Because of thermal reasons please leave a small gap of 0,5 – 1 mm (app. 0.04") between plug and cable connector.
The ground cable **GC** is connected to the engine chassis according to the sketch below. To ensure a safe electrical connection please use a serrated washer between engine and cable connector.



Anschluss GC/ Connection GC

Anschluss GPC/ Connection GPC

Anschluss zwei 1-Zylindermotoren
Connection of two 1-cylinder engines



Connection 2-cyl. engine

Connection 1-cyl. engine