



# HV SmokeDriver V1.0

## Operator Manual

Dear valued customer, thank you for purchasing our SmokeDriver. This small and light-weight component governs three functions when using our electrical smoke device Smoke-EL.

- It regulates the heating element within the smoke device.
- It proportionally regulates the smoke pump.
- It supervises the lipo-voltage.

To connect the receiver you will need only one slot. Please make sure you use a 3-step transmitter (-100% / 0% / +100%), since feeders and dials will compromise the faultless operation of the device.



### Mounting the Model:

The SmokeDriver has to be mounted in a way to ensure appropriate cooling, as continuous currents in excess of 40A might occur while the SmokeDriver is running.



If the hull of your model is too small, it might be necessary to add additional air holes so that the airstream can cool down the SmokeDriver.

Overheating may destroy the SmokeDriver.

Please mount the SmokeDriver at an easily accessible area. The battery has to be disconnected after every flight, as this resets the SmokeDriver to its default setting. Furthermore, even though the standby current is low, the battery might discharge over time and in turn might be destroyed through this.

### Connections:

There are six slots for connecting all components. Each slot is clearly marked. However, since the slot for the pump and the slot for the heating element look similar, please pay attention to the appropriate connections.

#### The Receiver (RC):

The SmokeDriver should be connected to a free channel of the receiver with the enclosed patch cable. The negative pole (brown) of the patch cable should be closest to the circuit board.

#### The SmokePump (Pump):

The SmokePump should be connected to the SmokeDriver through the individual MPX-plugs. The connectors are protected against reverse polarities.

#### The Smoke Pipe (Heating):

The smoke device should be connected directly to the MPX-plug next to the slot that connects the battery (top right). This connection is also protected against reverse polarities.

#### The Battery (6S Lipo):

The battery should be connected next to the slot for the heating element. Here too the connection is protected against reverse polarities through the MPX-plug, and the polarity is clearly visible on the plug as well as on the image above.

#### The Magnetic Valve (optional):

The slot marked as "VALVE" on the connector board is reserved for connecting the magnetic valve. You can attach a maximum of two magnetic valves.

#### AUX1 (optional)

The "AUX1" slot is reserved for an external LED connection. The LED will show the battery setup you have chosen, and will show an error code in case of a malfunction.

### Initial Operation:

For initial tests we recommend that you disconnect the heating element from the SmokeDriver. By doing so you will avoid fusing the heating device.



**Heating up the smoke device without the appropriate Smoke-Oil can lead to the destruction of the heating elements.**

The SmokeDriver needs the exact center position of the channel you reserved for the smoke device. Since this position depends on how the manufacturer of a transmitter defines this setting, we have allotted a wide range for the "center position."

The SmokeDriver is programmed to be ready for use. Please delete any programs which could interfere with the SmokeDriver from your transmitter. Adjust the setting to -120% and +60%. The center position should be at 0%. (It might be necessary to reverse the servoway if you are using Futaba, i.e. you have to adjust to +120% and -60%).

### Connecting the LiPo-Battery (8S – 12S)

The HV-SmokeDriver has been produced to accommodate 8-12 LiPo cells. Upon connection of the battery the HV-SmokeDriver will check the battery setup and will signal the detected number of cells via the built-in LED. If the optional external LED is attached as well, the signal will be displayed there, too. The LED will display the following flashing signals:

- 8S-Lipo → LED flashes 2 times
- 10S-Lipo → LED flashes 3 times
- 12S-Lipo → LED flashes 4 times



The LED is situated on the circuit board, diagonally beneath the ventilation slots.

Please make certain that the HV-SmokeDriver detects the correct battery setup since this will determine the discharge threshold of the LiPo battery. If the battery setup is not correctly identified, please check the voltage and recharge the battery.

### Operating Test:

Please connect everything except the heating element. The pump can be tested "as is," simply plug in the connectors as described above. Please make sure that the battery is connected before you switch the receiver on. Please perform the following seven tests to check the device's functions:

Switch Setting	Impulse	Function
1 Bottom (-120)	<1300µs	Reset the SmokeDriver
2 Top (+120%)	>1600µs	Pump on (valve switches, optional)
3 Center (0%)	1500µs ±<100µs	Pump off
4 Top (+120%)	>1600µs	Pump on (valve switches, optional)
5 Bottom (-120%)	<1300µs	Pump off, restart SmokeDriver (min. 0.5sec.)
6 Top (+120%)	>1600µs	After 30 sec delay the pump turns on
7 Bottom (-120%)	<1300µs	Pump off

If the pump works as described, your transmitter is programmed correctly, and the SmokeDriver is ready for use. The protective setting of the SmokeDriver ensures that the pump will not be turned on automatically when the receiver is switched on. Only when the channel is on -120% will the SmokeDriver be activated.

The SmokeDriver recognizes three operating states: Off, Heating up, and Smoke-ON.

#### Off, switch setting -120%:

The SmokeDriver is in standby. The heating and the pump are completely turned off, current consumption is minimal.

#### Heating up, switch setting 0% (center position):

In this position the evaporators will be heated up with reduced power. The pump is still off. The heating process will take 30 seconds, and is governed by the SmokeDriver. After 60 seconds in the center position the SmokeDriver will decrease the current further but will keep the heating on.

#### Smoke-ON, switch setting +10% to +120%:

As soon as the signal from the transmitter climbs past 10% and the heating up phase has ended (30 seconds), the heating will be increased to 100% and the pump will be added proportionally. The pump output will increase linearly to the transmitter signal from 10% to 100%. You can adjust the output with the transmitter via limiting your chosen channel. Usually, a pump output of 60% will be sufficient. After 30 seconds, production of the smoke will stop automatically, but you can always reactivate smoke production by using the center position of your transmitter (first put the switch to the "Heating up" position, then to "Smoke-ON").

-100%



± 0%



>10%

### Pre-Flight Check:

To ensure that the whole device is completely aired before every flight, the SmokeDriver is outfitted with a pre-flight program that has to be run before each flight. When switching the SmokeDriver on for the first time, the heating will always be deactivated.



**Without Magnetic Valve:** Switch on the pump first (switch setting "Smoke-ON") and wait until the pump has started to deliver SmokeOil to the evaporators. You can now adjust the amount of oil you need with the appropriate valves. The amount is correctly adjusted once a small rivulet of oil comes out of the evaporator, while single drops of oil are not sufficient for the device to work properly. You can disrupt the pump by turning the switch to the center position. You can then readjust the output through the transmitter.

**With Magnetic Valve (optional):** Switch on the pump first (switch setting "Smoke-ON") and wait until the pump has started to deliver SmokeOil to the evaporators. You can now adjust the amount of oil you need with the appropriate choke valves. The amount is correctly adjusted once a small rivulet of oil comes out of the evaporator, while single drops of oil are not sufficient for the device to work properly. To adjust the amount of oil for the second evaporator, please switch back to the center position and then turn the pump back on. The magnetic valve will now switch to the second pipe. You can always switch between the pipes until both choke valves are correctly fine-tuned.

After you have correctly adjusted the oil input, please turn off the smoke device (switch setting "Off"). The Smoke-EL is now ready for use.

### Lipo-Supervision:

The smoke device Smoke-EL with the HV-SmokeDriver is powered by a 8s-12s LiPo battery. The recommended capacity for the battery (for approximately 90 seconds "Smoke-ON") depends on the smoke device you are using.

Smoke-EL	Lipo Capacity
S	1100 mAh
S Duo	1600 mAh
S Twin	1600 mAh
SmokeBlock	>=2100mAh

The HV-SmokeDriver is usually connected directly to the power battery. The battery capacities above refer to a setup where a separate Smoke battery is used.

The Lipo-Supervisor will turn off the whole device if the battery voltage falls below 3.3 volt per cell (26.4V with 8s, 33V with 10s, and 39.6V with 12s batteries). The SmokeDriver will be reset when the battery is disconnected and the receiver is turned off. Both the power for the heating elements and the pump originate from the smoke battery, so that neither the receiver battery nor the flight battery will be burdened. Be aware however, that the standby voltage of the SmokeDriver is 0.04A and can discharge the battery. To avoid damage or even destruction of the battery, please disconnect the battery after each use.

Also, in your calculations, please consider the extra load of approximately 700Watt per evaporator that the the battery has to handle on top of its usage as power source.

For further tips on how to adjust the smoke device, please watch this video: <http://youtu.be/wSig1LeaJc>



## Safeguarding equipment

The HV-SmokeDriver has extensive safeguarding equipment. Since the possible operating voltage might reach 50V, severe sparks can be emitted when the battery is connected. To protect the battery, the HV-SmokeDriver is equipped with an automatic safety fuse which will result in a one second time lag when turning the device on.

Additionally, the HV-SmokeDriver will continually monitor possible malfunctions during operation and will react before it will be damaged itself. If a forced switch-off occurs, the SmokeDriver will stay deactivated even if the malfunction is no longer apparent. The flashing signal will continue until the battery is physically disconnected to ensure that you will be able to read the error code after landing.

## LiPo-Supervision

The LiPo-supervision has already been discussed above. Depending on the detected battery setup, a forced shut-off will occur at an end-of-discharge voltage of 26.4V, 33V or 39.6V. The HV-SmokeDriver will indicate a forced shut-off through a flashing signal on the internal and external LED.



LED flashes once: The LiPo voltage fell below 3.3Volt per cell.

## Temperature supervision

The HV-SmokeDriver is able to process an electrical capacity of 2000Watt. Despite choosing our material with care, loss of power is inevitable, especially in the form of heat within the components. To avoid overheating, and in turn the possible destruction of the SmokeDriver, we equipped the device with a temperature monitoring system that will shut off the smoke device before a critical temperature is reached. However, please make sure that the SmokeDriver is cooled appropriately to avoid a forced shut-off in the first place.



LED flashes twice: The temperature monitoring system shut off the device.

## Power limitation to the pump

Usually, the pump needs less than 3A power. If the pump needs more power, the choke valves are either turned too far, or the evaporators are strongly sooted and have to be cleaned. The HV-SmokeDriver monitors the power needs of the SmokePump and will shut it off if it is too high.



LED flashes three times: The power for the pump has exceeded its defined maximum.

## Internal Voltage Supervision

The voltage of the LiPo battery is regulated within the SmokeDriver to an internal operating voltage which produces a constant voltage for the SmokeDriver. If the internal voltage falls below its defined limit, the HV-SmokeDriver will shut off the smoke device.



LED flashes four times: The internal voltage fell below its defined limit.

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## FailSave

To make sure that the smoke device will be shut down in case of loss of the transmitter signal, you should add a FailSave channel. Program this channel to turn the smoke device into its OFF setting. Doing so will decrease the risk of fire in case of a missing signal.

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## Safety Fuse

Additionally to our internal safeguards, we recommend using a safety fuse for the battery feeder cable. For each SmokePipe you should calculate 15-20A. You can purchase a holder for the fuse in the accessories section in our webshop (order number S0010).

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## Technical Data:

Operating Voltage	8S-12sLiPo (26-50Volt)
Current Load (Heating)	40A continually (70A short-term)
Current Load (Pump)	3A (max)
Standby	0,04A ( <u>Warning: Disconnect the battery!</u> )
Temperature Range	0°C (32°F) to 45°C (113°F)
Weight	ca.50g (appr. 1lb)
Connectors	JR and MPX

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We hope you will have great flights and "many happy landings."  
Sieverstedt, 2014



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