ElMod Fusion Puma Board
Installation instructions and user manual

Before installation always read carefully all these instructions.

Congratulations on your purchase of the *ElMod Fusion Puma*, the innovative and universal full-option solution for the SdKfz 234. With the *ElMod Fusion Puma* you can upgrade your model with true-to-scale motion, weapon, light and special functions combined with easy installation. You adjust all functions down to the last detail, conveniently on your Windows® or Apple® computer through numerous, meaningfully summarized and extensively explained settings.

Scope of delivery

Before installation, check that the set is complete:

- *ElMod Fusion Puma* board
- Volume control incl. cable and plug
- Cable for connecting the proportional system
- Cable for the speaker connection
- microSD card (already inserted on the *ElMod Fusion Puma*)
- USB cable for connection to the computer
- Cables for connecting additional light sources

Connectors and operating elements
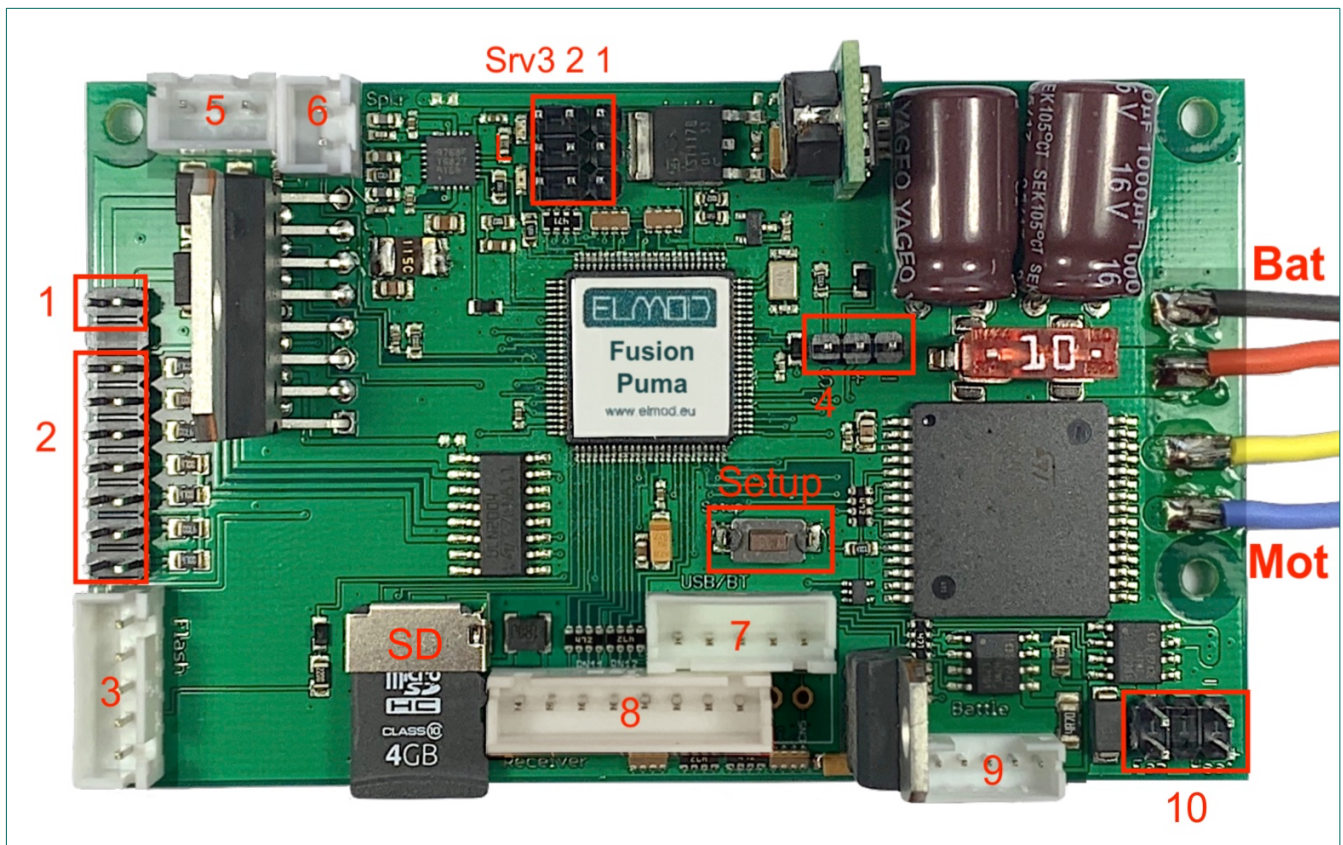
Bat	Battery connector	3	Main gun muzzle flash connector
Mot	Motor connector	4	Connector for optional external ESC
Setup	Push-button for setup/reset/firmware update	5	Connector for volume control knob
Srv1..3	Connectors for servo motors	6	Connector for loudspeaker
L	Status-LEDs	7	Connector for USB-Dongle und ElMod Bluetooth
SD	microSD-card	8	Connector for RC-receiver
1	Turret motor connector	9	Connector for IR-Battle add-on
2	Terminals for lighting	10	Connector for a smoker unit

Hint: all connectors are labeled on the top or bottom side of the PCB.

Power supply

The *ElMod Fusion Puma* can be used with batteries up to 10V. It has a deep discharge protection and an overvoltage protection function. For correct function of the protection the battery type has to be set in the *ElMod App* according to the actual battery. For further details see section "Battery Protection".

• Connect the battery to the battery plug. Connect the red cable to the "+" terminal and the black cable to the "-" terminal of the battery. ATTENTION! Mixing up the connections leads to destruction of the electronics!

• Keep the cable length as short as possible. This helps to avoid interference!

Drive motor (integrated driver)

The maximum short-term current consumption of the motor is limited to 30 A. The maximum permanent current load is 10A. The motor driver is protected against short circuit and overload. Brushless motors and motors with a particularly high current consumption can optionally be operated via a standard external controller (see section "Connection of the drive motors (external drivers)"). A mixed operation is not possible.

• Solder the motor to the yellow and blue wires.

• Which cable (+/- of the motor) is connected in which of the two motor terminals is irrelevant. The electronics recognizes this by the "setup process" described below.

• Keep the cable length as short as possible. This helps to avoid interferences. As additional interference protection, the motor cables can be twisted.

Proceed as follows to check the correct connection of the motor and to setup the electronics:

• Make sure that the vehicle's wheels can rotate freely and that the model cannot drive off uncontrolled.

• Connect a full battery to the electronics and switch on the power supply.

• Wait 3 to 4 seconds until the blue LED starts blinking regularly.

• Press and hold the setup button, the motor will start moving.

• Keep pressing and holding the button. The motor changes the direction of rotation every few seconds.

• Release the button when the wheels rotate forwards.

The drive motor is now correctly configured and ready for use.

Drive motors (external drivers)

A standard ESC can be connected directly to the *ElMod Fusion Puma*. The operating mode (internal/external driver) must be set via the *ElMod App* (Tab "Drive", Parameter "Motor driver" set to "external"). Mixed operation of internal and external controllers is not possible. The external controller is connected to the *connector 4*. The ground connection (brown wire) of the controller points to the right.

Smoke generator

The smoke generator is connected to the *connector 10*.

• If your smoking unit has only one connection, attach it to the terminals marked "Fan" (left connection).

• if your smoking unit has a separate connection for the heater and the fan, attach them
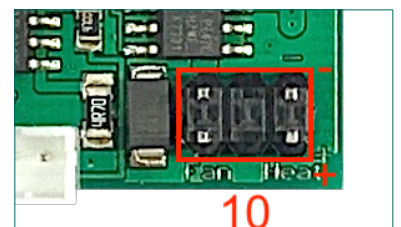
to connection 10 accordingly (terminals "Fan" to the fan, terminals "Heat" to the heater).

The polarity (plus/minus) is printed next to the connections on the board

Turret and weapon functions

- Turret motor: connect the turret motor to *connector 1*. If the turret motor runs in the wrong direction, turn the plug around.
- Gun elevation: connect the servo for raising/lowering of the main gun to the *connector for servo 2*. For further details see the section "Servos".
- Gun recoil: the gun recoil retraction simulation is also performed using a servo. This is connected to the *servo 3 connector*. Refer to the "Servos" section for further details.

Light functions

The *ElMod Fusion Puma* can control different light channels:

- Machine gun muzzle flash. *Connector 2, MG* is for the muzzle flash of an optional MG. An LED (preferably super bright, white or red) can be connected directly to it.
- Front lighting (*connection 2. L1*). One or two white LEDs.
- Stealth light (*connection 2. L2*). One or two white LEDs.
- Combined rear and brake light (*connection 2, L3*). One or two red LEDs. This light is switched together with the main light. The brake light also comes on when the main light is switched off during braking.
- Muzzle flash: The Taigen® xenon flash or the HengLong® muzzle flash is supported. These are equipped with a 5-pin plug and are connected to *connection 3*.
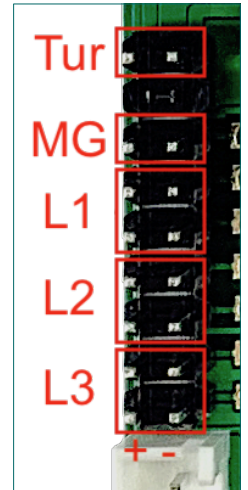
All light connections are protected against short circuit and overload. The anode of the LEDs is connected to the respective left pin, the cathode to the right.

Loudspeaker and volume control

- Connect the supplied volume control to the provided *connector 5*.
- The *ElMod Fusion Puma* offers the option to control the overall volume via channel 6 on the transmitter. If this is desired, the corresponding parameter must be set in the *ElMod App* (tab "Sound Volume", parameter "Main Volume control" to "external"). In this case the *connection 5* can remain empty.
- Solder the speaker cable to a suitable 8 Ohm speaker and connect it to the speaker output (*connector 6*). The speaker polarity (+/-) is irrelevant.
- Connect a fully charged battery to the *ElMod Fusion Puma* and wait 3-4 seconds until the blue LED starts flashing regularly.
- Now briefly tap the setup button. From the loudspeaker you hear the announcement "Battle Mode...". Tap the button repeatedly until "Battle Mode off" is heard.
- If you don't hear anything, check whether the volume is set too low.
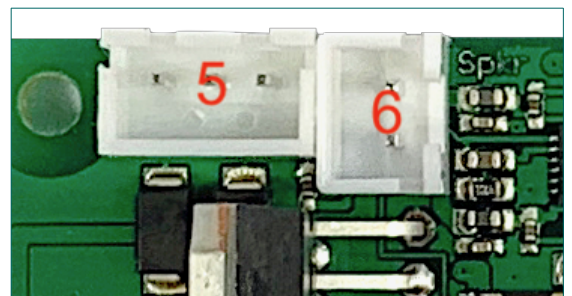
Servos

Up to three servos can be connected to the *ElMod Fusion Puma*. The servos are supplied with 5V voltage internally. The allowed current is 1.5 A for all servos together. The brown ground wire of the servo points to the upper edge of the board.

Each servo has a permanently assigned function. For each function the servo movement direction can be reversed (servo reverse), and the left and right deflection limit can be set separately (useful if, for example, the attached mechanics has a smaller range of motion than the servo arm). The function can be additionally adjusted by a further parameter (see table).
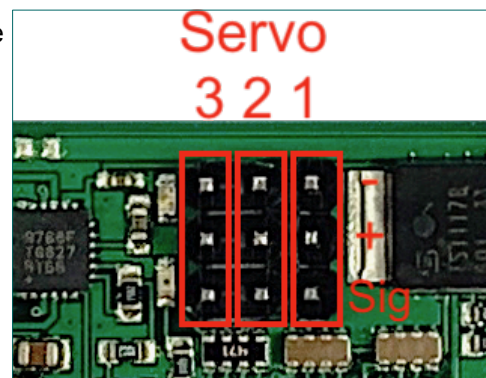
servo	function	effect	param 1 (0-100%)	param 2 (0-100%)
1	steering	steering axle	speed dependent steering lock angle (0% - off, 100% - no steering on max. speed)	
2	elevation	vertical movement of the main gun. The larger the stick deflection the faster the movement	max. speed	
3	barrel recoil	barrel recoil after firing the main gun	retraction speed	extraction speed

IR battle functions

The *ElMod Fusion Puma* module offers a combat function compatible to Tamiya® Battle Unit®. The configuration is done by a short tap on the setup button. The new setting is immediately active.

Each time the Setup button is pressed, an announcement is audible about the currently selected setting. These are:

- Battle Mode light Tank for a light tank.
- Battle Mode middle Tank for a middle tank.
- Battle Mode heavy Tank for a heavy tank.
- Battle Mode test Setting for the test mode. Each infrared signal is now evaluated. In this setting, a hit can be triggered with almost any infrared remote control or by switching on a fluorescent lamp, thus testing the function of the receivers.
- Battle Mode off for deactivating the fight function.

The selection of the vehicle type affects different characteristics during the battle. These properties are summarized in the following table.

setting	Hit count			Time in seconds			Mushroom blinks after power up
	slight slow down*	strong slow down*	destruction	reload time	invulnerability after a hit	delay until resurrection	
test mode	1	3	6	3	2	5	4x
light	1	2	3	3	15	15	1x
middle	1	4	6	5	12	15	2x
heavy	1	5	9	9	10	15	3x

* means the reduction of the maximum speed at which the vehicle can move.

The *ElMod Fusion Puma* module signals certain events with the following sounds:

- A fanfare after each "resurrection". After the fanfare the vehicle cannot be shot down for the time indicated in the table ("invulnerability after hit").
- Reloading procedure is finished. Until this sound is heard, no further shot can be fired.
- A metallic impact after a hit is received. The vehicle stops and cannot be moved for two seconds.

- An explosion if the vehicle is destroyed. The vehicle is then not controllable for the duration specified in the table.

Additional electronics are required for the IR combat function:

- An IR sensor to detect a hit with LED display (sensor mushroom)
- An IR transmitter, preferably placed in the barrel of the gun

These components are supported in the following version:

- Fusion IR Battle Set connects directly to port 9.
- Tamiya® Sensor Mushroom and Transmitter is connected to port 9 via an additionally available adapter.
- HengLong®/Taigen® sensor mushroom and transmitter is connected to port 9 via an additionally available adapter.

Sound

The microSD card supplied with the *ElMod Fusion Puma* contains ready-to-use sample sets for various model types (tanks, half-tracks, trucks, etc.). The sample set of a SdKdfz 234 Puma is activated at delivery. To activate a different sound set, start the *ElMod App* and select a new sound set from the drop-down box in the "Sound" tab. The new sound set is immediately active.
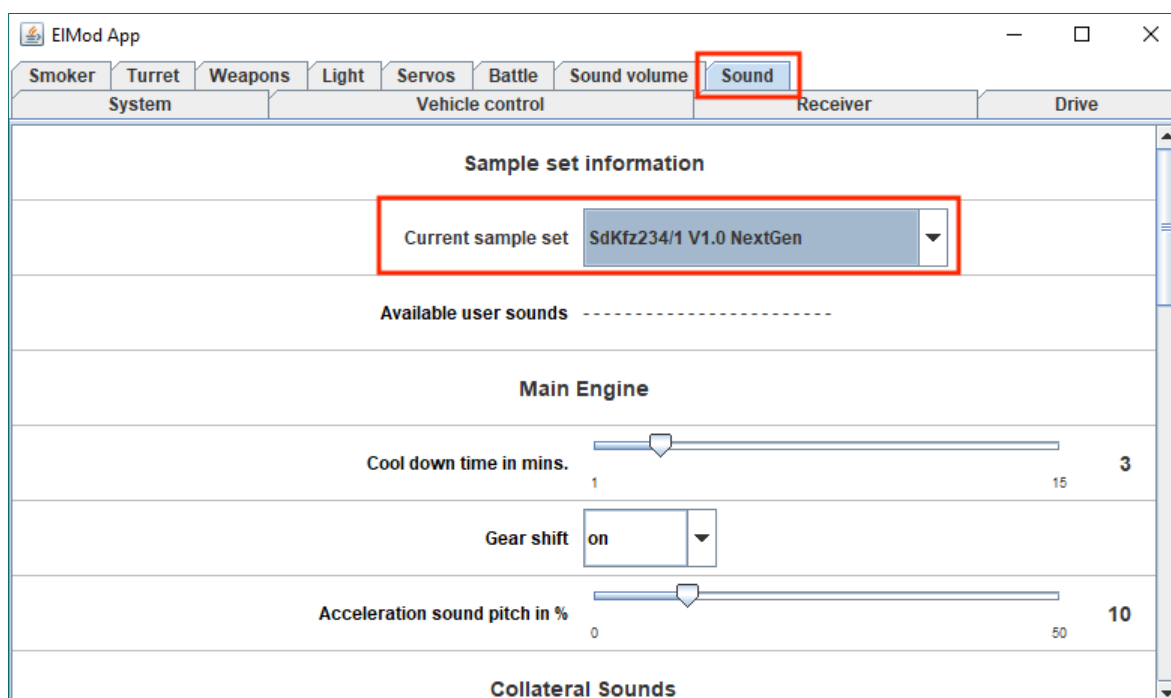
Alternatively, you can connect the SD card to a computer and use the *Sound Manager* program to make the selection. This program is located directly on the SD card and requires no installation.

To remove the SD card, pull it out carefully of the slot in the direction shown.

Never drag the card in a direction other than the one shown! This can lead to permanent mechanical damage to the card holder and thus to destruction of the electronics!
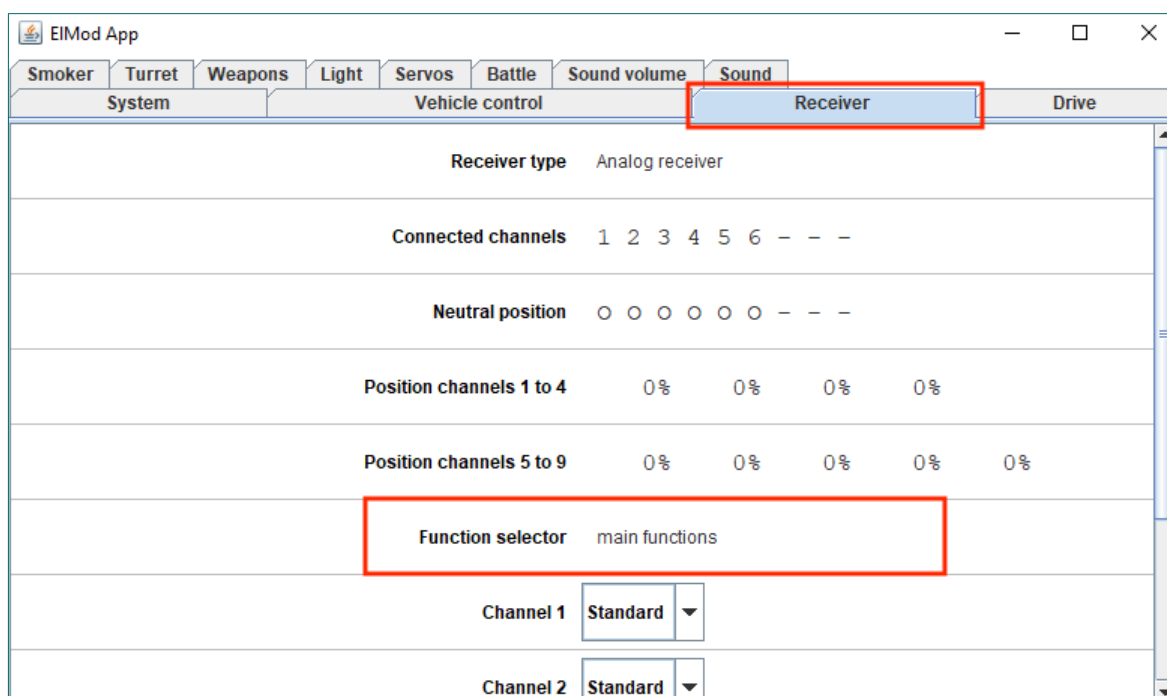
RC receiver

The *ElMod Fusion Puma* is operated on a standard RC system. The number of channels depends on the requirements and is summarized in the table. The power supply of the receiver is provided by the *ElMod Fusion Puma* (5V BEC, servo connector with the red/black wire), so no receiver battery is necessary.

channel	function	wire color	control
1	acceleration and ignition	brown	stick
2	steering	orange	stick
3	turret, weapons, light and auxiliary functions	yellow	stick
4		green	stick
5	selection of the function group	blue	3-way switch (up/off/down) or slider/knob (reduced function when using an on/off switch)
6	volume control	white	slider/knob

The number of connected channels is determined automatically. For correct detection and optimum operation all mixers must be deactivated, servo deflection must be 100% and trim must be centered. Contact the service department of your dealer if you have problems with the detection and operation of your radio system with the *ElMod Fusion Puma*. The cause can usually be easily determined and corrected using the *ElMod App*.

To support the full range of functions, channel 5 must be equipped as a switch with three positions (top - middle - bottom) or as a knob/slider. The position of the switch determines which command level is active on the left stick (main functions, extended functions or user-defined sounds). If no 5th channel is available, only the standard functions are available. If the control element is designed as an on-off switch, only two of the three command levels can be selected. Which ones are selected depends on the wiring or configuration of the radio system. The *ElMod App* provides information on this (parameter "Function selector" in the "Receiver" tab shows the current command level. See illustration).


For the black/red power supply cable, the black cable must be connected to the receiver's ground pin (usually the lowest or outermost pin on the receiver's power supply connector). If the connections on your receiver are not protected against reverse polarity, consult the receiver's instructions for the actual pin assignment. Incorrectly inserted plugs will not damage the components, but will simply prevent the receiver from functioning.

Depending on the system, it may be necessary to adjust the channel sequence or reverse the servo deflection. Please read the manual of your radio remote control. The signal from channels which are not assigned in the transmitter system varies from manufacturer to manufacturer. For this reason it is important that lines from unused channels are NOT connected.

Motor control (channels 1 & 2)

The ignition and acceleration/brake control is made by channel 1 (brown wire). After power up the engine doesn't run and the vehicle cannot be moved. To start the engine the throttle control must be moved to the upper most position and hold until the ignition sequence starts (see image below). Wait until the ignition sequence is finished and the idle sound is played. Now the vehicle is operational.

- For moving the vehicle forward, the throttle control must be moved to the top. After engaging a gear the vehicle starts moving.
- Is the throttle control released or moved back to the center, the vehicle rolls out (engine brake).
- Is the throttle control moved in the opposite to current direction, the vehicle brakes (actively braking).
- The brakes are full proportional. That means, the higher the deflection in the opposite direction the stronger the brake force.
- If the vehicle comes to a stop and the throttle control is not put back to the center, the vehicle will stand still for a moment and start moving in the opposite direction.
- The vehicle direction is controlled by the horizontal deflection of the right throttle stick (depending on the configuration by chains and/or steering axles).
- All drive related parameters, such as maximum speed ahead and back, acceleration and deceleration power, hold time during directional change and many more may be configured in the *ElMod App*.
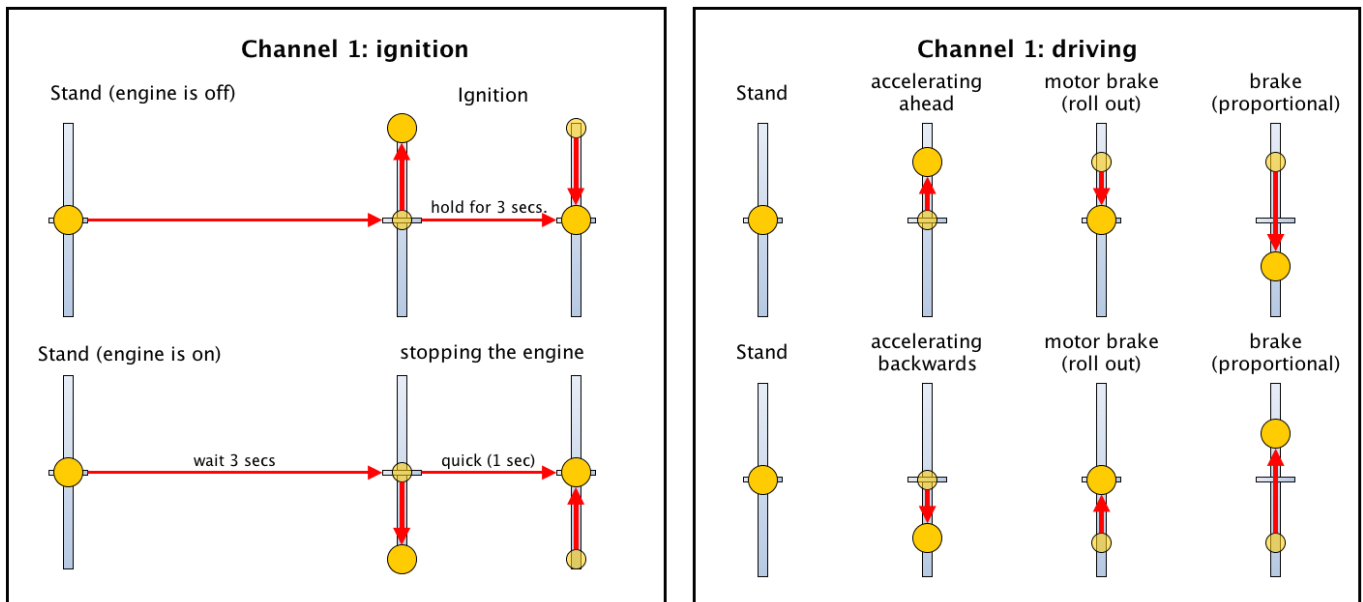
To switch off the motor, proceed as follows: stop the vehicle for at least three seconds. Then move the stick to the bottom most position and release it back quickly. This procedure may not last longer than one second.

Is the motor restarted after just a short time, a shorter start up sequence (warm start) is played. The time of cooling down the engine may also be configured in the *ElMod App*.
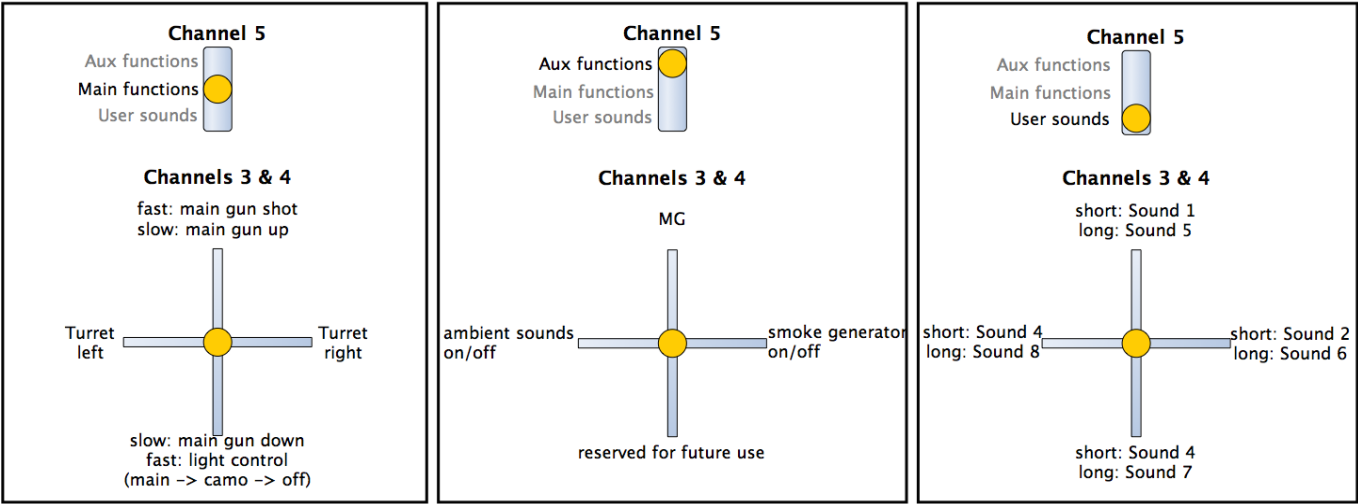
Function control (channels 3 to 5)

The control of the functions of the turret, weapons and the lights is done by the left stick and the switch or slider/knob on channel 5. Depending on the position of the switch on channel 5, the right stick controls

- main functions (turret rotation, elevation of the main gun, fire the main gun and light control),
- auxiliary functions (MG shot, activation/deactivation of the optional smoke generator and the ambient sounds)
- or the playing of user sounds (e.g. horn).

Depending on the sample set there are different numbers and contents of user sounds. If a particular user sound is not defined, the sound "User 1" to "User 8" is played. Custom user sounds may be easily added with the *Sound Manager*.

The function layout is shown below. Short operation means holding for about 1 sec. Long operation means holding for 2 sec or longer.

Channel 5
Aux functions
Main functions
User sounds

Channels 3 & 4

fast: main gun shot
slow: main gun up

Turret left — Turret right

slow: main gun down
fast: light control
(main –> camo –> off)

Channel 5
Aux functions
Main functions
User sounds

Channels 3 & 4

MG

ambient sounds on/off — smoke generator on/off

reserved for future use

Channel 5
Aux functions
Main functions
User sounds

Channels 3 & 4

short: Sound 1
long: Sound 5

short: Sound 4 / long: Sound 8 — short: Sound 2 / long: Sound 6

short: Sound 4
long: Sound 7

Extended function control (channel 5)

If channel 5 is equipped with a knob or slider control, the number of available user sounds is increased. There are two additional function levels for the half down position (user sounds level 2) and half up position (user sounds level 3). Thus, a total of 24 user sounds are possible.

Vehicle control using a computer or Android®

The *ElMod Fusion Puma* can be controlled via a Windows® or Apple® computer or Android® smartphone/tablet. For this purpose the optionally available *ElMod Bluetooth* is required, which has to be attached to *connector 7*.

The computer control remains deactivated as long as connector 8 (receiver) is left empty. Parallel operation with a proportional receiver is not possible.

Status LEDs

The blue and red status LEDs on the PCB show the current operating status of the *ElMod Fusion Puma*.
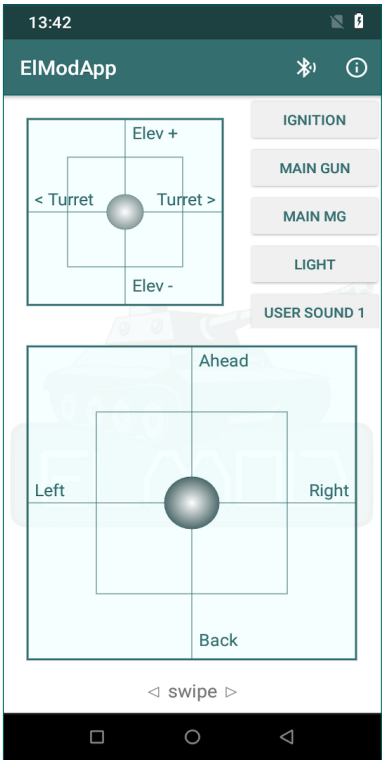
off	■ ■	on	ready to operate. blue LED blinks once after stick movement
off	■ ■	blinking	no receiver signal detected
on	■ ■	off	under- or overvoltage protection active
on	■ ■	on	no SD card inserted, card empty or its contents faulty (operation with default settings and without sound only)

Installation

When selecting the installation location, the following must be observed:

• Make sure that short circuits are excluded. No live parts may touch each other. It is best to insulate all open cable connections with a piece of heat shrinkable tubing.

• Keep current-carrying cables, especially the supply lines to the drive motors and drive battery as short as possible to minimize interference.

• Ensure that the receiver's antenna is not located within shielded metal walls (e.g. in the hull of a vehicle) or between power consumers (motors). This can lead to drastic deterioration of the radio signal, loss of radio communication and

loss of control over the model. The *ElMod Fusion Puma* is equipped with fail-safe mechanisms that help to detect radio signal failure. Depending on the manufacturer and settings, receivers can react unpredictably to an interruption of the radio link and, for example, continue to output the last correctly received signal.

First start up

- Make sure that all cables have been laid correctly.
- Switch on the radio transmitter.
- Insert a fully charged battery and switch the vehicle on.
- The blue status LED lights up shortly after switching on and goes out again.
- After 2-3 seconds it starts flashing regularly (search for receiver signal).
- The blue LED stays on as soon as the receiver signal is identified and the number of active channels has been defined or a command has been given via the vehicle control in the *ElMod App*.
- Start the engine and drive off! Have fun with your model!

Battery protection

The *ElMod Fusion Puma* is equipped with a voltage monitor which protects the battery from deep discharge. The setting of the battery type can be changed in the *ElMod App*. The standard setting is 6-cell NiMH battery. With this setting any other battery type up to 10V can be used, but in this no protection is given.

In order for the battery protection to become active, the switch-off voltage must be undercut for at least one second. All driving functions and sound are then immediately disabled. The red LED remains permanently on, the blue status LED is off. Every five seconds the announcement "Low voltage" is played. To switch off the active battery protection again, the battery has to be replaced or recharged and electronics must be switched off and on again.

## Installation of the ElModApp

With the help of the free *ElMod App* it is possible to customize the electronics to your needs. The software is freely available for Microsoft® Windows® operating systems, MacOS® and Android®. It allows a wide range of parameters to be set and information about the operating status to be read out. Furthermore firmware updates can be transferred to the *ElMod Fusion* module (not yet supported by Android®). Please note that when installing the software it may be necessary to ensure that any anti-virus software or other security settings do not prevent access to the USB hardware or block the execution of the program.
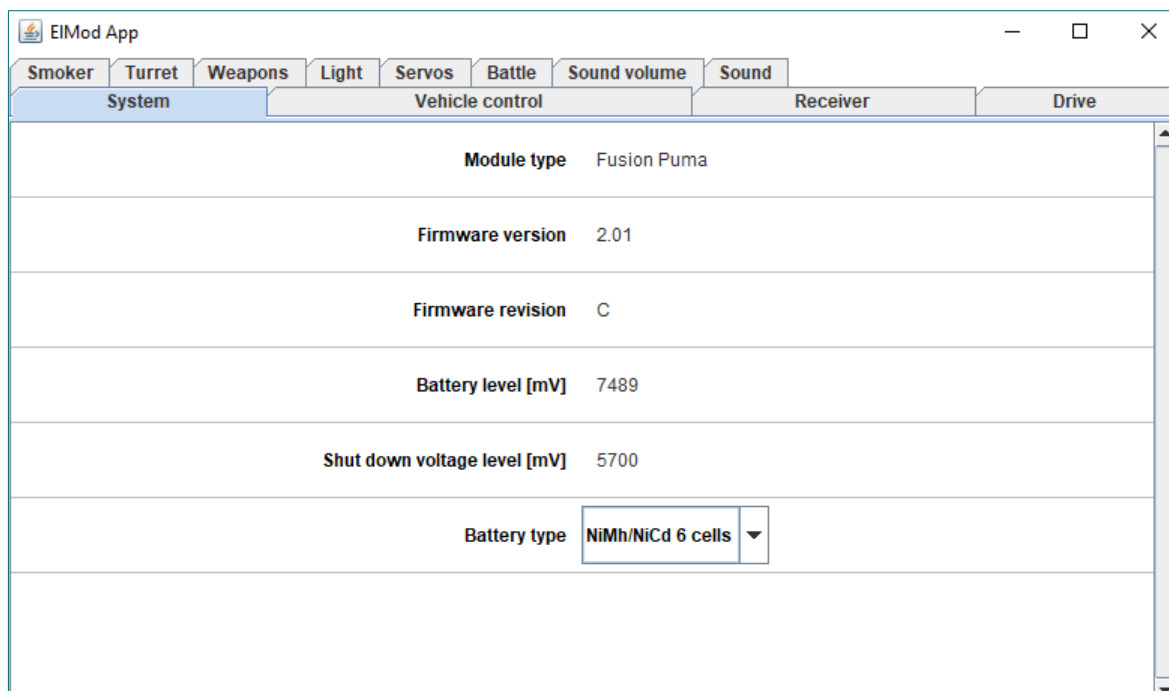
Under Microsoft® Windows® it is necessary to install a driver for the USB dongle. This driver is included in the installation package. Alternatively, the driver can be downloaded directly from the manufacturer. The link can be found on our website.

Under MacOS® the driver is already integrated in the system. If you did not download the *ElMod App* for MacOS® in the Apple® App Store®, it may be necessary to explicitly allow the execution of the *ElMod App*.

To do this, start "Security & Privacy" in the System Preferences, then click on "Allow apps downloaded from: App Store and identified developers". After the first execution of the *ElMod App*, return to the "Security & Privacy" settings and click on "allow" right to the listed *ElMod App*. This only needs to be done once.
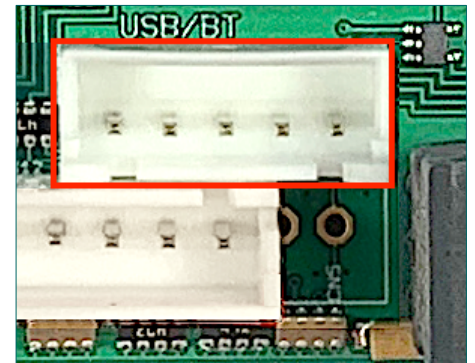
To attach the board to your computer, plug the USB Dongle to the designated connector and use the included USB cable to link the dongle to the computer.
A wireless connection to the *ElMod App* is possible with the optionally available *ElMod Bluetooth Adapter*.

Parameter configuration

The factory settings of the *ElMod Fusion Puma* matches a SdKfz 234.

To change settings with the *ElMod App* a connection to the *ElMod Fusion Puma* must be established. Proceed as follows:

• Power on the *ElMod Fusion* and connect it to the computer.
• Start the *ElMod App.*
• After 2-10 sec. the *ElMod Fusion Puma* will be detected and the current settings are shown on the screen.

With the *ElMod App* various settings can be made and different informations are displayed. The main screen is divided in four areas:

• On the upper edge there is a tab to choose the parameter's group.
• In the center area the parameters of the current category are listed. Each parameter has a detailed description. It is shown whenever you hoover the mouse pointer over the parameter's name.
• Below are several buttons:
  • "Load profile" loads a previously saved or provided setting profile from your hard disk.
  • "Save profile" saves all current settings on your hard disk.
  • "Help" shows a brief manual for the *ElMod App.*
  • "About" shows the version number of the software and legal notes.
  • "Quit" closes the *ElMod App.*

Reset to factory defaults

To reset all settings to factory values proceed as follows:

• Switch off the voltage and wait for 5 sec. Preventively disconnect the motors from the electronics or jack up the vehicle so that it cannot move.
• Switch on the voltage again.
• As soon as the blue LED lights up (about 0.5 sec. after power on) press and hold immediately the setup pushbutton.
• The blue LED goes off. After about 4 sec the blue LED and the red LED light up together.
• Release the setup button. All parameters are set to delivery condition.

Firmware update

For updating the firmware the *ElMod Fusion Puma* must be connected to a computer. To set the PCB in update mode, switch off the voltage and press and hold the setup pushbutton on the *ElMod Fusion Puma*. Switch the voltage on again. The blue status LED blinks three times. Now start the *ElMod App* and press the red "Update" button. Follow the instructions on the screen.

The newest firmware versions are always included in the current installation package of the *ElMod App*. A new version of the *ElMod App* may be installed anytime. It's not necessary to deinstall the existing version before.

In-Depth informations

Several documents describing various aspects of the *ElMod Fusion* Modules are available in our knowledge base which may be found on our web site.

SAFETY INSTRUCTIONS

General

- Damage caused by non-observance of these operating instructions will void the warranty! We assume no liability for consequential damages!
- We accept no liability for damage to property or personal injury caused by improper handling or non-compliance with the safety instructions! In such cases all warranty claims are void.
- For safety and approval reasons (CE), unauthorized modification or conversion of the device is not permitted. Only use original spare parts or equivalent spare parts for repairs.
- Make sure that all electrical connections and connections have been made correctly and in accordance with these operating instructions.
- If the ambient climate changes suddenly (e.g. from a cold room to a warm room), moisture can condense on the unit and possibly destroy it. Do not operate the unit until it has been acclimatized for about 2 hours.
- Do not operate the device in the vicinity of easily inflammable objects, liquids or gases, danger of explosion!
- Do not expose the device to high temperatures, strong vibrations, high humidity or chemically aggressive environments.
- Operate the device only in a dry environment (below 80 % humidity, non-condensing) and at normal room temperature.
- Do not operate the unit unattended.
- If you have any questions about the operation, safety or connection of the device that are not explained in the operating instructions, please contact your dealer's support or another specialist.

Electrical hazards

- Supply the device only with low voltage as specified in the technical data. Only use current sources approved for model making, such as NiMh rechargeable batteries. Operation with voltages higher than 12V is not permitted. There is a fire hazard!
- Observe the limit values for currents as specified in the technical data. Exceeding the permissible values leads to overloading and destruction of the device and carries the risk of fire or electric shock.
- Installation and connection must only be carried out when the device is disconnected from the power supply.
- Ensure that all connecting cables have a sufficient cross-section.

Heat hazards

- Electronic components on the product can become very hot during operation.
- During installation, ensure that there is sufficient air circulation around the device to prevent overheating due to heat accumulation.
- During installation, also ensure that there is sufficient distance to heat-sensitive and flammable objects (e.g. wooden and plastic surfaces, cable insulation).
- Touching the device may burn the skin.

Other hazards

Children can cause all the risks described above due to carelessness or a lack of sense of responsibility. To avoid danger

to life and limb, children under the age of 14 must not install our products. Small children can swallow or inhale the sometimes very small components with pointed ends. Danger to life! Therefore, do not allow the components to fall into the hands of small children. In schools, educational institutions, hobby and self-help workshops, the assembly, installation and operation of components must be supervised by trained personnel. In industrial facilities, the accident prevention regulations of the Association of Industrial Employers' Liability Insurance Associations for electrical systems and equipment must be observed.

DECLARATION OF CONFORMITY

The product meets the requirements of EC Directive 89/336/EEC on Electromagnetic Compatibility and bears the CE marking for this purpose.

MANUFACTURER'S NOTE

According to DIN VDE 0869, the person who makes an assembly ready for operation by extension or housing installation is regarded as the manufacturer and is obliged to supply all accompanying documents when passing on the product and also to state his name and address.

WARRANTY CONDITIONS

This product is guaranteed for 2 years. The guarantee covers the free remedy of defects which can be proven to be attributable to material used by us which is not faultless or to manufacturing faults. We guarantee that the components will function in accordance with their characteristic values when unassembled and that the technical data of the circuit will be complied with when installed in accordance with the instructions and with the prescribed commissioning and operating instructions. Further claims are excluded. We assume no liability beyond the legal regulations of German law for damages or consequential damages in connection with this product. We reserve the right to repair, repair, replace or refund the purchase price.

In the following cases the warranty claim expires: In case of damage due to non-observance of the instructions and the connection diagram, in case of modification and repair attempts of the circuit, in case of unauthorized modification of the circuit, in case of improper removal of components not provided for in the construction, free wiring of components such as switches, potentiometers, sockets etc., in the event of destruction of conductor tracks and solder lugs, incorrect assembly or incorrect polarity of the module / components and the resulting consequential damage, damage due to overloading of the module, connection to an incorrect voltage or type of current, damage due to intervention by third parties, persons, incorrect operation or damage due to negligent treatment or misuse, damage due to contact with components before electrostatic discharge of the hands.

Nicht geeignet für Kinder unter 14 Jahren.
Not suitable for Children under 14 years.
Ne convient pas pour des enfants de moins de 14 ans.
Niet geschikt voor kinderen onder de 14 jaar.