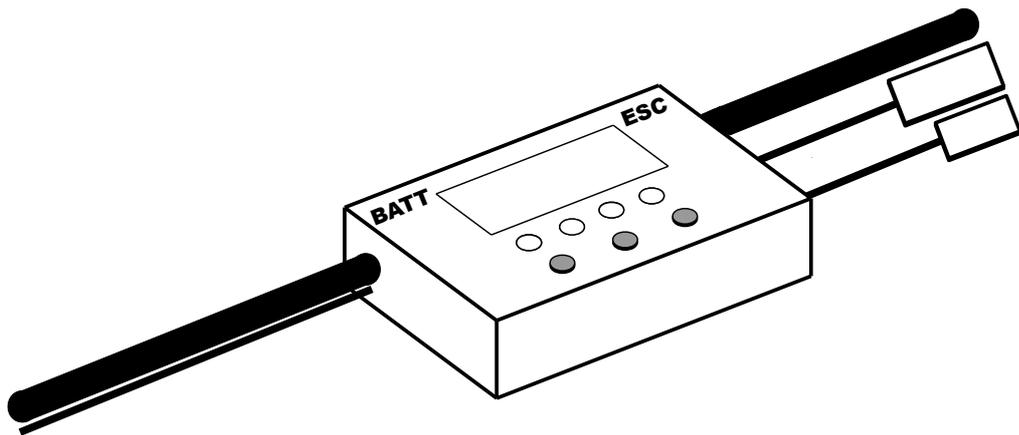


User's Manual

Energy Meter with Limiter

Model KLW202

Software version 5.6



www.wozniakrctech.com

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1. Safety Precautions

- Before starting please carefully read entire User's Manual to ensure safe product use.
- High power electrical systems e.g. RC model's equipment pose dangers and it is the user's responsibility to be familiar with these dangers and take any necessary action to ensure safe use. Shorting a rechargeable battery can supply huge currents and have serious consequences including explosions, causing fire, damage to equipment and personal injury.
- This product is designed to be safe to use when operated within the parameter limits it was designed for. Typical applications are well within these limits, but it is the user's responsibility to be familiar with the product specifications and ensure the unit is operated within its limits.
- The current measured by the device may have a very large value. Poor connections may cause large increase of temperature and risk of personal injury, fire and property damage. The user must be familiar with the relevant methods, procedures and connection components. It is suggested that any connectors and wires chosen for use be appropriately sized and rated for the intended application and attached in the manner recommended by their respective manufacturers.
- Before connecting a battery or power source it is necessary to verify polarity and there are no exposed wires or connectors at risk for a short circuit.

2. Introduction

Energy Meter and Limiter KLW202 was designed for R/C boats with special needs such as high current consumption, water resistance. During production we use potting process, a complete electronic assembly is filled in a vacuum with a solid compound. The device maintains high measurement accuracy even after sinking.

The device has a double function. Energy Meter shows in real time the amount of energy consumed. Limiter after reach the programmed limit of energy reduce the throttle demand to the ESC. The device allows to program four different energy limits. Switching between them is done by short pressing the SET button. The ramp time, throttle minimum and limit time could be programmed.

The KLW202 is a perfect solution for training and competitions. During training user can set any value of energy limit and see how many energy consumed. During competitions limiter is programmed and the SET button is sealed with a non-removable sticker, user can't change settings.

If the energy limits will be updated by NAVIGA, there is no need to return the device to the manufacturer or to buy a programmer. The change can be made yourself from the menu by holding down the SET button for a longer time.

Features:

- Current measurement up to **200 A**.
- Minimal power loss by the use of silicone connecting cables with a cross section area of 10 AWG (5.3 mm²) and sensor resistor of **0.0001 Ω**.
- High waterproof, **IP67**.
- No need a special programmer and additional switch button
- High accuracy.
- Clear LED display.
- Double function: energy meter and limiter.
- Fast changing a limit value, 4 values are stored in the memory
- High credibility, value of the programmed limit and other parameters could be shown on display at any time.

3. Specifications

Specifications table:

Current:	0 – 100 A (CONTINUOUS), 200 A (PEAK)
Battery voltage:	0 – 45 VDC
Supply voltage:	4,5 – 6 VDC
Supply current:	70 mA max
Measured energy:	0 - 38000 Wh
Energy resolution:	0,1 Wh
Energy accuracy	+/- 1 % for current above 5 A
Sampling frequency	50 Hz
Starting current threshold I_s :	0 – 5 A
Ramp time t_R :	0 - 30 s
Throttle minimum Th_{MIN} :	0 - 99 %
Limit time t_L :	0 - 999 s
Minimum Pulse width t_{PWM} :	0,8 - 1,6 ms
Series resistance:	0,0001 Ω
Connection cable:	AWG 10 (5,3 mm²)
Display:	3 digit, LED
Dimensions (without cables):	45x31x12 mm
Weight:	35 g
Nominal Operating Conditions:	0 – 50 °C ambient temperature, IP67

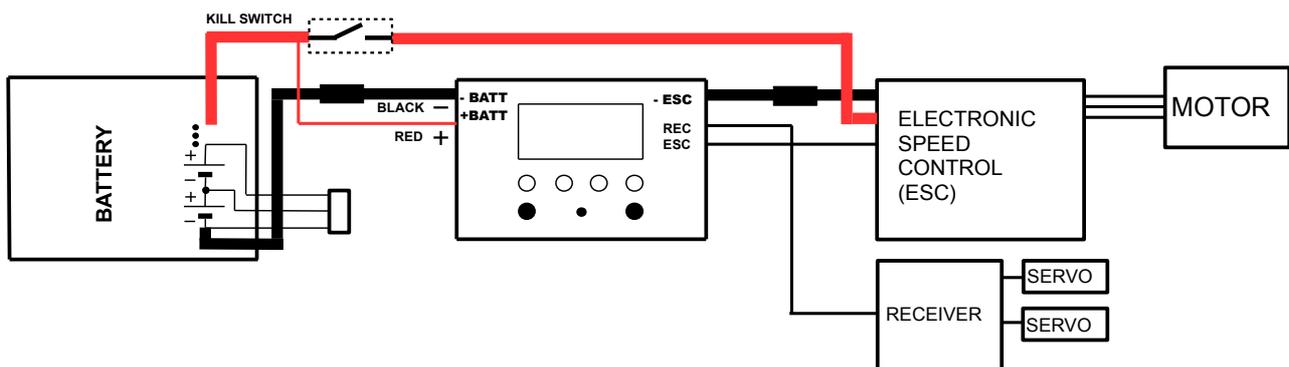
4. Getting started

4.1. Making connections

- The current is measured by BLACK cable, current flow from *-ESC* to *-BATT cable*. Connect this cable between battery negative and ESC negative terminal.
- The voltage is measured by RED *+BATT cable*. In the absence of ESC power (the kill switch is disconnected) , this cable provides a backup power to maintain the memory of the amount of energy consumed. Connect this cable to battery positive terminal, you may use balancer connector.
- The device is power supplied from ESC, supply voltage 4,5 – 6 V. **Ground of ESC cable is not connected to -ESC cable** (ground of the limiter) inside the device, be sure to **always connect -ESC cable to the ESC**.
- The device measure the energy consumption of the connected load and itself.
- Do not leave the device connected to the battery unattended. Long-term connection to the battery can lead to excessive discharge and its destruction.

ATTENTION:

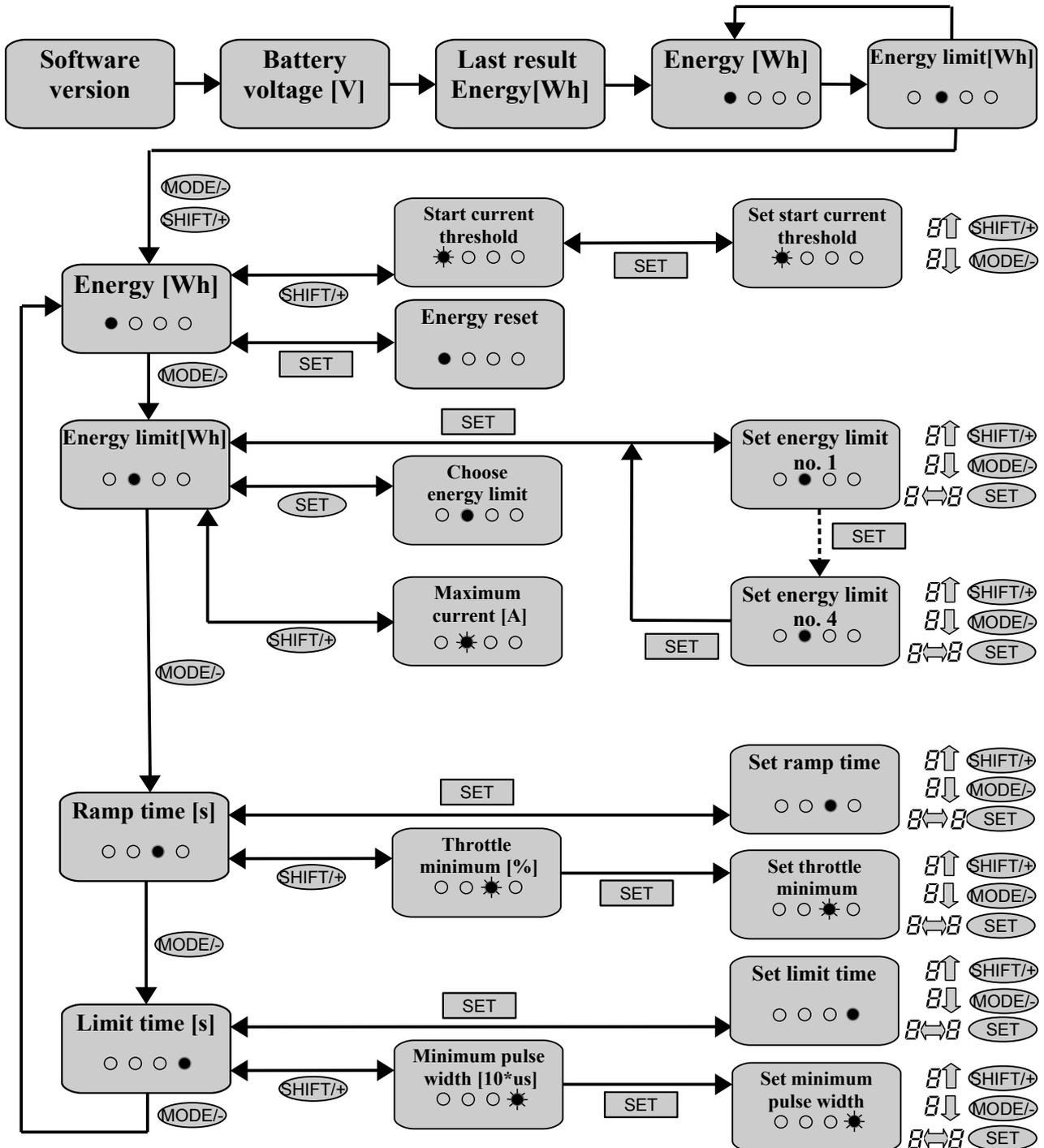
**When connecting, pay special attention to the polarity. Black or brown wire - Negative pole (-)
Red wire - Positive pole (+). Yellow wire – PWM Signal.**



5. Menu

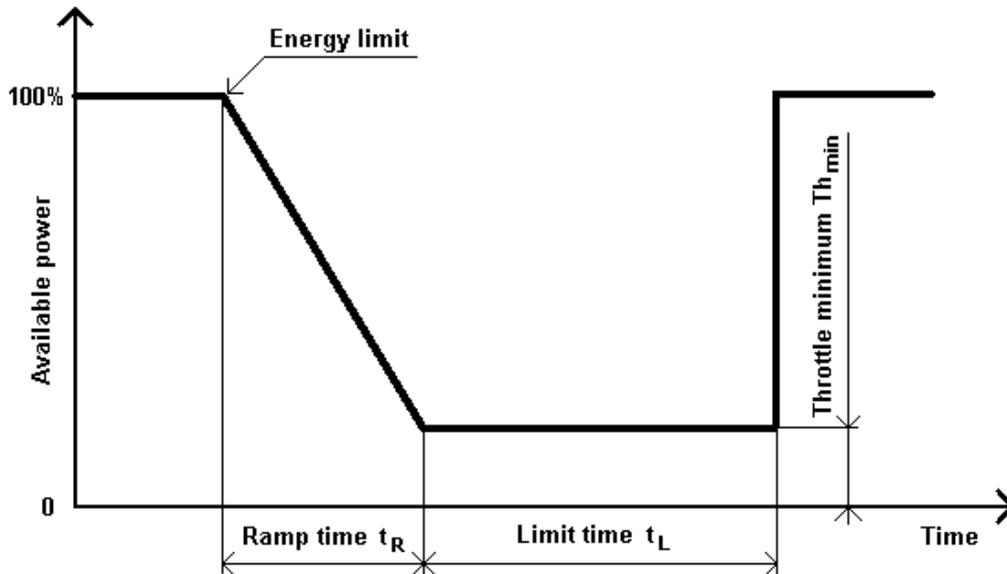
	Push button		The LED is on
	Hold button		The LED flashes

\bar{h} - k "noU" message - no voltage (cable +BATT disconnected)



6. Limiter

Limiter counts energy when current is greater than set in *Starting current* threshold, so you can skip energy counting while the model is being prepared for start. Limiter after reach the programmed limit of energy reduce the throttle demand to the ESC. The parameters of the reduction are programmable. Figure below explains them.



In order to reset the energy value, the device should be completely disconnected from the power supply (both from the ESC cable side, eg by pulling out the kill switch and the red cable + BATT measuring the battery voltage) and wait 1 - 2 minutes. This process should be carried out before each new start, so that the energy value is counted from 0. Resetting the energy value can also be done by holding the SET button for approx. 1 second, only possible if the button is not sealed, eg during training. When the power supply is connected, the value of the last energy value blinks on the display for 4 seconds, it does not affect the new measurement.

The device to determine the value of percent energy reduction need to know minimum and maximum pulse width of signal controlling ESC. The maximum pulse width (maximum power) is determined automatically as a maximum pulse width since turn on the device. The minimum pulse width could be determined automatically or set manually by menu option t_{PWM} . To select the automatic mode set "---", the pulse width will be measured with KLV202 turn on. The transmitter must be switched on in advance and the throttle set to minimum. To select the manual mode, enter the pulse width value in $10 \cdot \mu s$. For example to set 1 ms enter value 100.

If the message "noU" appears on the display, it means no voltage measurement, +BATT wire is not connected. This message can be canceled by pressing any button. If there is still no voltage, this message will appear again after 5 seconds.

The *Maximum current* is the maximum value calculated from the averaged series of 64 samples (1.28 seconds). This parameter is useful, for example, when choosing the right speed controller.

7. Warranty

This device is covered by a 24-month manufacturer's warranty.

At the time of any problems with proper functioning, first contact the store where the product was purchased, showing the purchase receipt, accurately describing the symptoms noted. The defects discovered during the guarantee period will be free of charge removed within 14 working days from the date of delivery to the manufacturer and the warranty period is extended by the repair duration. During the warranty period, the damaged product will be repaired or replaced free of charge by the guarantor for the same fault-free. If the repair or replacement of the device is not possible, the claimant is entitled to a refund of the amount paid.

The warranty does not cover mechanical damage to the product as well as the consequence of such defects resulting from the user's fault. The warranty also does not apply if the product is not used for its intended purpose, confusion of polarity, supply voltage higher than stated, failure to comply with instructions contained in the user manual, self tampering, obvious negligence, short circuit, use in the system the faulty element and other, not directly caused by the fault of the manufacturer. This warranty does not exclude, limit or suspend the buyer's rights under the law.

The manufacturer is not liable for any damage caused by using the device contrary to its intended use or inappropriate handling.

The manufacturer reserves the right to make changes in the product design without reservation and without notification to its users.



This symbol on the equipment and / or its documentation indicates that such waste can not be disposed of with other household waste in the European Union (EU Directive 2002/96 / EC). To ensure the proper conditions for the product to be recovered or recycled, it should be left at the collection points for this type of waste, where it will be free of charge. For information on the correct disposal of used electrical and electronic equipment, please contact the municipal administration or the seller of the appliance. By disposing of worn-out equipment you contribute to protecting the environment.

Manufacturer

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