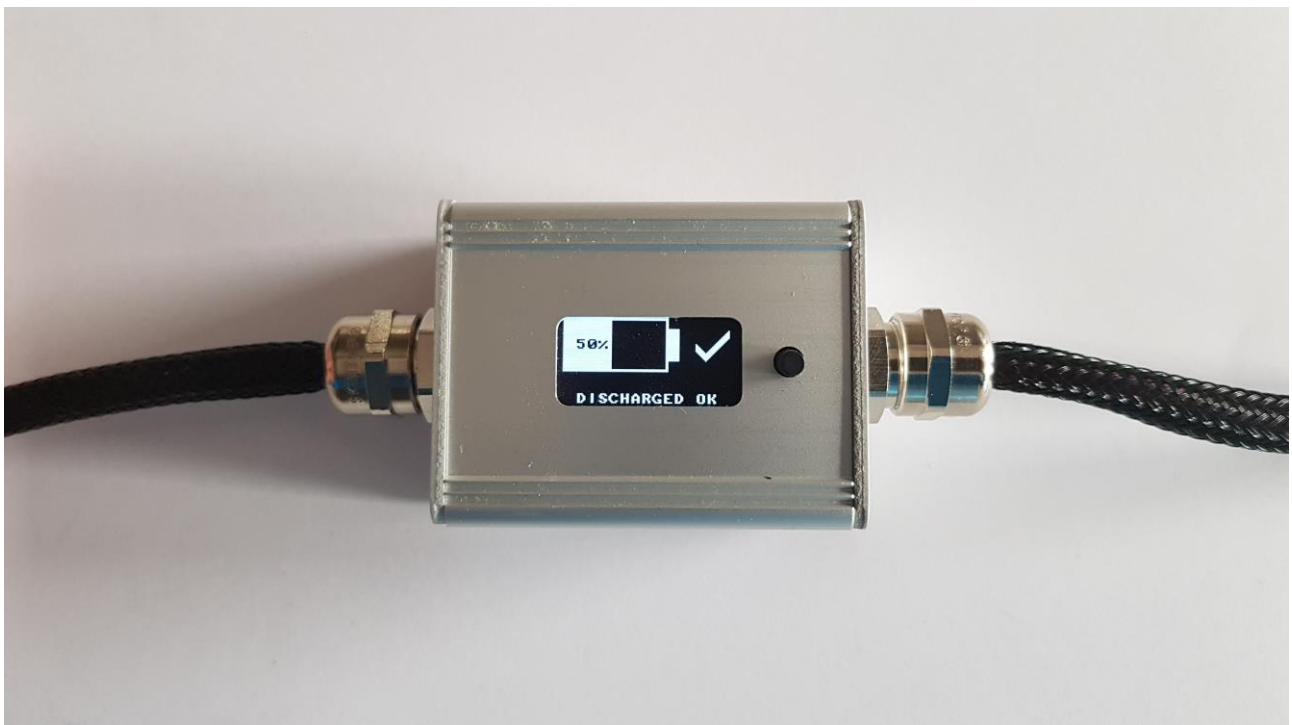




# FES Discharging assistant

User manual, Version 1.33



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## 1. Important notices

This user manual contains important information about proper and safe usage of the Discharging assistant.

If you need more information, please contact the manufacturer LZ design.

Information in this document are subject to change without notice. LZ design reserves the right to change or improve this product and to make changes in the content of this material without obligation to notify any person or organization of such changes or improvements.



A Yellow triangle is shown for parts of the manual which should be read carefully and are important



Notes with a red triangle describe procedures that are critical and may result in reduced safety or may lead to critical situation



A bulb icon is shown when a useful hint is provided to the reader

### 1.1 Limited Warranty

This product is warranted to be free from defects in materials or workmanship for one year from the date of purchase. Within this period, LZ design will, at its sole option, repair or replace any components that fail in normal use. Such repair or replacement will be made at no charge to the customer for parts and labour, however the customer shall be responsible for any transportation cost. This warranty does not cover failures due to abuse, misuse, accident, or unauthorised alterations or repairs.

Usage of this device is at user's own risk. Manufacturer (LZ design d.o.o.) will not under any circumstances accept any responsibility or will be liable for possible damage on people, animals or things, which might directly or indirectly happen from using the discharging assistant. With using of discharging assistant user automatically agree with above listed terms.

To obtain warranty service, please contact the manufacturer of your glider, local dealer of glider manufacturer or LZ design directly.

## **1.2 Invalid Warranty**

Warranty becomes invalid in next cases:

1. Applying loads with unknown power rating to device output, to prevent possible over-current from battery pack, which can lead into damaging of battery pack, device or load.
2. Shortening the device output - this will lead to over-current from battery pack, which can lead into damaging of battery pack, device or load.
3. Trying to discharge other than FES battery packs. This device is designed to be used only with FES battery packs which has 14 or 16 Li-ion cells wired in serial.
4. Using the device in dusty, hot or humid environment. This may lead to damaging of the device.

The warranty does not cover failures due to abuse, misuse, accident, or unauthorised alterations or repairs.

The discharger is not waterproof in anyway.

## 2. Description

FES discharging assistant (in further text word "device" will be used) is a device used for discharging a single FES GEN1 or GEN2 battery pack (with 14 or 16 LiPo cells wired in serial) down to 50 % of pack capacity. Such capacity is suitable for longer time storage of battery packs.

FES discharging assistant is suitable for discharging of:

- FES GEN2 14S or 16S battery packs (end of cables equipped with connection pins),
- FES GEN1 14S battery packs (end of cables equipped with cable shoes).

FES discharging assistant can **only work in a combination with a suitable DC (direct current) load**. Load is not supplied as part of FES discharging assistant. As suitable load we recommend using a standard electric oil radiator 230 VAC, with EU plug, and rated as between 1.5 kW and 2.5 kW (min. 1 kW). Also, US oil radiators rated as 110 V and up to 1.5 kW, could be used if a suitable plug or plug adaptor is used.



**Warning:** *Please check that radiator is not equipped with ventilator, as ventilator might need AC current, and as such it would not be suitable as DC load.*

The DC load needs to be connected to the output side of the device, for slow and safe discharge of one FES GEN1 or GEN2 battery pack (in further text words "battery pack" will be used) which is connected on the input side.



FES 14S discharger is available with European (upper right image), UK (middle right image) or USA (lower right image) outlet type.

The device contains OLED display which can lose some of its light output over working time. This can be prevented with disconnecting the device from the battery pack when not in use. Due to OLED technology some picture retention might happen during using of the device.

Hardware / software version:

- current hardware version: 1.4
- current software version: 1.56



**Caution:** For discharging FES GEN2 16S Battery packs, there is a **special version of 16S Discharging assistant available.**

### 3. How to use

Make sure that you have a proper type of discharging assistant!

- 14S Discharging Assistant for FES GEN1 and GEN2 14S battery packs,
- 16S Discharging Assistant for FES GEN2 16S battery packs.

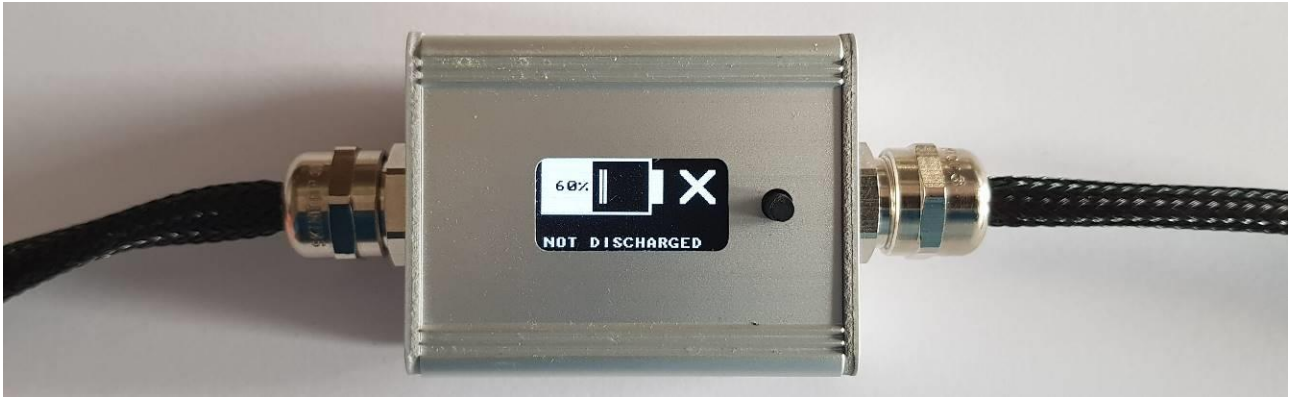


Connect an electric oil radiator to the output and connect the battery pack to the input with correct polarity (blue minus connector is smaller than red plus connector, so wrong connection is not possible).



Device will start working and welcome screen with software and hardware version of the device will be displayed.





If battery pack is charged over 50%, a "NOT DISCHARGED" text, "X" symbol and battery pack percentage will be displayed. Battery pack percentage will be displayed with numbers from 50 to 100 (%), with 5 % steps and with different number of bars in battery symbol.



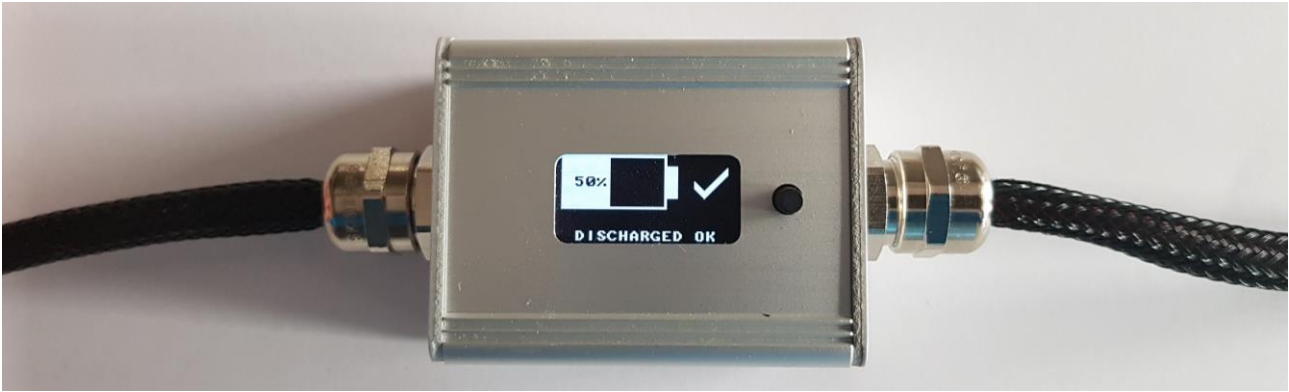
By pressing a button, the device will start discharging the battery pack through the load. A text "DISCHARGING" and an arrow symbol will be displayed.

Each button press will sound buzzer with short alarm and functionality will be switched between discharging and non-discharging state.



When button will be pressed for the first time, device will first measure voltage drop on input elements and text "U DROP MEAS" will be displayed.

Scaled voltage drop value will later be used for correct voltage measuring of battery pack, taking into account voltage drop error, due to supply wire resistance and voltage drop of battery due to discharging current.



When battery pack voltage will reach 50% of charge (51.8 V, 3.7 V/cell) a device will automatically disconnect load from the battery pack, to prevent further discharging of the battery pack. Buzzer will sound the alarm and text "DISCHARGED OK" and tick symbol will be displayed. Pressing button again will not start further discharging of battery pack.

If battery pack voltage will rise slightly after discharging has been stopped, message "DISCHARGED OK" and tick symbol will remain until 60 % of battery pack due to applied hysteresis.

**It is very important to disconnect the battery packs when the discharging is over!** After battery packs are discharged to 50% SOC, some drain current remains (approx. 5 mA), which can discharge the battery packs to 0% SOC if they are left connected for a longer time (more than 24 hours).



**Warning:** *After discharging to 50% SOC, the battery pack should not stay connected to the discharger for a longer time (more than 24 hours). It can cause serious damages of the battery packs!*

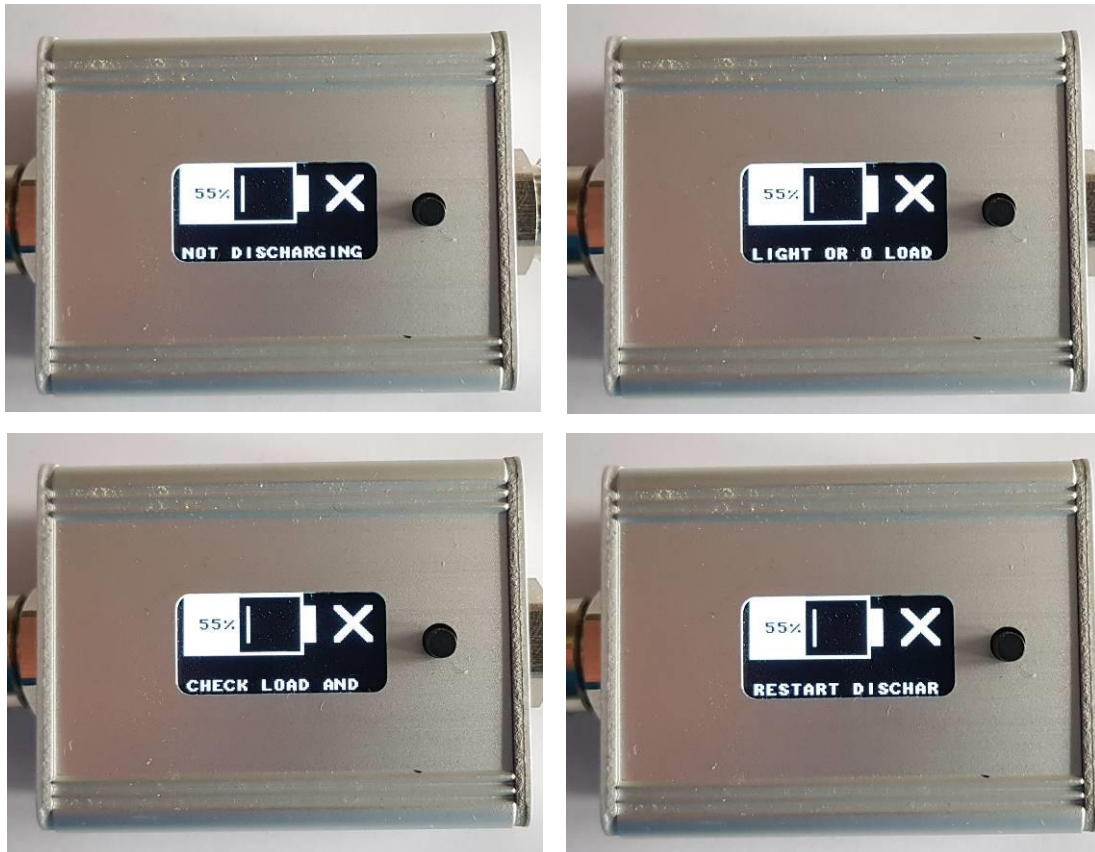


## 4. Special behaviours

From SW version 1.55 further load disconnection detection at start or during discharging is implemented.

### 4.1 No load at start of discharging

If no load (or load below 1 kW 230 V oil radiator) will be detected after voltage measurement, device will not start discharging and will sequentially display text:

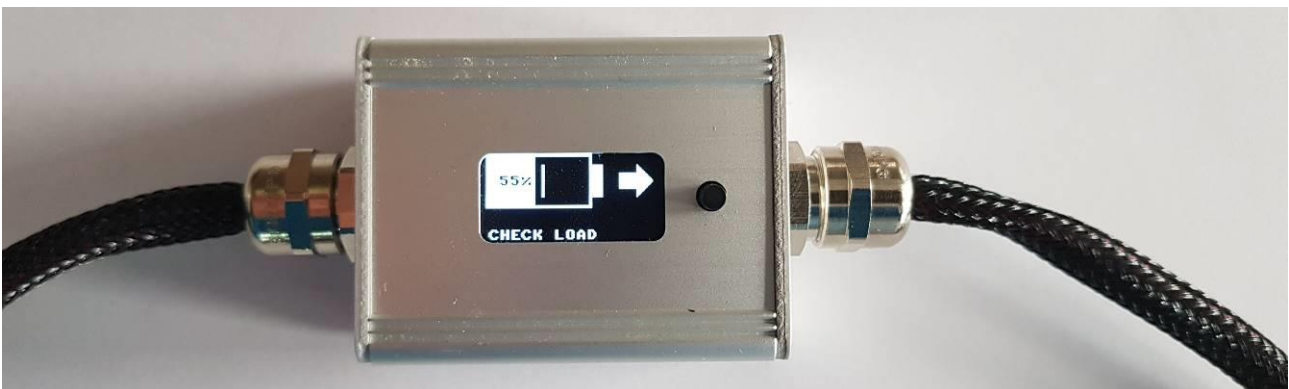
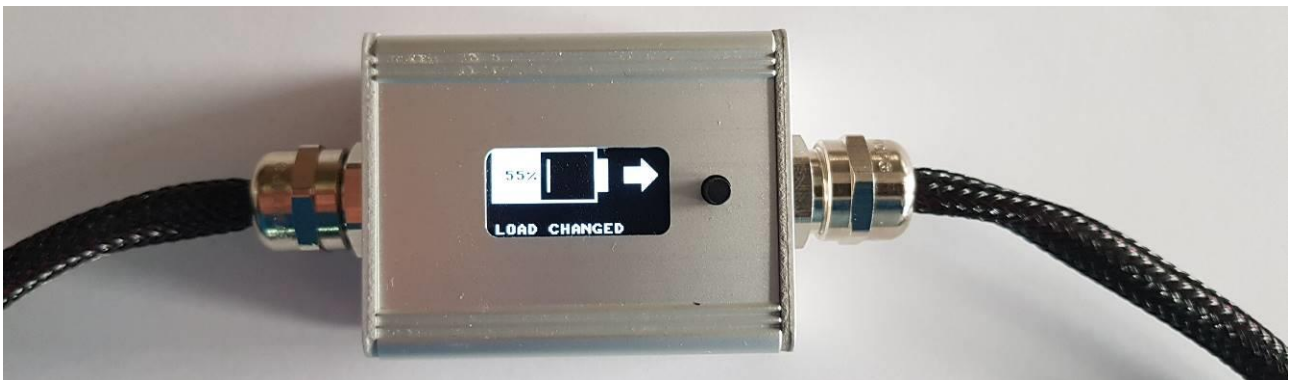
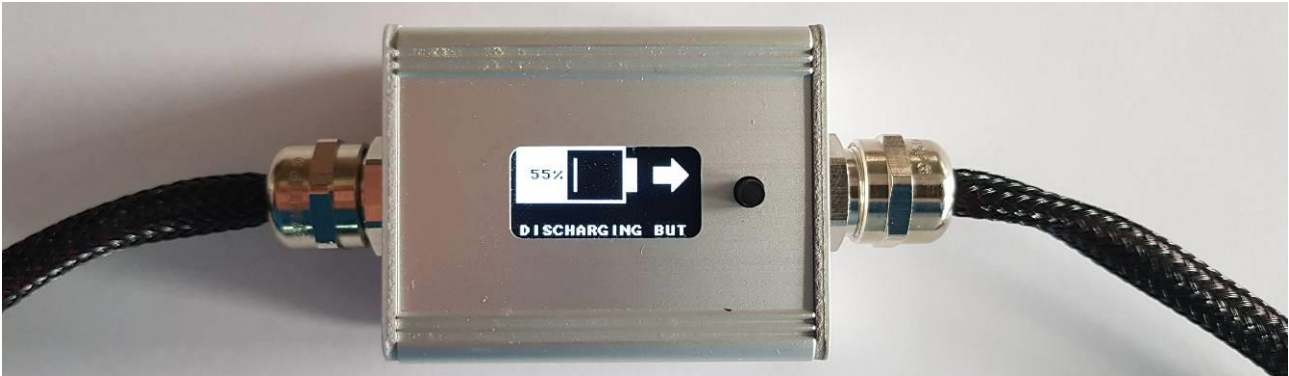


"NOT DISCHARGING" → "LIGHT OR 0 LOAD" → "CHECK LOAD AND" → "RESTART DISCHAR".

In this case please check the load. If the load is disconnected, you need to connect it back and press the button, to cancel current discharging procedure. Press the button again and the device will start the usual voltage drop measurement and normal discharging behaviour.

## 4.2 Load disconnection during discharging

If load reduction or disconnection will be detected during discharging, device will still discharge battery pack (in case of load reduction) but will sequentially display text: "DISCHARGING BUT" → "LOAD CHANGED" → "CHECK LOAD".



In this case, please reconnect or raise the load to normal load measured at the beginning of discharging process and the device will stop sequentially displaying text.

This scenario is possible in the case of electric radiator with multiple load switches.

### 4.3 Battery SOC below 50%

When battery pack SOC (State of Charge) is below 50 % (this equals below 49 V), buzzer will start with slow on/off buzzing, a text "UV CHECK FOR SC" and "X" symbol will be displayed.

This scenario can happen when battery pack is undercharged at connection or in case when internal switch is damaged (in short circuit) and so the battery pack is still discharging through electric radiator.

In this case disconnect the battery pack from the device ASAP.

### 5. Fuse replacement

In case of over-current situation Discharging assistant has a removable standard 5x20 mm fast acting 10 A fuse, which can be replaced with dismantling device enclosure.



Replacement is only needed when buzzer is alarming with fast on/off buzzing and text "CHANGE FUSE" is displayed on the display. User must take special care when dismantling the enclosure to prevent any possible damage to internal elements.

Usage of ESD protection is obligatory when dismantling the enclosure. Device must be disconnected from input and output before dismantling the enclosure.

### 6. Repair and service

In case of a fault or damage(s), contact manufacturer of your glider, local dealer of glider manufacturer or LZ design.

## 7. Revision history

|                |  |
|----------------|--|
| March 2017     | Initial release, user manual v1.0  |
| May 2017       | Update regarding new software version, user manual v1.1  |
| September 2017 | Update regarding new software version, added algorithm for no load or load reduction detection, user manual v1.2   |
| December 2017  | Update regarding new software version, minimum load is 1kW 230V oil radiator from SW1.56 further, user manual v1.3 |
| December 2018  | Updated photos and text, user manual v1.31   |
| November 2019  | Minor updates, user manual v1.32   |
| February 2020  | Minor updates (16S discharging assistant, remaining drain current), user manual v1.33                              |