



FES SYSTEM MANUAL

Version 1.22



LZ design d.o.o., • Brod 3D, 1370 Logatec, Slovenia • tel +386 59 948 898
info@lzdesign.si • www.front-electric-sustainer.com

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1. Important notices

Please read this manual thoroughly. It contains important information about your FES system, having a vital importance to the flight safety.

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

1.1 Limited Warranty

This FES system is warranted to be free from defects in materials or workmanship for two years 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 repairs or replacement will be made at no charge to the customer for parts and labour, the customer shall be responsible for any transportation cost. This warranty does not cover failures due to abuse, misuse, accident, or unauthorized alterations or repairs.

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To obtain warranty service, contact your FES equipped sailplane manufacturer, your local LZ design dealer or contact LZ design directly.

February 2013

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2. General

Congratulations on your purchase. This is a high-end electric propulsion product, for powered sailplanes, which will keep its capability for a long time if treated the right way. The FES was developed by Ing. Luka Žnidaršič and Ing. Matija Žnidaršič.

The development objective was to build reliable Sustainer system, which would add minimum additional weight to sailplane, but still with good climb performance and suitable range.

Our expectation was surpassed as FES proved to be suitable also as self-launch system for lighter 13,5m, 15m and even some 18m sailplanes.

3. Available FES manuals

FES System manual consist of next separate manuals:

Standard manuals which is valid for all different sailplane types:

- **FES Quick Guide** – safety information's before flight with FES equipped sailplane.
- **FES Flight manual** - what you should know before first flight with FES equipped sailplane.
- **FES Maintenance manual** - what you should know about maintenance of FES system.
- **FES FCU INSTRUMENT manual** - detailed explanation about FES control unit.
- **FES BATTERY PACK GEN1 manual** - info about generation 1 battery pack (with external BMS).
- **FES BATTERY PACK GEN2 manual** - info about generation 2 battery pack (with integrated BMS).
- **FES BMS CONTROL manual** - how to monitor charging and other parameter with PC software (Windows operating system only).

Special manuals for motors which are dedicated to different sailplane types:

- **FES-LAK-M100 Motor manual** - for LAK17A FES, LAK17B FES, MiniLAK FES sailplanes
- **FES-SIL-M100 Motor manual** - for SILENT 2 Electro sailplanes
- **FES-AS-M100 Motor manual** - for AS13,5 FES sailplanes
- **FES-VEN-M100 Motor manual** - for Ventus 2cxa FES sailplanes
- **FES-DIS-M100 Motor manual** - for Discus 2c FES sailplanes
- **FES-HPH-M100 Motor manual** - for HPH 304ES FES sailplanes

Special manuals for propellers which are dedicated to different sailplane types:

- **FES-LAK-P10-100 Propeller manual** - for LAK17A FES, LAK17B FES, MiniLAK FES AS13,5 FES sailplanes
- **FES-SIL-P15-100 Propeller manual** - for SILENT 2 Electro sailplanes
- **FES-VEN-P14-102 Propeller manual** - for Ventus 2cxa FES sailplanes
- **FES-DIS-P1-102 Propeller manual** - for Discus 2c FES sailplanes
- **FES-HPH-P1-102 Propeller manual** - for HPH 304ES FES sailplanes

Regular updates of all available FES manuals are available on official FES website, at download section:

<http://www.front-electric-sustainer.com/download.php>

Following the name with its link to the pdf file, is written date of latest update (for instance: FES System manual v1.0 , pdf file updated 1.4.2013)

It is responsibility of the owners and the users of FES system to regularly monitor if there is any new manual or updates of already existent manual available. Manufacturers of FES powered sailplanes can include some manuals and information's regarding FES to their sailplanes manuals, however latest FES manual published on official FES website is valid as proper and latest info about!

4. Technical data

Weight of all components	cca 45 kg
Maximum power	22 kW
Time to full power	1-2 sec
Total energy stored in two GEN2 (or GEN1) battery packs	4,2 kWh
Propeller diameter	1,0 m
Max propeller speed	4500-4700 rpm
Cruising propeller speed	3000-3300 rpm
DC/DC converter power	60W
Maximum battery total voltage	118V
Minimum battery total voltage	90V
Maximum battery current	220A

Data can vary regarding sailplane type as, FES system is adjusted to each specific type of sailplane.

5. FES drawings

Check FES Maintenance manual, FES Flight manual, FES Motor manuals.

6. Maintenance

Check FES Maintenance manual!

7. Repair and service

In case of a fault or damage(s), contact manufacturer of FES system (LZ design company) or manufacturer of your sailplane.

8. Revision history

April 2013	Initial release of manual v1.0
June 2013	Added information about updates of manuals v1.1
March 2015	Added information about new FES sailplane types, manual v1.2
September 2016	Added information about new FES sailplane types, manual v1.21
October 2016	Added information about FES Quick Guide, manual v1.22