



FES Quick Guide

Version 1.1



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1. Important notices

This guide contains the most important information about FES safety on the ground and during flight. Even that FES is very simple to operate there is still required some basic understanding, as it is quite different from other propulsion systems.

It was prepared as a guide to pilots, before their first flight with FES equipped sailplane, in order to use it in proper and safe way.

This QuickGuide should only be used as a refresh document prior to flying and not as a substitute for the full manuals. Users should check for the latest versions and review the full manuals at least annually.

2. General information

New FES pilots should understand and respect next procedures:

Before the flight both battery packs should be properly fixed. Plus and Minus power cables should be fully engaged and signal cable with two multipole connectors plugged to the battery packs.



Before trying to plug in male connectors, make sure about proper orientation. Do not use excessive force! If it does not fit, probably orientation is wrong. Plug them in straight direction, otherwise pins could be damaged!

1. When glider is not used on the ground (in trailer, in hangar, and early before and long after flight), make sure that "Connecting cable" is NOT inserted, between the FES battery packs! By doing so, FES system "is not live" on the ground.

2. The "Connecting cable" between FES battery packs, should be installed for preflight check before the flight. When "Connecting cable" is installed, DC/DC starts providing 12V to the FES system and to the other instruments on board (also starts charging any 12V battery on board).

After that, also BMS electronic switch, on top of each battery pack, should be switched ON, so that temperature data and each cells voltage data are available for the FCU instrument.

At this point system becomes "ready for flight" but still not "live".

3. In order that any of the gliders instruments will work, pilot need to check that "Master switch" for instruments, is ON. On Schempp-Hirth gliders "Master switch" for instruments it is usually arranged as Klixon automatic fuse, which can be pressed in – ON or pulled out - OFF. On most other types of gliders it is usually just a toggle switch.

4. FCU instrument should be switched ON (using toggle - pull switch on top right side of the FCU instrument) together with switching ON flight computer, radio etc.. FCU instrument must be always switched ON, during flight, so that pilot is able to monitor status of the battery packs, and could be warned about any dangerous state.

5. Below the instrument panel (at LAK gliders on right side of cockpit) is located so called "Power switch", which is protected with red safety guard, which prevents unintentional,

switching ON. It can be treated as Ignition switch on powered planes! So this switch is clearly not "Master switch", and this is important to understand.

Until "Power switch" is OFF, there is no possibility that motor would start. "Power switch", activates main contactor, which connects FES battery packs to the motor controller. System becomes "live".

6. When canopy is opened, "Canopy switch" prevents starting motor, (all FES gliders are equipped with canopy switch)

7. "Power switch" should be ON only during powered flight. After motor is stopped, and propeller aligned horizontally, "Power switch" should be switched OFF by pressing red safety guard downward.

8. After landing, "Connecting cable" should be unplugged from FES battery packs! FES system is "not live".

All this safeguards prevents unintentional or intentional motor starting on the ground.

9. To successfully run the motor, next actions are required in proper order:

- insert "Connecting cable" between front and rear FES battery pack (to wire them in serial, otherwise motor will not run), before flight
- switch ON "Master switch" for instruments ON, before flight (so that FCU instrument can work)
- switch ON, FCU instrument, before flight (must be switched ON during complete flight)
- close and lock the canopy
- lift red safety guard, and switch ON "Power switch", system becomes "live"
- gently rotate throttle knob clockwise -> and motor will start.

Before the first flight with FES, pilot should know a few numbers:

- first "Low voltage, reduce power" message will appear at 95V.
- second "Critical low voltage, stop FES motor" message will appear at 90V.

Do not discharge batteries below 90V level unless you are ready to pay new packs.

- max allowed motor and controller temperature is 90°C (at 70°C is first warning)
- max allowed battery packs temperature is 55°C (at 45°C is first warning)
- around 3000RPM is required for level flight
- max RPM is about 4700RPM

-at least 1500RPM is required that propeller brake will work, in flight is usually always enough RPM even at no power where propeller is in windmilling stage.

As part of preflight inspection, before the flight, it should be performed short ground run with low RPM only, so that pilot can be sure before the flight, that all works fine (and mostly that pilot would not wondering at 200m above the field if he actually plugged in "Connecting cable") – valid for sustainers!

- remove tail dolly
- close canopy (motor will not start with canopy opened)

-make sure that nobody is around the propeller. Call loudly "Clear prop!", before starting!
-you can check if propeller braking is working, but more than 1500RPM is required, otherwise it will not work.

10. When helper attaching towing rope, "Power switch" must be switched OFF, in order to provide required safety to the helper!

11. During aero-tow or winching "Power switch" must be OFF.

12. Always land with "Power switch" OFF.

For further details please refer to the FES Flight manual, FES FCU instrument manual, FES GEN2 battery pack manual, and others available on our FES dedicated website at download section:

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

3. Available FES manuals

In FES system manual, is description and list of all available manuals for FES.

4. Technical data

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

5. FES drawings

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

6. Maintenance

Regarding required maintenance, check FES maintenance manual!

7. Repair and service

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

8. Revision history

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| October 2016 | Initial release of quick guide v1.0 |
| November 2016 | Additional info about DATA connectors, v1.1 |