



# FES PROPELLER MANUAL

Version 1.0

Type: **FES-SIL-P15-100**



LZ design d.o.o., • Brod 3D, 1370 Logatec, Slovenia • tel +386 59 948 898  
[info@lzdesign.si](mailto:info@lzdesign.si) • [www.front-electric-sustainer.com](http://www.front-electric-sustainer.com)

**Table of Content**

1. Important notices .....	3
1.1 Limited Warranty .....	3
2. General.....	5
3. Model designation .....	5
4. Construction .....	6
4.1 Certification standards .....	6
4.2 Construction Material .....	6
4.3 Surface finish .....	6
5. Installation.....	6
6. Inspection.....	7
7. Possible damages and allowables .....	8
8. Maintenance and repair .....	8
9. Shipping and storage.....	9
10. Revision history.....	9

## **1. Important notices**

Please read this manual thoroughly. It contains important information about your 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 product 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 unauthorised alterations or repairs.

THE WARRANTIES AND REMEDIES CONTAINED HEREIN ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES EXPRESSED OR IMPLIED OR STATUTORY, INCLUDING ANY LIABILITY ARISING UNDER ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, STATUTORY OR OTHERWISE. THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, WHICH MAY VARY FROM STATE TO STATE.

IN NO EVENT SHALL LZ DESIGN BE LIABLE FOR ANY INCIDENTAL, SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES, WHETHER RESULTING FROM THE USE, MISUSE, OR INABILITY TO USE THIS PRODUCT OR FROM DEFECTS IN THE PRODUCT. Some states do not allow the exclusion of incidental or consequential damages, so the above limitations may not apply to you. LZ design retains the exclusive right to repair or replace the unit or software, or to offer a full refund of the purchase price, at its sole discretion. SUCH REMEDY SHALL BE YOUR SOLE AND EXCLUSIVE REMEDY FOR ANY BREACH OF WARRANTY.

To obtain warranty service, contact your local LZ design dealer or contact LZ design directly.

February 2013

© 2013 LZ design. All rights reserved

**Warning:**

People who fly should recognize that various types of risks are involved, and they should take all precautions to minimize them, since they cannot be eliminated entirely.

The propeller is a vital component of the aircraft. A mechanical failure could cause a forced landing or create vibrations sufficiently severe to damage the aircraft.

Propellers are subject to constant vibration stresses from the motor and air stream, which are added to high bending and centrifugal stresses.

Before a propeller was certified as being safe to operate on an airplane, an adequate margin of safety was demonstrated.

It is essential that the propeller is properly maintained according to the recommended service procedures and a close watch must be exercised to detect impending problems before they become serious. Unusual vibration should be investigated and fixed, as it could be a warning that something is going wrong.

We urge you to read this Manual thoroughly. It contains important information about your propeller. The propeller is one of the most critical parts having vital importance to the flight safety. It therefore deserves the care and maintenance called for in this Manual. Please give it your attention, especially the section dealing with inspections and checks.

## 2. General

The foldable fixed pitch composite propeller FES-SIL-P15-100 is built to the highest quality standards from modern composite materials.

### Technical data and limitations of the propeller:

Maximum power on a propeller shaft:	23 kW;
Maximum rotational speed:	4500 RPM;
Propeller blade mass excluding attaching bolts:	approximately 245 g each blade;
Diameter of the propeller:	d = 1000 mm;
Service time between main overhauls:	50 hours;
Total service time:	200 hours;
Type of propeller:	tractor;
Sense of rotation:	clockwise looking at direction of flight.
Operating conditions:	the propeller can be operated in any normal environment conditions except hail, sand storm or similar

## 3. Model designation

Propeller model designation is the following:

FES SIL P15 100

(1) (2) (3) (4)

where:

- (1) designed for application;
- (2) suitable for sailplane type;
- (3) model version;
- (4) propeller diameter in cm;

Propeller serial-number is identified as follows:

XXX      YYYY

where:

- XXX - serial number of the propeller; one blade is marked A second as B
- YYYY - year of manufacture.

Propeller identification placard is located on the propeller sticker (glued on inner center part of the propeller).

**Warning:** *Do not use your propeller as a handle to move the airplane! The propeller is one of the most important parts of your airplane!*



## 4. Construction

### 4.1 Certification standards

Propeller FES-SIL-P15-100 described herein is designed and tested according to CS 22 Subpart J.

### 4.2 Construction Material

Propeller is made of GFC and CFC. It is made in accurate metal molds, which were manufactured using modern CNC technology. This made possible to have very accurate propeller geometry.

The composite propeller runs much smoother. No placards for RPM are needed because of the high damping characteristics of the plastic.

### 4.3 Surface finish

Quality acrylic white paint is used to protect the composite body against moisture and erosion. Each blade pair is sanded and polished so that mass difference is only 0,1g. Paint is resistant against fuel, oil and other chemical products. This type of paint has also an excellent flexibility. Tips can be painted red as a safety mark.

## 5. Installation

5.1 Check propeller type and condition. Clean propeller and let it dry.

5.2 Oil on any of the surfaces must be avoided. Check bolts for cracks, thread and corrosion. Replace if needed (important that the bolts would be of the same length, so as not to damage the motor bearings).

5.3 Assemble propeller blades with the propeller holder. Make sure that blade marked with a small dot is inserted into propeller holder side which is also marked with small dot.

5.4 Insert special blade holding bolts, from back side of propeller. **This means that head of the bolt must be on trailing edge side of propeller as on picture below!** One of the bolts is **marked** on the head with a small dot. Be sure to install it into marked side of the holder. Before inserting bolts, grease them just slightly on the stable. Too much grease will be removed by centrifugal force, so use really a minimum amount of grease.

5.5 On the threaded side of a bolt put M8 Inox washer, and thread in crown nut M8. Tighten the crown nut with 13 key so that there is some tension in holder forks, so that bolt can not rotate. However blades must still be able to open and close freely. Then insert into a bolt hole and trough crown nut a safety pin (with 1,4 mm diameter), cut it to proper length and bend it around crown nut.



Fig.1 Propeller blades mounting on the holder

5.6 Tighten the spinner p.4 with special M4 Inox bolts p.3.

5.7 Removal - refer to 4.1 through 4.6 but in reverse order. In any case, if hard tools are used, the propeller will be damaged.

## 6. Inspection

6.1 Every time you go to fly, thoroughly perform preflight inspection:

- take a look at the entire propeller inspecting for damages, leading and trailing edges for possible splitting or de-lamination.
- composite propeller blades are always as good as they look. If the total blade surface show no cracks, no reconditioning or overhaul will be necessary. Pay special attention to the root part of the blade, leading and trailing edges.
- inspect central part of the propeller for possible cracks or deformations. No cracks or deformations are allowed. If such are found, contact the manufacturer.

6.2 At the 25 hours inspection (periodically to be done up to the annual inspection):

- clean the propeller with any car wash solution or equivalent.
- make the normal preflight inspection, but especially pay attention to the center part of the propeller, leading and trailing edges of the blades for cracks and de-laminations and the lacquer surface for condition.
- inspect blades for stone damages, and mark them.

6.3 Annual inspection or inspection after up to 15 % over-speed of the rated maximum rotational speed RPM:

- inspect propeller as per instructions given under 5.2. If any crack is found, the propeller must be removed from service immediately. Send propeller to the manufacture for inspection.

5.4 Over-speed: Up to 15 % above the rated maximum rotational speed RPM inspection per 5.2 and 5.3 is required. At more than 15 % over-speed the propeller should be sent to the factory for inspection.

5.5 Service time between main overhauls is 50 flight hours. Main overhaul can be performed by propeller manufacture only.

## 7. Possible damages and allowables

7.1 No structural cracks or de-laminations of composite structure are allowed for the propeller.

7.2 Small cracks up to 10 mm of length in a lacquer are allowed. Make sure cracks are in a lacquer layer only and not going into the composite structure. Fine cracks in the lacquer surface across the blade axis are indications of bending vibrations. Such cracks mostly occur in the outer part of the blade. No sudden blade failure can occur due to these cracks. If such cracks do occur, the factory should be consulted regarding airworthiness, if possible together with a photo and information about operating time.

7.3 The erosion occurs due to the peripheral speed of the blade and is normal. However, always take care that the erosion never becomes so deep that FRP-coat is damaged and there is a possibility that moisture may enter into the blade body. In this case the blade must be repaired/overhauled immediately.

7.4 Stone damages. If stone damages are visible, mark them and check them periodically. Maximum size of stone damages permitted for operation is 2x4 mm large and 0,7 mm deep. Maximum number of damages allowed is one damage per 4 cm<sup>2</sup>. If bigger or more damages exist on a blade, send propeller to manufacture for inspection and overhaul.

7.5 Cracks or deformations in a center part of the propeller are not allowed. If such occurs, send propeller back to manufacture for the overhaul.

## 8. Maintenance and repair

**Note:** *Serious cracks which originate from the inside of the blade, are extending through the lacquer and so are visible from outside. These cracks are radial cracks or tangential cracks. Fine cracks in the lacquer as described above, are considered of serious character, although they usually start at first in the lacquer and not in the composite structure.*

8.1 Clean propeller if necessary with water.

8.2 Normal small stone nicks are unimportant as long as there is not obvious structural damage. Scratches and nicks should be filled and protected during routine maintenance with a coating of water resistant lacquer. Allowables for damages are given in a Paragraph 6 of this document.



8.3 Broken tips and damaged blades are not reparable and have to be replaced. Small damages on the trailing edge can be repaired by manufacture.

## **9. Shipping and storage**

8.1 No propeller should be stored by standing on the tips. If storage is required, it is recommended to use the original packing. If original packaging is not available, store it in a horizontal position on a soft padding supporting at about middle of blade or center section of the propeller.

In cold weather the propeller should not be stored close to heat source or in rooms with extreme changes in temperature.

8.2 Careful packing is the best protection against damage during shipment. Therefore the propeller is shipped from the factory in a special cardboard container. This container may be used for reshipment for overhaul. The blade tips and trailing edge should be sufficiently protected.

## **10. Revision history**

February 2013	Initial release of manual, Version 1.0
---------------	--