TECHNICAL MANUAL

SPRAY PUMP

IPANEMA 201/202/203 PAWNEE 235 CESSNA 188

ZANONI EQUIPAMENTOS AGRÍCOLAS

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INTRODUCTION

The ag aircraft spray pump is designed to centrifuge the product load contained in its hopper and sending it with pressure to the spray system. This occurs through the impact of the wind received by the fan blades during flight, moving the pump impeller through the shaft and thus generating the required pressure/flow. The spray pump maintains pressure in the system to ensure uniform flow and proper atomization.

The figures in this document are used only to facilitate the identification of Zanoni Equipamentos® spray pump's parts. For more information and details about the brand's products, visit the website www.zanoniequipamentos.com.br or contact the sales team and request the complete catalog.

This technical manual refers to the Zanoni spray pumps for Ipanema (Z20330E), Cessna 188 (Z18830EN) and Pawnee 235 (Z23530EN) aircrafts.

It shall be read thoroughly before any technical intervention.

TECHNICAL SPECIFICATION

- Weight: 8.55 Kg (≅ 18.85 lbs.)
- Bearings: 6204 DDUC3;
- Mechanical Seal: 3/4" Viton, Silicon/Tungsten
- Electric consumption - 12V pump: 5.2 Amps;
- Electric consumption - 24V pump: 2.2 Amps;
- Pressure: 90psi (maximum).

All parts of the Zanoni Equipamentos® spray pump are presented in chapter 1 of this document. When ordering any replacement material, please provide the full part name, product number, and your equipment's serial number.

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1. COMPOSITION/PARTS

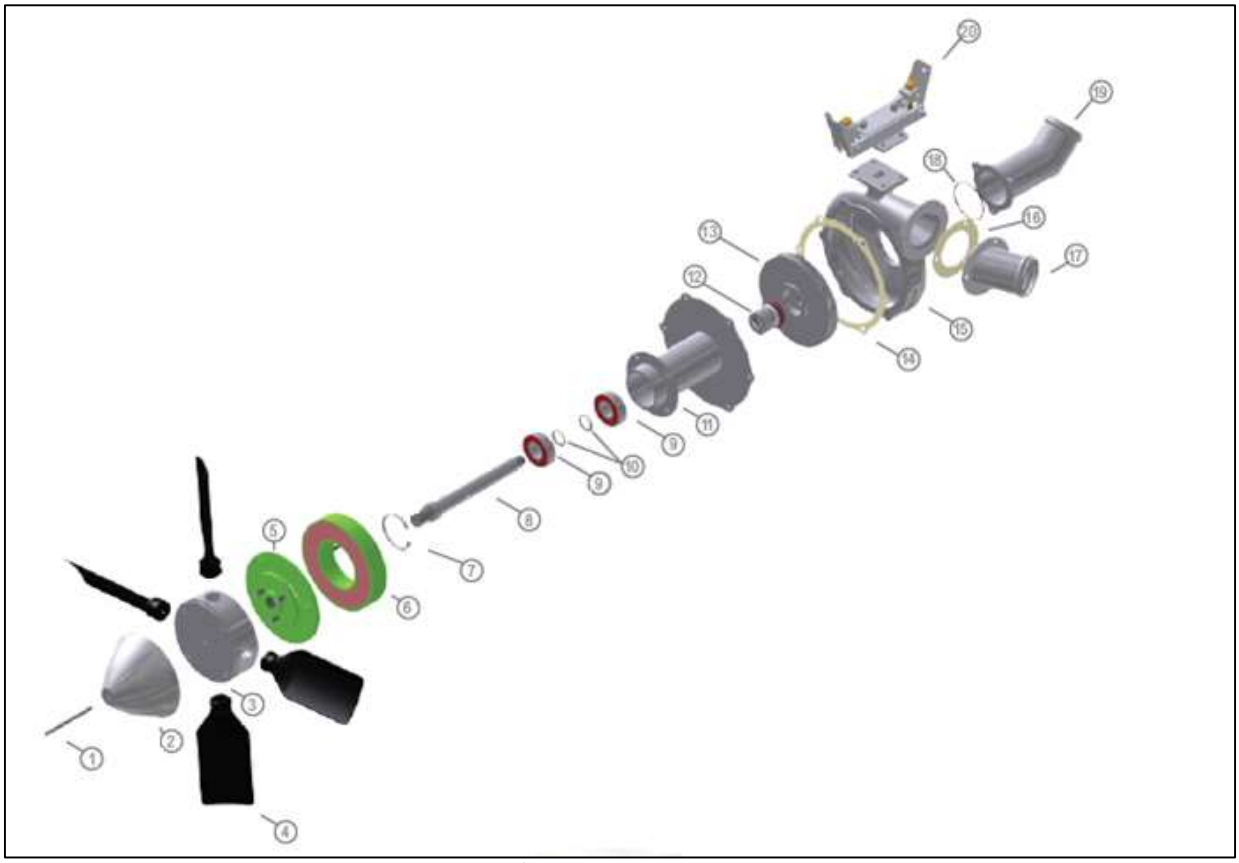

Figure 01: Zanoni Equipamentos® spray pump (exploded view - illustrative picture).

NUMBER	PN	DESCRIPTION
01	Z 20230E-09	SPINNING SCREW
02	Z 20230E-07	SPINNER
03	Z 20230E-03	BLADE SUPPORT
04	Z 20230E-03-03N	FAN BLADE (15CM)
05	Z 20230E-04-02	BRAKE DISK
06	Z 18830E-04-01-12V Z 20230E-04-01-24V	12V COIL 24V COIL
07	Z 20230E-19	I47 SNAP RING
08	Z 20230E-06	SHAFT
09	Z 20230E-10	6204 BEARING
10	Z 20230E-12	E20 SNAP RING
11	Z 20330E-01	BEARING HOUSING
12	Z 20230E-11 Z 00231M-17	¾" SEAL (GRAPHITE AND CERAMICS) ¾" SEAL (TUNGSTEN AND SILICON CARBIDE)
13	Z 20330E-05	IMPELLER
14	Z 20330E-21	GASKET
15	Z 20330E-02	IMPELLER HOUSING
16	Z 20230E-24	GASKET
17	Z 20230E-02-06 Z 23530E-02-06	PUMP OUTLET (EMB IPANEMA 201/202/203 AND CESSNA 188) PUMP OUTLET (PIPER PAWNEE 235)
18	Z 20330E-02-03	O'RING 140
19	Z 20330E-02-02 Z 23530EN-02-02	PUMP INLET (EMB IPANEMA 201/202/203 AND CESSNA 188) PUMP INLET (PIPER PAWNEE 235)
20	Z 20330E-20 Z 23530EN-20	PUMP MOUNT (EMB IPANEMA 201/202/203 E CESSNA 188) PUMP MOUNT (PIPER PAWNEE 235)

Table 01: Zanoni spray pump's parts.

2. SAFETY INSTRUCTIONS AND INFORMATION

Improper installation, operation or maintenance of the spray pump may cause permanent damage to the product and to other equipments. Therefore it must be handled by qualified persons.

For proper operation, the following safety instructions must be followed.

Do not use the equipment if its discharge and inlet piping are not attached to pump or if it is dry (with no liquid inside).

Before operating the spray pump, check if::

- pump and all other parts of the spray system are properly secured and adjusted;
- pump is clean and free of debris;
- the voltage (12V or 24V) is according to your aircraft. Check the brake coil for the 12V or 24V voltage marking;
- shut-off and spray controls valves are open and free for flowing;
- brake system is operating properly;
- piping is fully supported and correctly aligned to the pump
- fan blade placement is correct for the desired direction of rotation (and flow direction);.
- grounding is adequate, remembering that the negative pole of the brake system (coil) is connected to the pump frame. The pump must be grounded to the airplane structure (in proper contact).

Zanoni Equipamentos does not recommend the use of the pump brake during the operation for closing the spray system. We suggest to use the <u>spray control valve</u> for this purpose. This ensures agitation within the hopper, contributing to the homogenization of the spray load and preventing wear of the brake assembly.

3. ADJUSTMENTS

a) The fan blades have variable pitch and can be adjusted according to the pilot's need (figure 02). The greater the angle of attack, the greater the rotation of the blades and, consequently, the pump pressure will increase.

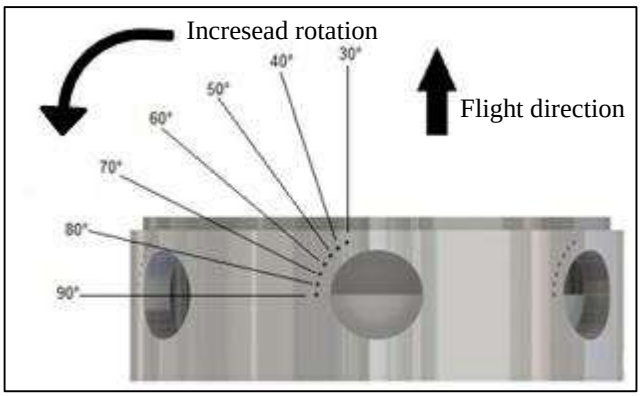

Figure 02: representation of fan blade adjustment.

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b) Brake assembly: for the proper functioning of the brake, there must be a space of approximately 1mm between the coil and the brake disk (figure 3). If the measurement is different, adjust the height of the floating disk by loosening the three locknuts of the set and also tightening the three Allen screws (figure 4), until the distance of 1mm is reached. Once this is done, remember to tighten the locknuts again.

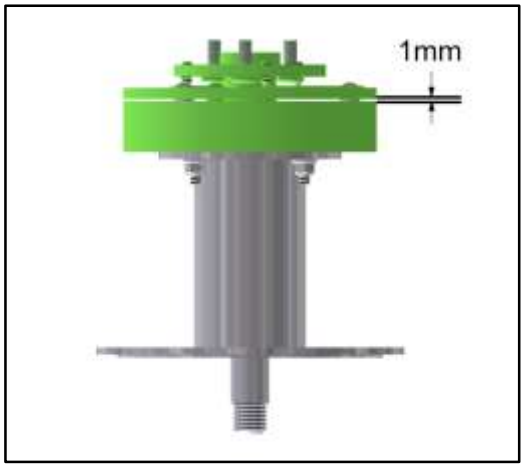

Figure 03: necessary distance between the coil and the brake disk.

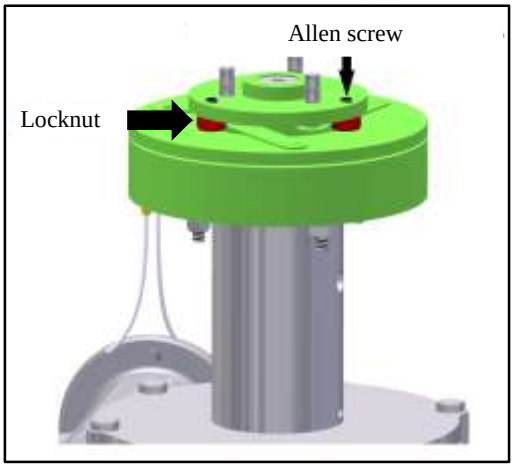

Figure 04: adjustment of locknuts and Allen screws.

4. MAINTENANCE

Zanoni Equipamentos® spray pumps are designed to have long and trouble-free life under various conditions. However, the following aspects should be considered:

- **CLEANING** – keep the pump clean as this facilitates repair, adjustment and inspection work;
- **SEAL ADJUSTMENTS** – This pump is manufactured with a mechanical seal to prevent liquids from passing between the rotary shaft (movable) and the bearing housing (fixed). External adjustment is not possible. When there is a leak (in the drain hole), the mechanical seal should be replaced. To prevent the spray pump from dry working, a condition that damages the seal, some liquid must always be left on the aircraft hopper, thus maintaining cooling in the seal system;
- **BEARINGS** – Particular care is required when removing and inserting bearings in any eventual replacement. Always use proper bearing installation and removal tools. It is always recommended to use the best quality bearings;
- **BRAKE ASSEMBLY** – Check its condition periodically;
- **FAN BLADES** – In the event of dryness or malfunction, the fan blade should be replaced;
- **GASKETS** – gaskets should be replaced every time the spray pump is disassembled in order to avoid leaks;
- **GREASING** – No external lubrication required.

NOTE: It is advisable to change the propeller blades every 12 months, due to fatigue and dryness.

5. DISASSEMBLY

The disassembled pump parts are illustrated and indicated in chapter 1 of this document, on page 03.

5.1 Required tools

To properly handle the pump, we recommend the use of the following tools. Be sure to have them on hand before beginning maintenance.

- Internal and external locking pliers;
- Round steel bar, Ø6 x 70 mm;
- 1/8” hex (Allen) key;
- 3/4" Wrench;
- 7/16' Wrench';
- 5/8" UNF Screw Nut;
- Appropriate gloves;
- Hydraulic press;
- Silicone;
- Vaseline;
- Thread seal tape;
- Grease;

5.2 Disassembly instructions

a) Insert a round bar in the hole located in the center of the bearing housing, on the opposite side of the pump mount (figure 5). Withdraw the spinner using a 7/16" wrench (figure 6).

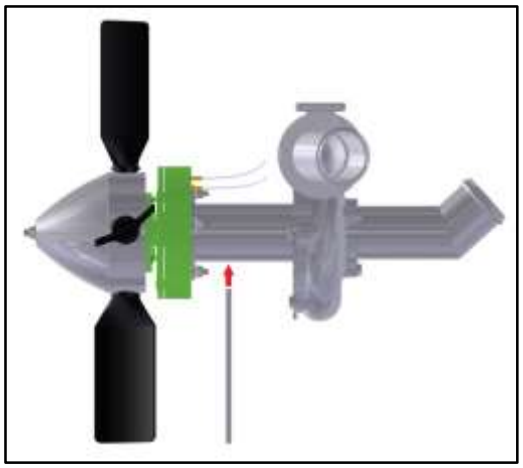

Figure 05: locking the shaft through the hole in the bearing housing.

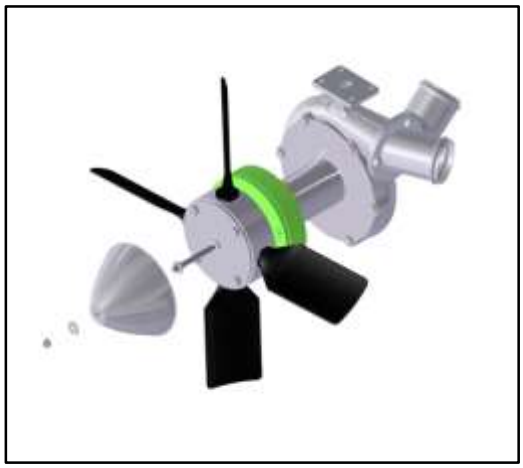

Figure 06: spinner withdrawal.

b) Using the same wrench (7/16 '') remove the screws of the blade support to release the fan blades (figure 05). In order only to adjust the blades, loosen the screws and make the necessary adjustment.

c) Keeping the shaft locked, remove the safety washer from the shaft end (figure 08).

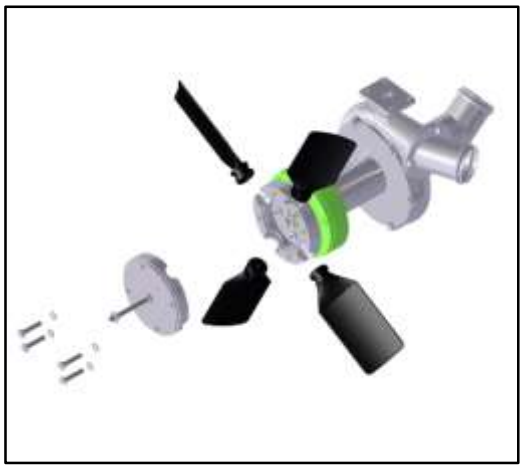

Figure 07: removing the screws of the blade support.

Figure 08: removing the safety washer.

d) Partially insert two screws into the blade support base (figure 09) and unscrew counterclockwise the brake assembly with a bar (figure 10).

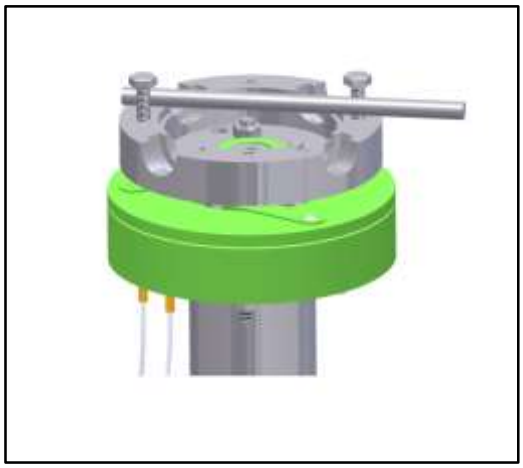

Figure 09: arrangement to unscrew the brake assembly.

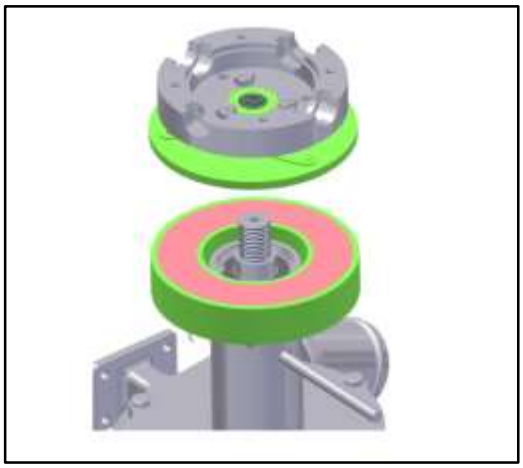

Figure 10: unscrewed brake assembly.

e) Remove the nuts and bolts that hold the coil (figure 11) and then, with locking pliers, remove the snap ring that is on the bearing housing (figure 12).

Figure 11: removing the nuts and bolts that hold the coil.

Figure 12: snap ring.

f) For replacing only the O'Ring or the inlet and outlet gaskets, remove the screws that hold them, and replace the required item (figure 13). Skip this step if this is not the case.

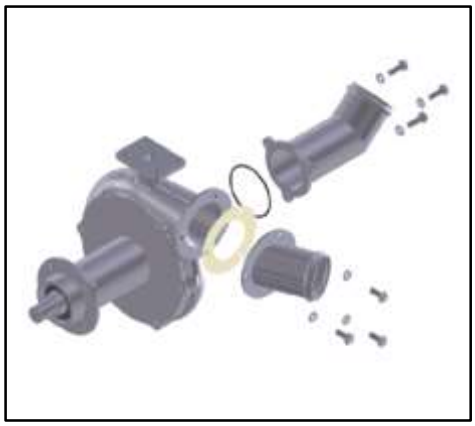

Figure 13: screws removed for replacing only the O'Ring or gaskets.

g) Remove the screws that attach the impeller housing to the bearing housing with a 7/16" wrench (figure 14).

h) Lock the shaft through the bearing housing's hole with a round bar and with a 3/4" wrench, remove the impeller by unscrewing it counterclockwise (figure 15);

Figure 14: removing the screws that attach the impeller housing to the bearing housing.

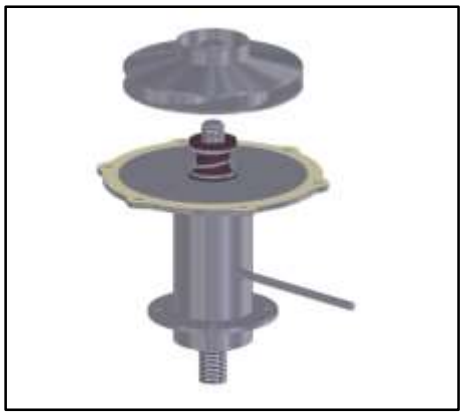

Figure 15: impeller removal.

i) For protecting the shaft, thread a 5/8" UNF nut on its end where the impeller was attached (figure 16). With a hydraulic press, remove the shaft and the bearings, carefully applying pressure on the nut.

j) Using the hydraulic press, carefully not to damage the shaft, remove the remaining bearing (figure 17);

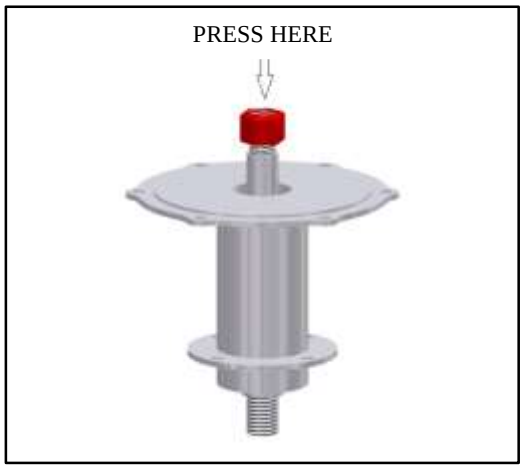

Figure 16: threaded nut for shaft protection.

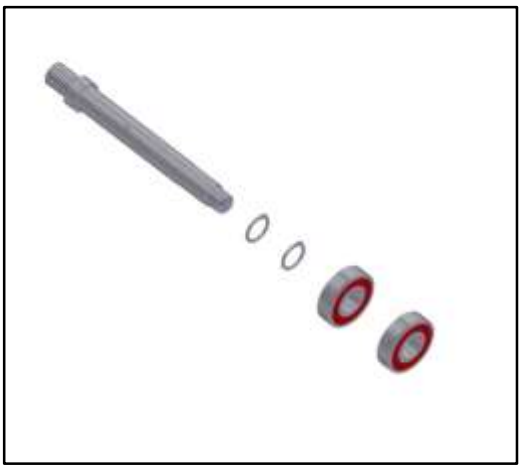

Figure 17: bearing withdrawal.

6. SPARES KIT AND PARTS REPLACEMENT

Make sure you have the right products for parts replacement. Zanoni Equipamentos provides a complete spares kit (figure 18) for your spray pump. Contact us to order your kit.

Figure 18: spares kit for Zanoni spray pump.

After disassembling the spray pump, evaluate the condition of the bearings, of the spinning screw, and of the nuts and bolts in general. Replacement of these components is mandatory whenever any damage or excessive wear is observed. It is recommended to change the mechanical seal every time the spray pump is opened.

7. REASSEMBLY

a) For best use, thoroughly clean all parts.

b) With a hydraulic press, insert one of the bearings into the shaft and carefully press the bearing until it reaches the shaft stop. Then place the two snap rings on the shaft, one next to the bearing and the other in the designated space, as shown in figure 19.

c) Insert the other bearing (with the hydraulic press) directly into the bearing housing until it reaches the bottom stop.

d) Again with the aid of the hydraulic press, place the shaft into the bearing housing, passing it through the bearing located inside, until they fit (figure 20). Then, place the lock on the bearing housing so that the bearing is securely fixed.

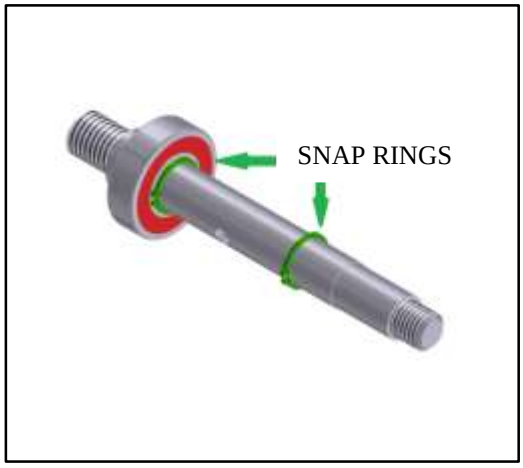

Figure 19: shaft-bearing-snap ring positioning.

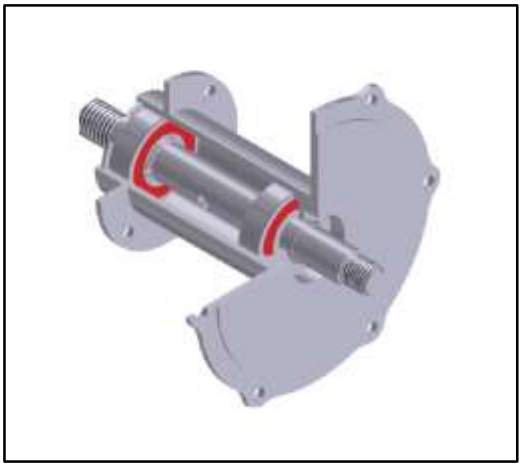

Figure 20: set bearing housing-shaft-bearings adjusted.

e) Attach the brake coil to the bearing housing, noting that the wires must be positioned on the opposite side of the shaft lock hole and of the drain hole (figure 21). Lock the shaft with the aid of a round bar and thread the brake disk, so that it is approximately 1mm away from the coil (figure 22). If the distance of 1mm is not reached, check the adjustment in chapter 3 of this manual.

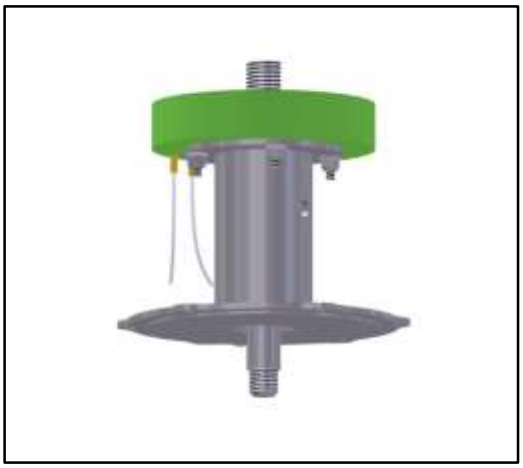

Figure 21: correct positioning to screw the coil.

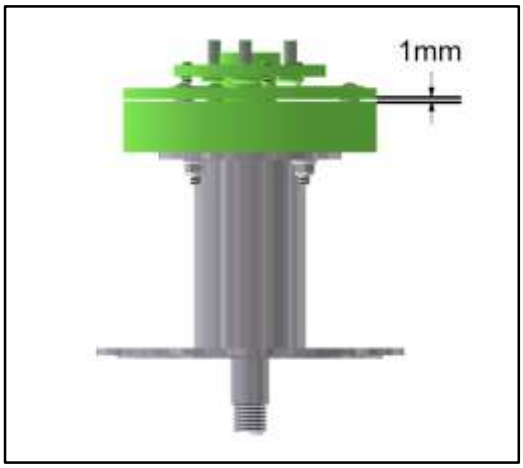

Figure 22: correct distance between brake assembly and coil.

f) Insert the blade support into the brake disk and secure it with lock washers and 1/4” nuts.

g) For the brake assembly to be securely locked, secure the safety washer on the shaft using a pressure washer and a 1/4 "x 3/4" UNC screw (figure 23).

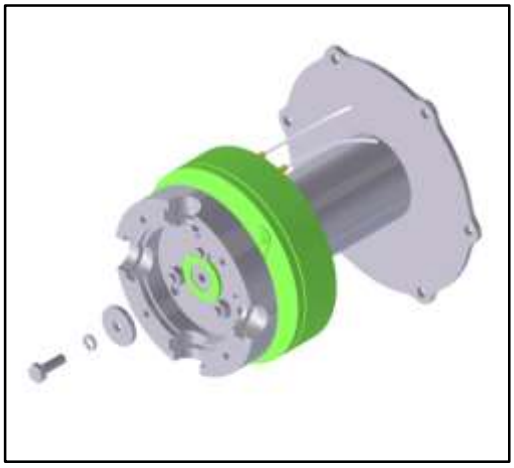

Figure 23: safety washer to ensure locking of the brake assembly.

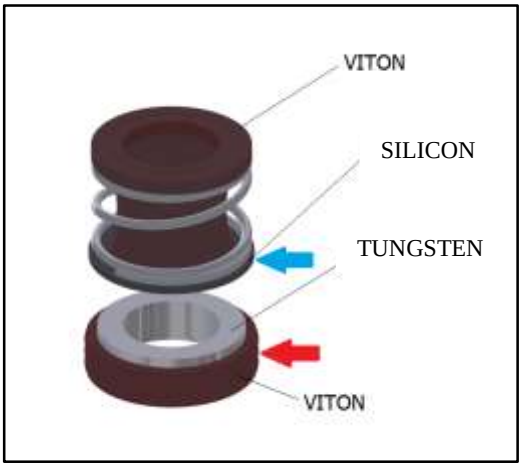

Figure 24: instructions for inserting the mechanical seal.

h) **Turn the pump upside down**. To facilitate the insertion of the mechanical seal, apply Vaseline to the Viton of the smallest part (the one with tungsten and Viton, indicated by the red arrow in figure 24) and fit it in place on the bearing housing. Tungsten portion should face **upwards**. Then, apply vaseline on the other side of the seal, on the silicon part, which is face to face with the tungsten already fitted (indicated by the blue arrow in figure 24). Finally, insert this bigger part of the seal with the Viton part facing upwards and the silicon part facing downwards, as in figure 25.

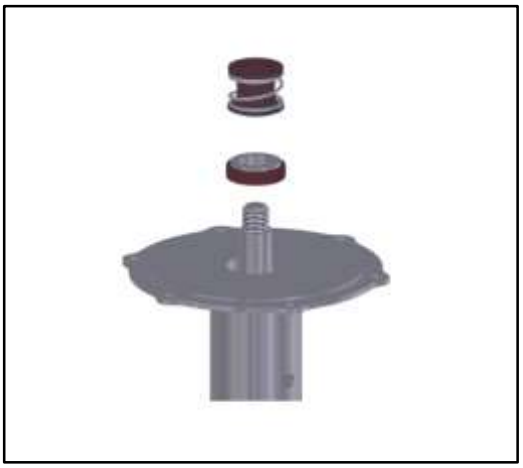

Figure 25: correct placement for seal insertion.

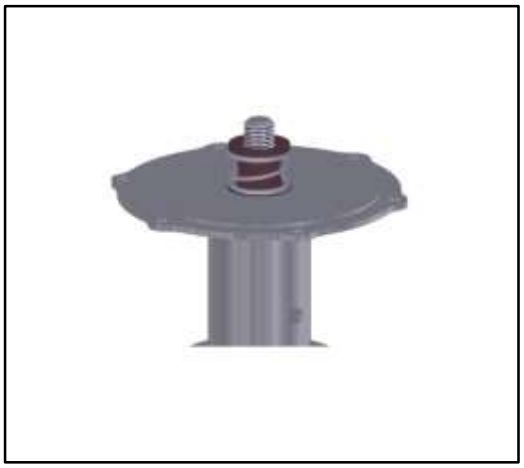

Figure 26: inserted seal.

Note.: Take special care to keep the mechanical seal clean. Be aware that dirt particles, especially on its faces, cause breakage and undesirable leaks. Touch the seal only with appropriate gloves or with clean hands.

i) Using a round bar, lock the shaft through the bearing housing hole, manually screw the impeller to the end and tighten it with a ¾" wrench (figure 27). For easing the work and to avoid unwanted friction, apply a **little** grease to the shaft end before threading it to the impeller.

Figure 27: shaft locking to thread the impeller.

j) Secure the impeller to the bearing housing, observing the position of the impeller housing outlet. Apply silicone to both parts before attaching the gasket, use teflon tape on the 1/4" x 1/2" screws and secure them with lock washers (figure 28).

k) To fasten the impeller housing inlet, put silicone through the holes of the inlet flange, insert the O'Ring into its housing and screw the inlet into the impeller housing (figure 34). Remember to put thread seal tape in the 1/4" x 5/8" screws and to use lock washers (figure 28).

l) With 1/4" x 1/2" screws and lock washers, fit the outlet into the impeller housing, applying silicone to both pieces before fitting the gasket. Observe the correct position before screwing.

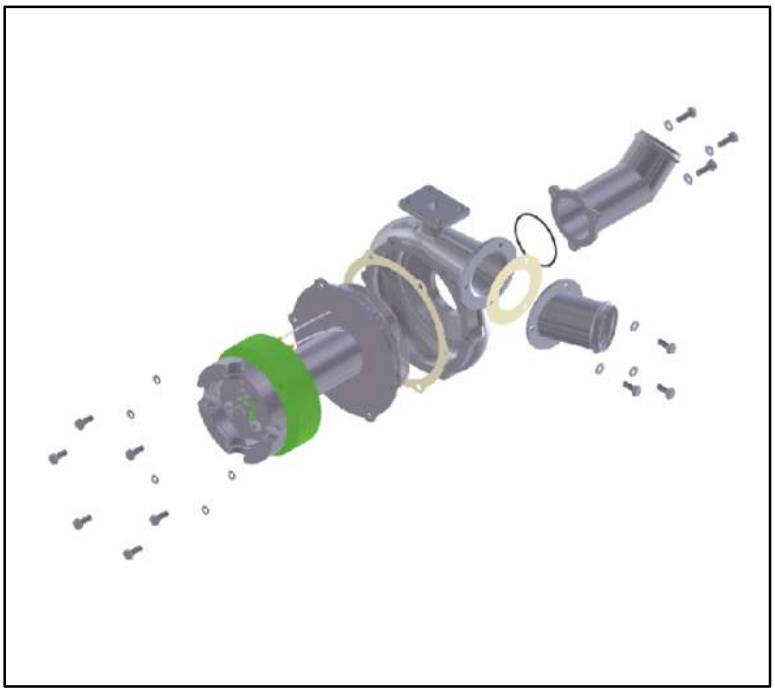

Figure 28: inlet and outlet attachment to the impeller housing.

m) Using nuts, screws and washers, put the spinning screw on the blade support (figure 35). Check the proper height adjustment of the of the spinner's nut and washer, so that it is firmly supported to the blade support (figure 29).

Figure 29: spinning screw positioning.

n) Insert the fan blades (remembering that they have a variable pitch and can adjusted according to the existing marks in the blade support, figure 30). Screw the blade support using 1/4" x 1 1/4" screws and flat washers (figure 31). The numbering of both parts of the blade support (cover and base) should be the same and aligned with each other.

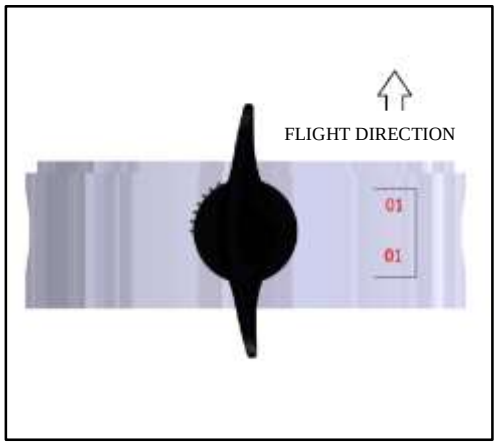

Figure 30: Alignment of the two parts of the blade support (cover and base).

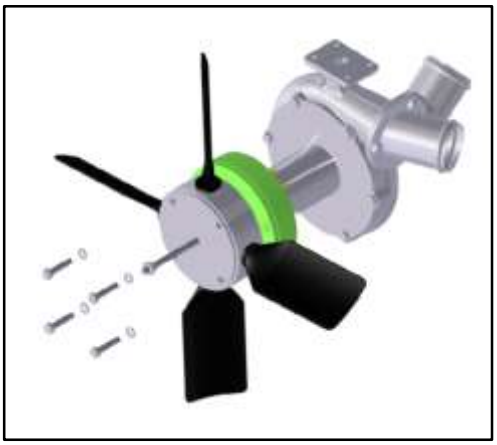

Figure 31: positioning of the spinner.

o) Rotate the blades with your hand and make sure that the assembly rotates freely without any difficulty and noise. Next, close the spinner using a 1/4" washer (wide) and a 1/4" locknut (figure 32). Mount the pump on your aircraft support (figure 33).

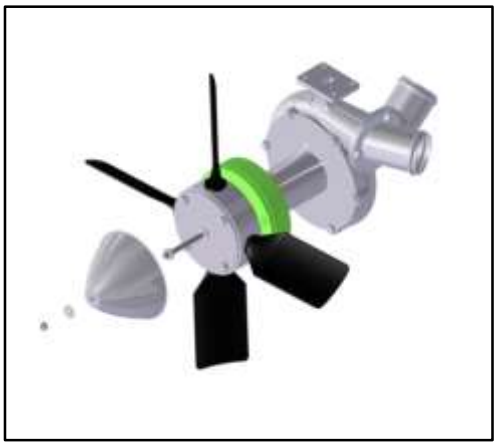

Figure 32: locking the spinner.

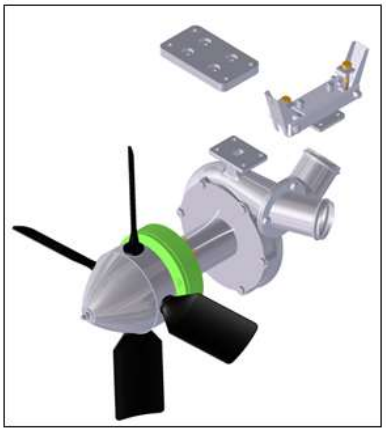

Figure 33: mounted pump.

p) Finally, test the brake on a 24V (Ipanema) or 12V (Cessna, Pawnee) battery. If you have questions or problems, please contact the Zanoni team or its dealers.

NOTES

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