User Manual

Finapp Installation

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Scope

This manual provides step-by-step instructions for the on-field installation of a Finapp probe.

Disclaimer

FINAPP will repair or replace any product within the guarantee period if the Guarantor declares that the product is defective due to workmanship or materials and has not been caused by mishandling, negligence on behalf of the User, accident or any abnormal conditions or operations.

FINAPP declines all responsibility for damages or injuries caused by an improper use of the probe due to negligence on behalf of the User. It is strongly recommended to read thoroughly the FINAPP User's Manual before any kind of operation.

FINAPP reserves the right to change partially or entirely the contents of this Manual at any time and without giving any notice.

Disposal of the Product The product must never be dumped in the Municipal Waste. Please check your local regulations for disposal of electronics products.

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1. Introduction

The Finapp probe is a CRNS – cosmic ray neutron sensing – probe that monitors soil moisture down to 50 cm, SWE – snow water equivalent - and BWE – biomass water equivalent. The values are referred to an area around the probe of about 100-300m of radius depending on the altitude, the higher the longer.

Since neutrons are naturally moderated by water molecules, CRNS probes can relate the counting of cosmic ray neutrons with the water content of soil, snow and biomass. A decrease in the neutron counting is related to an increase of water content. Thanks to the innovative materials and design of Finapp probes it is also possible to monitor the incoming cosmic-ray flux variations. Temperature and barometric pressure are also measured, due to determine the total incoming in the most precise way. This allows a real time and more precise estimation of water content. This specific feature is a unique on the market and is part of our patent.

A data logging system is also included. Data telemetry is accomplished via a GSM modem and locally stored on a SD card. The neutron detector, data logger unit and weather sensors are housed in an IP-67 enclosure for outdoor use.

Finapp probe has a self-checking system that allows to detect probe malfunctions and a specific algorithm for converting neutron counting into soil moisture, SWE and BWE according with customer needs.

WARNING: Do not modify this product without first contacting Finapp SRL. Unauthorized modifications can damage the product and invalidate warranty.

2. Description of the probe

The Finapp probe is an embedded system for the measurement of environmental neutrons and cosmic rays. The system can be operated completely off-the-grid thanks to the ultra-low power control board with a power consumption below 50 mA @ 12V. The system is provided inside an IP67 box for outdoor use with solar panel 20Watt and back-up battery 7Ah. The size of the box is 40x30x16 cm and the total weight including battery and accessories are 6 kg.

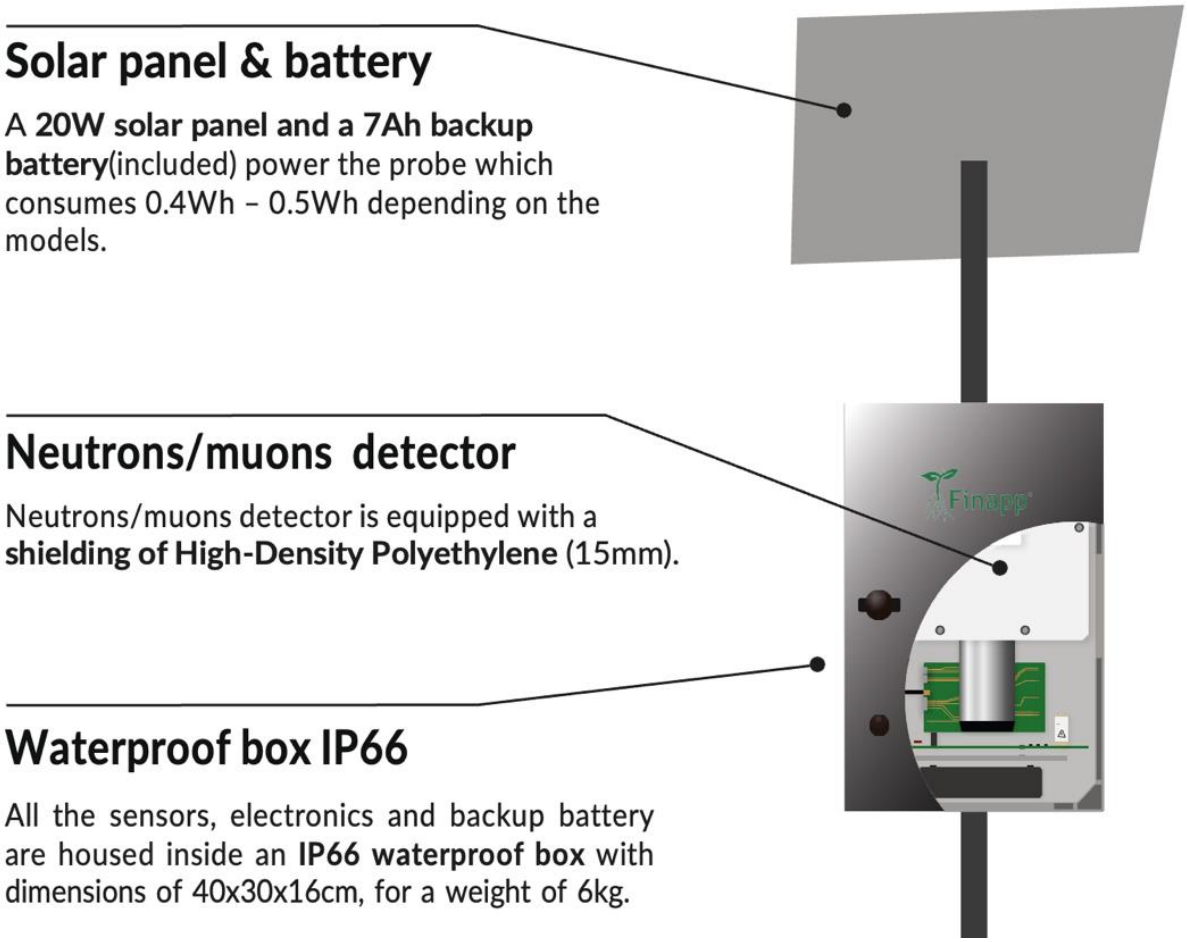

Figure 1: Details of a Finapp System

3. Installation

The system is preconfigured and “plug and play”. The customer needs only to mount the system on a pole with the metal ware provided and connect battery and solar panel. Normally the probe is installed 1.8 meters above the ground to cover an area of radius of 100-120 meters at sea level. The height respect to the ground is defined respect to center of the box. By default, the system is equipped with collar for a 48mm pole mounting, on request it is possible to equip the system for mounting on a diameter between 30 and 90 mm.

Figure 2: Default height of installation

Proceed as follow:

1. Mechanics for solar panel: the solar panel must be equipped with triangular brackets. Connect the brackets (1,2) to the solar panel as shown in Figure 3a, then connect the horizontal aluminum bars (3,4). The aluminum bars are already equipped with collars for pole mounting (Figure 3b). For solar panel mechanics use provided M6 screws and bolts.

Figure 3(a) and (b): Mounting brackets for solar panel

The tilt of the solar panel is adjustable. Taking the vertical axis as a reference, it is possible to choose a 30° angle, recommended in snowy areas or for high latitude installations, a 45° angle recommended for mid-latitudes, and a 60° angle recommended for the tropical zone.

Figure 4: solar panel tilt

2. Mechanics for IP67 box. The Finapp box is provided with aluminum bars in the rear for pole mounting, Figure 5. In the middle of the bars there are a

couple of M8 screws (two for each bar) for mounting the collars. Use two bolts to fix the collar. Collars and bolts are provided within the metal ware.

Figure 5: Mounting bars for Finapp box

3. Insert cables of temperature sensor and solar panel. When you have mounted the box, solar panel and solar shield (temperature sensor) on the pole, you have to insert the cable into the box through the holes in the bottom of the box. All the cables are pre-wired and with the cable gland. Follow the steps in figure 6 to insert each cable in the bottom of the Finapp box.

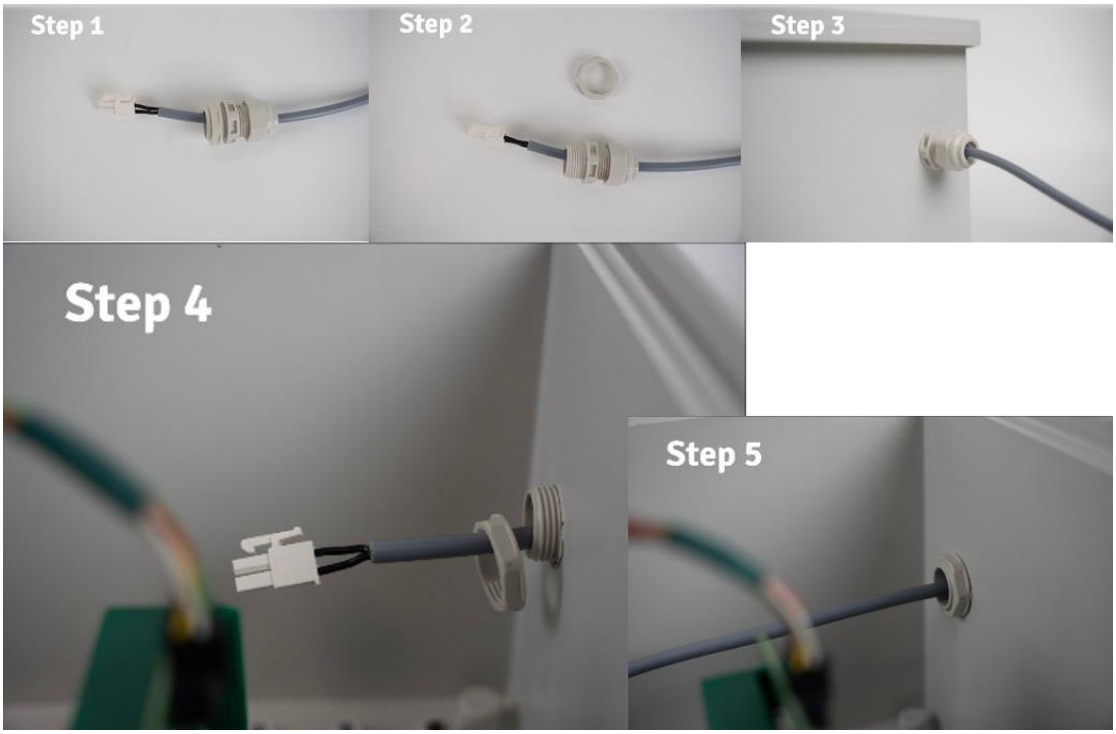

Figure 6: Steps for inserting pre-wired cable into Finapp box

4. Insert the battery. Please note that the battery may already be installed. In this case, skip the following operation. Next step is to insert the battery inside the box. Rotate by 90 degree the battery with faston connectors on the right as shown in figure 7.

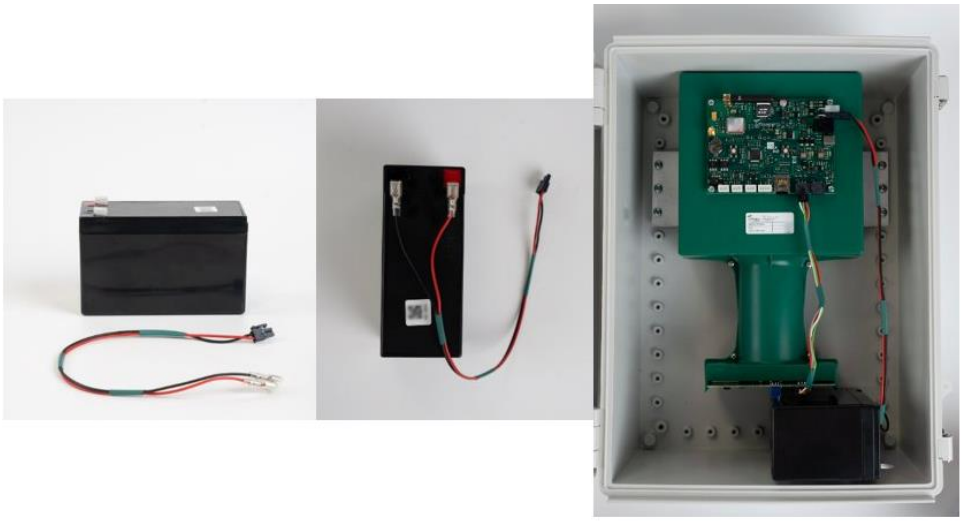

Figure 7: connecting the battery

5. Connect temperature sensor (optional). An external temperature - humidity sensor is provided inside a solar shield. After step 3, you can connect it to the main board in the SHT20 connector (connector 4, figure 8). Remember to connect the temperature - humidity sensor before power-on the system.

6. Connect battery and solar panel. Solar panel and battery cable are already pre-wired. Connect the black male MOLEX from battery to the female black MOLEX in the board (connector 2, figure 8), repeat for white connector of the solar panel (connector 1, figure 8).

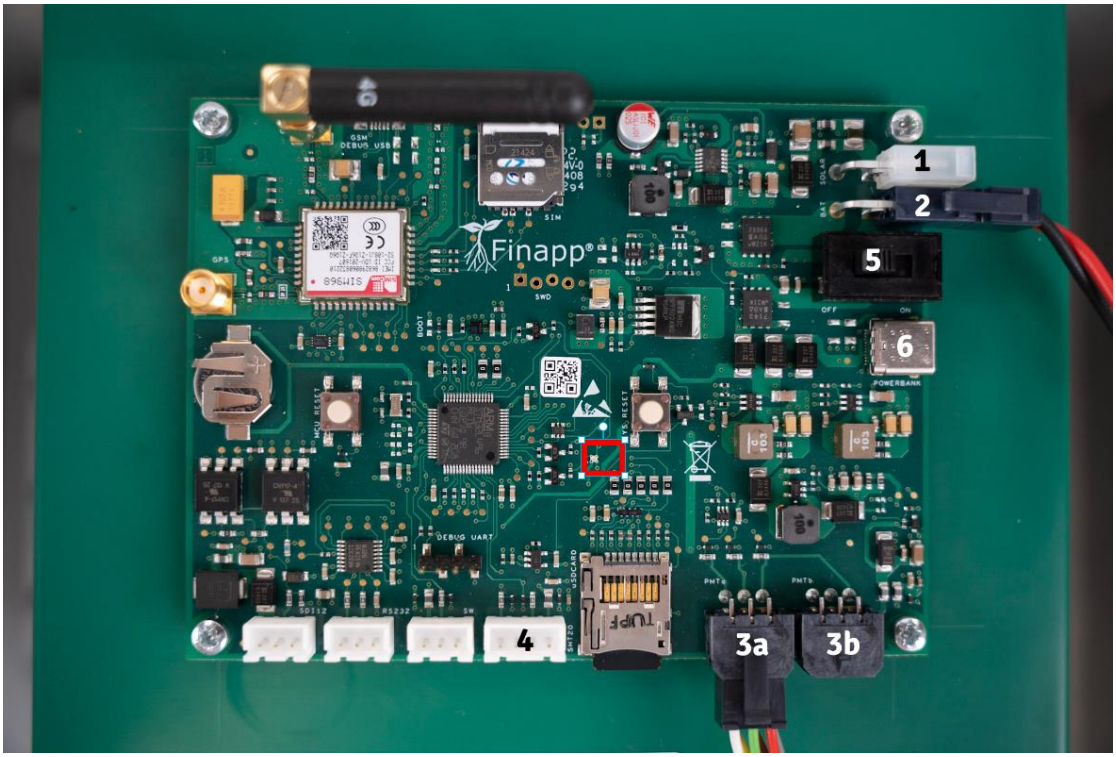

Figure 8: Details of the electronic board. 1 - MOLEX of solar panel, 2 - MOLEX of the battery, 3 - PMT connectors, 4 - SHT20, red square – LED for debug, USB-C for indoor use

7. Switch ON the system. Now, you are ready to power on the system. Use the switch (switch 5, figure 8) on the board to power on the system. The central LED (red square, figure 8) turns green and remains on for a few seconds until the correct initialization of the board. To operate the system indoor you can use the USB-C female connector (connector 6, figure 8), the power requirement is 5V (1.5A).

4. Disinstallation

If you need to move/dismount the system, please follow the steps below in order to not damage the Finapp system:

1. Safe power-off: open the box and use the switch to power off the probe (switch 5, figure 8).
2. Remove cables: disconnect the MOLEX of solar panel (connector 1, figure 8) and then the MOLEX of the battery (connector 1, figure 8). Disconnect temperature sensor (connector 4, figure 8) and remove it from the bottom of the box, the solar panel cable must be removed as well.
3. Remove battery: remove the battery.
4. Dismount hardware from the pole: now you are ready to dismount the system from the probe in safe way.