3R UAV01 Ultrasonic Anemometer for Davis VP2

User Manual

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The products manufactured by APEXS are in continuous development, therefore the contents of this manual are subject to change without prior notice.

Please observe that this manual does not create any legal binding for APEXS towards the customer or the end user and that no liability is assumed by APEXS for any damages and/or injuries resulting from the use of the product described.

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1 General Information

1.1 About this manual

This manual provides all the information needed to install, configure, operate and maintain the 3R UAV01 Ultrasonic Anemometer for Davis VP2.

Make sure you read and understand all the information given in this manual prior to use the product since an inappropriate use may cause measuring errors or even damage the product.

1.2 Important considerations

Throughout the manual, important considerations are highlighted as follows:

Warning: Alerts of a serious hazard. Read and follow the instructions carefully because there is a high risk of injury or even death.

Caution: Warns of a potential hazard. Read and follow the instructions carefully because the product could be damaged or important data could be lost.

Note: Highlights important information on using the product.

1.3 Feedback

APEXS welcomes any comment or suggestion to improve this manual. If you find errors, please feel free to contact us indicating the chapter, section and page number so we can correct it. Contact details can be found on the cover of this manual and in our website at www.apexvalue.com.

1.4 Recycling

From APEXS we encourage you to recycle all possible materials according to current regulations in your country. Further information on recycling can be found at the Department of Environment of your country.

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Products labeled with this symbol must be separate from other household waste and sent to specific collection facilities for recovery and recycling.

1.5 Warranty

APEXS hereby represents and warrants the product to be free of defects in material and workmanship for a period of 12 months from the date of delivery. However, if any defect is found during this period, APEXS will repair or replace, at its own option, the product or part thereof free of charge. This service warranty shall be valid for a period of 6 months not cumulative with the original warranty of the product.

Warranty will not be applicable in the following cases:

1. Damage caused by incorrect handling.
2. Inappropriate installation or use in unsuitable conditions.
3. If the product has been banged, dismantled or repaired by unauthorized service personnel.
4. Lightning strike, fire, water, accident or any other similar circumstance.

1.6 Returns policy

In case the product may need to be returned to APEXS, please contact your local distributor first. A Return Merchandise Authorization (RMA) number must be obtained prior to returning any product.

For the full RMA conditions, please visit our website at www.apexvalue.com.

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2 Introduction

2.1 Sensor overview

The 3R UAV01 is a 2-axis ultrasonic anemometer that measures the wind speed and direction with high accuracy and reliability thanks to its advanced technology.

It is especially designed to directly replace the Davis VP2 standard wind cups anemometer without needing to use any other component or transmitter apart from a power supply.

The sensor features a very rugged design to ensure high resistance to weathering and has no moving parts that could fall off, break or freeze, which minimizes the need of periodic maintenance.

2.2 Measuring principle

To determine the wind speed and direction, the sensor emits ultrasonic pulses from one transducer to the opposite one along 2 orthogonal axis and then measures the elapsed time between the emission and the reception of the pulses. The measurements are done in both directions of each path to avoid errors caused by the current environmental conditions of temperature, humidity and barometric pressure.

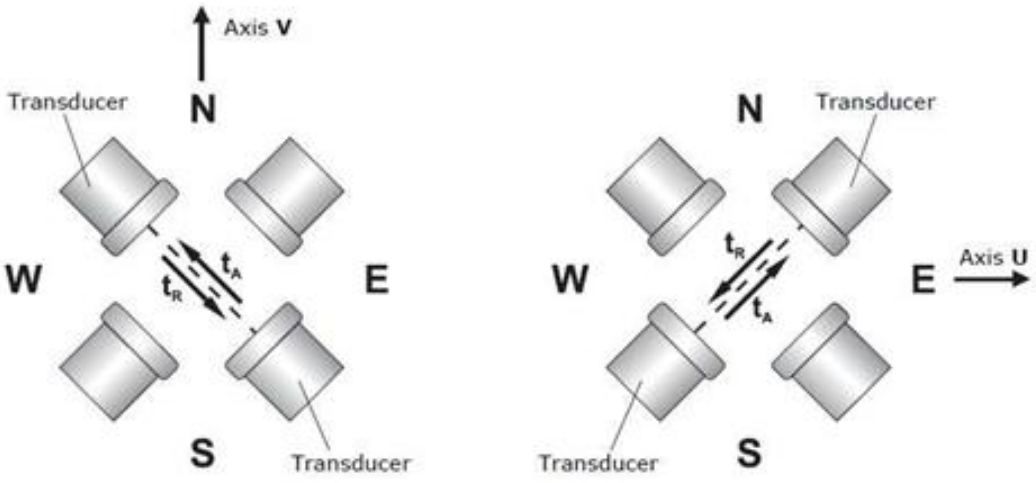

Figure 1. Measuring principle

The elapsed times are obtained using the following formulas:

$$t_A = \frac{D}{C + WS} \qquad t_R = \frac{D}{C - WS}$$

Formula 1. Elapsed times calculation

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Where:

- D = Distance between the 2 transducers of the same path.
- C = Speed of sound.
- WS = Wind speed.

Using the previous formulas, the wind speed is obtained as follows:

$$WS = \frac{D}{2} \cdot \left(\frac{1}{t_A} - \frac{1}{t_R} \right)$$

Formula 2. Wind speed calculation

2.3 Range of application

Its high performance makes it ideal for all kind of security and control applications in roads, buildings, ski resorts, theme parks, harbors, etc. Its low power consumption allows to use it in installations powered by solar panels.

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3 Installation

3.1 Package inspection

Before unpacking the product, inspect the package for any signs of damage that may have occurred during shipping. If the package is damaged, fill in a claim against the carrier company and report the damage in detail.

3.2 Unpacking the product

Unpack the product in a clean and dry area and check that the following items are not missing:

1. 3R UAV01 Ultrasonic Anemometer for Davis VP2.
2. Fixing clamp.
3. Manual (hardcopy).

Caution: Beware of damaging any part of the product when unpacking.

3.3 Selecting the best location

Finding a suitable location for installing the sensor is essential for getting representative measurements. The location should represent the general field of interest and be free from turbulences and any source of magnetic fields, such as electric motors, radio transmitters, radars, etc. Any terrain edge or object near to the sensor may have a negative impact on the measurements.

In case of mobile installations, take into account that the sensor measures the relative (apparent) wind speed. To determine the absolute (real) wind speed, the speed of the vehicle must be considered.

3.4 Installation procedure

Make sure you read and follow all the instructions given below in order to avoid measuring errors caused by an inappropriate installation.

Warning: Comply with all the applicable safety regulations when installing the product.

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3.4.1 Clearance distance

In order to avoid measuring errors, the sensor must be installed vertically in an open area at a minimum distance of 10 times the height of the closest object.

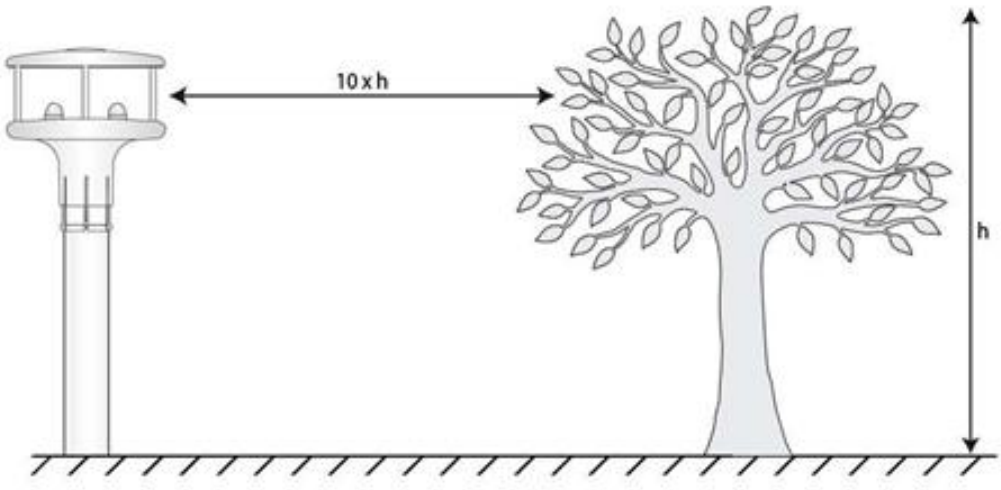

Figure 2. Minimum clearance distance

3.4.2 Mounting height

It is recommended to install the sensor at a height of 3 meters in open-space installations or at 10 meters in presence of close objects. If the sensor is installed on the top of a building, the height must be 1.5 times the minimum value between the height of the building and the longest diagonal of the roof.

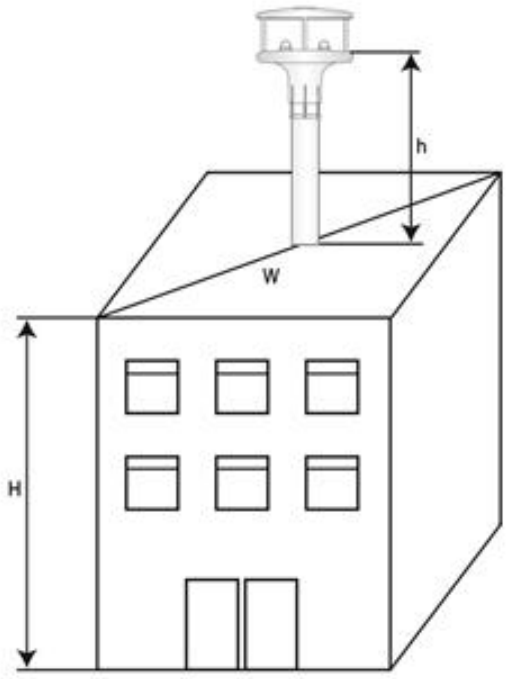

Figure 3. Installation on the top of a building

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3.4.3 Sensor alignment

The sensor is equipped with a magnetic compass and all the measurements are automatically compensated and referred to the magnetic North. This is especially useful for mobile installations. However, for fixed installations it is recommended to align the sensor manually during installation using the arrows printed on the upper and lower cases.

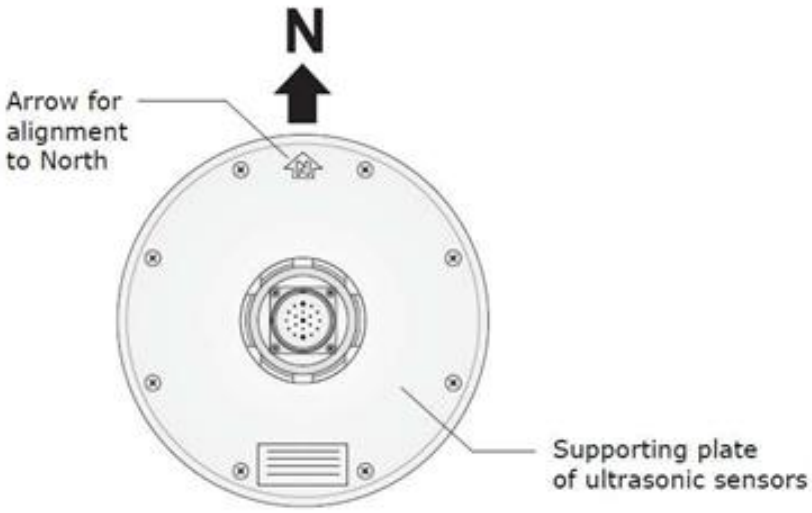

Figure 4. Alignment arrow

Note: The magnetic declination must be taken into account to refer the measurements to the geographic North.

3.4.4 Fixing clamp

The 3R UAV01 is supplied with a fixing clamp for installation on the top of a mast. The mast must have a maximum outer diameter of 40 mm and a minimum inner diameter of 36 mm.

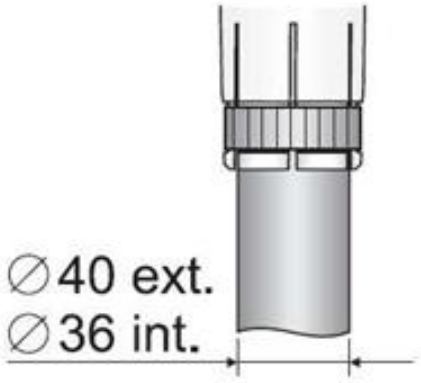

Figure 5. Fixing clamp

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3.5 Wiring diagram

The 3R UAV01 is supplied with 2 independent cables, one for the power supply and the other to connect the sensor to the Wind connector of the Davis VP2 ISS. Use the following wiring diagram to identify each wire:

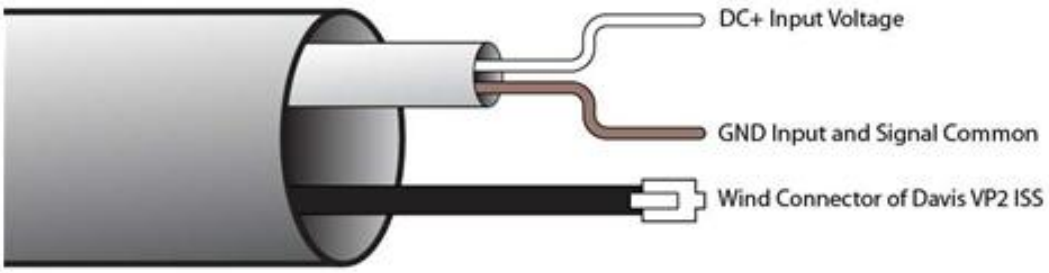

Figure 6. Wiring diagram

3.5.1 Power supply

The sensor must be powered from a DC power supply in the specified range. A 12 VDC power supply is the commonly used standard. Take into account the voltage drop when using a long cable.

Note: Reversing the power supply connection will not damage the sensor.

3.5.2 Connecting to the Davis VP2 ISS

To connect the sensor to the Davis VP2 ISS, follow the next instructions:

1. Open the SIM box of the Davis VP2 ISS by sliding the cover up.
2. Disconnect the solar panel cable and put the cover aside.

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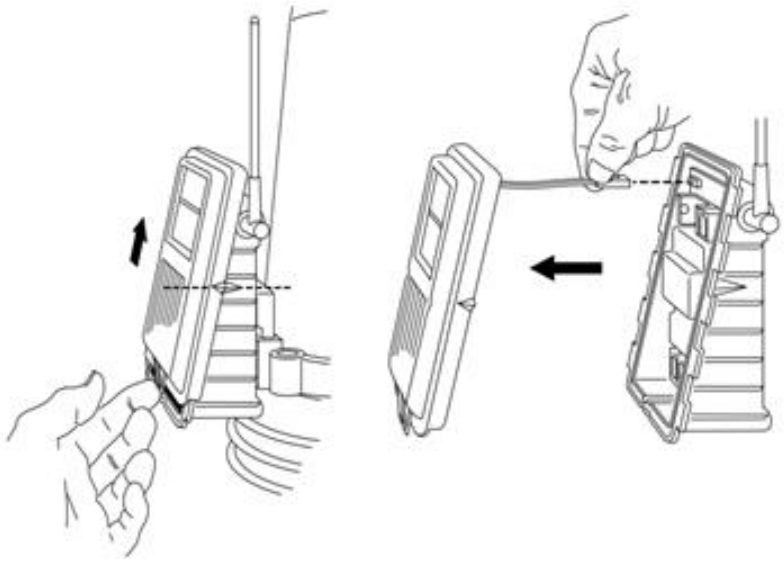

Figure 7. Opening the SIM box

3. Disconnect the standard wind cups anemometer from the Wind connector and then connect the 3R UAV01.

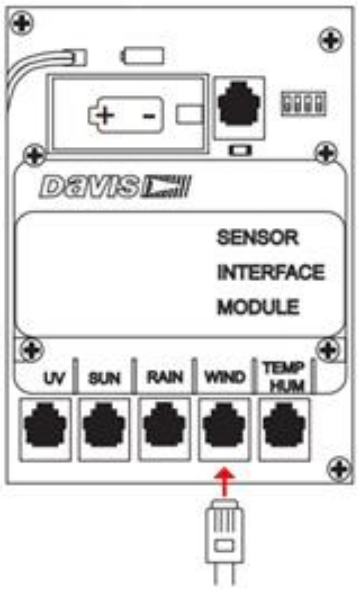

Figure 8. Connecting to the Davis VP2 ISS

4. Power the 3R UAV01 and check that the console is displaying wind data.
5. Reconnect the solar panel cable.
6. Close the SIM box of the Davis VP2 ISS by sliding the cover down.

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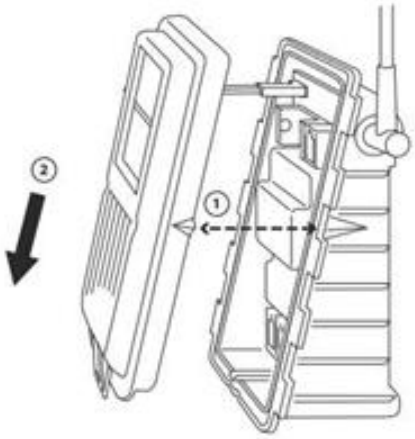

Figure 9. Closing the SIM box

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4 Davis VP2 Configuration

4.1 Overview

This section describes how to configure the Davis VP2 console to display valid data from the 3R UAV01. Make sure you read and follow all the instructions given below in order to avoid measuring errors caused by an inappropriate configuration.

4.2 Wind cup size

To display valid data from the 3R UAV01, the Davis VP2 console must be configured with the WIND CUP SIZE parameter set to OTHER. With this configuration, the console does not make any correction on the wind speed depending on the wind direction, which is only needed when using the standard wind cups anemometer. In order to configure this parameter, follow the next instructions:

1. Press and hold the DONE key and the DOWN (-) arrow to enter in the configuration menu.

2. Press DONE repeatedly until you see the WIND CUP SIZE parameter.

3. Set the parameter to OTHER using the UP (+) and DOWN (-) arrows.

Figure 10. Wind cup size

4. Press and hold the DONE key to return to the current weather screen.

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5 Maintenance

The 3R UAV01 does not need any meticulous maintenance apart from periodic cleaning of the ultrasonic membranes to avoid accumulation of dust, dirt or insects.

Caution: Before cleaning the ultrasonic membranes, disconnect the sensor from the power supply and the Davis VP2 ISS.

Caution: Do not try to clean the ultrasonic membranes with alcohol. Use a microfiber cloth dipped in water or a neutral cleaning agent.

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6 Technical Specifications

6.1 Sensor specifications

Wind speed

- Range: 0 to 60 m/s
- Resolution: same as Davis VP2
- Accuracy: ±2%

Wind direction

- Range: 0º to 360º
- Resolution: same as Davis VP2
- Accuracy: ±2º

6.2 Electrical specifications

- Power supply voltage: 10 to 30 VDC
- Power consumption: 40 mA (max.)
- Output signal: Davis VP2 compatible

6.3 Mechanical specifications

- Working temperature: -40ºC to 60ºC
- Material: aluminium and high strength plastic
- Dimensions: Ø 150 x 179 mm
- Weight: 1 Kg

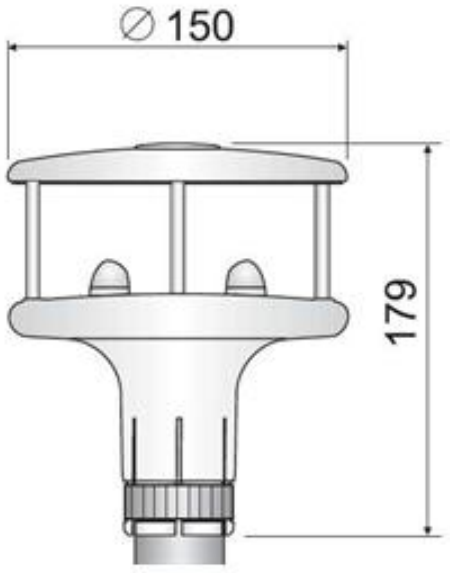

Figure 11. Sensor dimensions

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7 Declaration of Conformity

APEXS, Inc. hereby certifies that the following product:

- 3R UAV01 Ultrasonic Anemometer for Davis VP2

Is in conformity with the following directives:

1. Electromagnetic Compatibility: 2004/108/EC
2. Low Voltage: 2006/95/EC

This Declaration of Conformity is based upon compliance of the product with the following harmonized standards:

1. Electromagnetic Compatibility: EN 61326-1:2006
2. Safety: EN 61010-1:2001

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