

OWNER'S MANUAL

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# Rotating Vane Anemometers

Models RV, RVA, RVR



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**ALNOR<sup>®</sup>**  
A TSI<sup>®</sup> Company

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## General Description

The Alnor RV series of Rotating Vane Anemometers are intended for direct measurement of air flow at diffusers, grilles, and fume hoods.

Air movement causes rotation of a multi-blade fan mounted in low-friction bearings. A non-contact sensor translates fan blade movement into actual air velocity. All models are battery operated and feature LCD readout of measured parameters.

Each RV instrument can be operated with one hand, using the single switch plate control on the handle.

Individual model features may vary.

## Using Rotating Vane Anemometers Safely

All ordinary precautions must be observed when operating Rotating Vane Anemometers near moving equipment such as motors and blowers. Exercise care to ensure that the instrument does not interfere with any moving equipment.



The operational range of these instruments is 50 to 122°F (10 to 50°C) and must not be exceeded. Storing instruments beyond these limits may affect balance and accuracy.

These instruments are NOT designed for gas mixtures other than air. Use with corrosive or other dangerous gas mixtures is not recommended and is at the user's risk.

Although the sensing element is protected, it can be damaged if subjected to abuse. It is not repairable.

# Getting Started

## Battery Information

All models require a 9V battery (RV and RVA use NEDA type 1604, RVR uses IEC 6F22 zinc/carbon, or equivalent). The battery is not installed when the instrument is shipped. To install the battery, press firmly on the battery compartment cover and slide it in the direction of the arrow. RVR instruments require the removal of a retaining screw as shown in Figure 1.

## To Remove a Battery

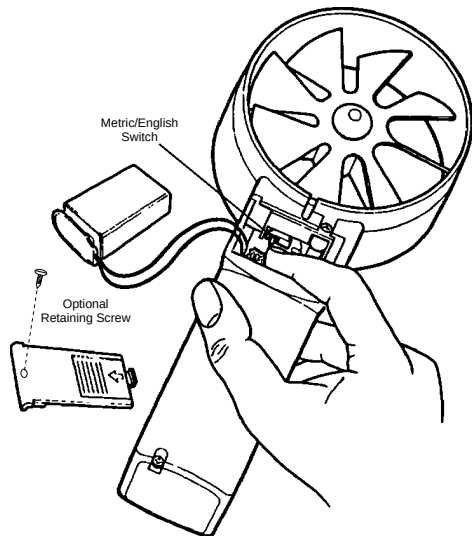
Remove the battery from the connector using a small screwdriver or similar tool. Do not disconnect it by pulling on the wires.

## Low Battery Indication

If the battery voltage falls below a predetermined level, the display will show four zeroes on the Model RV, and “bat” in the top left-hand corner on the Models RVA and RVR. These models will still operate correctly, but only for a limited time. However, the Model RV battery must be replaced before further readings can be taken.

**Note:** Do not leave a discharged battery in the instrument. Always remove the battery if the instrument is to be out of use for an extended period of time.

**Figure 1: Battery compartment detail**



## **Metric/English Switch (Models RVA and RVR only)**

The instrument can display readings in either metric or English units. The metric/English switch is in the battery compartment (see Figure 1).

When the switch position is changed, any value in the memory will be converted from metric to English or vice versa.

## **Using the Model RV Instrument**

- Hold the rotating vane in the airstream noting the direction-of-flow arrow on the head of the instrument. Keep the vane in the airstream about five seconds to enable it to reach steady speed.
- Press and hold down the switch plate.
- After a period of three seconds (metric model) or six seconds (English model), an average velocity over this period of time will be displayed. The reading will remain displayed until the switch plate is released.
- Repeat this process to take a new average reading.

**Note:** *Do not touch the fan blades within the anemometer ring while reading, as this may cause errors.*

## **Using the Model RVA or RVR Instrument**

### ***Velocity Mode***

- Switch on the instrument to “VEL” using the slide switch below the display.
- Hold the rotating vane in the airstream according to the direction of the flow arrow on the side of the instrument. Keep the vane in the airstream about five seconds to enable it to reach a steady speed.

The instrument may then be used in either of two modes:

1. A momentary push on the switch plate will display the average velocity over about a two-second period.
2. Pushing and holding the switch plate will display the average velocity over the period of time it is depressed. During this time the instrument is programmed to display the current average reading about every two seconds.

### ***Volume Flow Rate Mode***

Before switching on the instrument, determine the effective cross-sectional area of the duct, grille, etc. for which the volume flow rate is required. Consult the manufacturer's data for the outlet in use.

Switch on the instrument to “+area” and observe the area figure displayed from the memory.

- If the new area required is larger, remain in the + position and press the switch plate to increase the displayed area to the calculated figure.
- If the area is less than the figure displayed, move the slide switch to the “-area” position and press the switch plate to reduce the displayed area to the calculated figure.

When the correct area is displayed, move the slide switch to “Vol”.

#### **Note:**

- *If working in metric units, calculations must be in  $m^2$ . If working in English units, calculations must be in  $ft^2$ .*
- *The last area value will be retained in the memory even when the instrument is switched off. If the battery is removed, the area value will be reset to  $1.000\ m^2$  or  $1.000\ ft^2$ .*

The instrument may then be used in either of two modes:

1. A momentary push on the switch plate will display the average volume flow rate over about a two-second period.
2. Pushing and holding the switch plate will display the average volume flow rate over the period that it is depressed. During this time, the instrument is programmed to display the current average reading about every two seconds.

If the instrument is used in this mode for long time periods, the memory will become full after about 12 minutes and the display will indicate “full”. The last valid reading will be displayed when the switch plate is released. This reading will continue to be displayed until the instrument is switched off. This erases the memory, extinguishes the display, and makes the instrument ready for use again.

**Note:** *If the instrument is used in higher velocities than its specified range, “VEL HI” will appear on the display.*

*Do not touch the fan blades within the anemometer ring while using the instrument as this may cause errors.*



# General Usage Instructions

## Checking Air Velocity or Volume Flow Rate in Small Areas

- The instruments will function satisfactorily in any angular position but should not be used in airstreams which are smaller than the entire face area of the measuring head (113 mm or 4.5 in. diameter).
- The instruments are calibrated for use in free air conditions. For smaller airstreams, the Alnor CompuFlow anemometers are recommended.

## Checking Air Velocity or Volume Flow Rate Over Larger Areas

When checking air velocity or volume flow rate over larger areas, a number of “spot” readings should be taken and recorded as described in Velocity Mode or Volume Flow Rate Mode to give coverage over the whole area.

When taking “spot” readings, it should be noted that large variations may be observed between individual readings. In general, the more readings taken, the more accurate the result will be. It does not matter if the positions of the readings overlap somewhat, so long as they are equally spread to cover the entire area.

Alternatively, the RVA or RVR will provide the mathematical average automatically when steadily scanned across the whole area, if used as described in Velocity Mode or Volume Flow Rate Mode.

## Use on Grilles

### **Note:**

- *See comments under Possible Error Sources.*

- *Avoid intrusion of the hand, arm, or handle of the instrument into the face area of the grille. The blockage effect created by this would cause artificially high velocity over the remainder of the grille, leading to additional errors.*

Better measuring conditions can be obtained on grilles with adjustable direction vanes if the vanes on the grilles are temporarily straightened before making measurements. This should not significantly affect the flow rate as long as any built-in dampers are not accidentally disturbed. It is advisable to use the aperture, not the surface area of the grill, in any flow rate calculations.

The instruments are suitable for both supply and exhaust grilles, and the procedure for both is the same except that the direction arrow on the measuring head must be aligned correctly. While it is acceptable to hold the anemometer head against the grille on exhaust, it is usually better to hold it slightly away from the grille face on supply to avoid excessive turbulence and any vena-contracta effects.

## **Use in Airways**

In large airways, the presence of the instrument will have a negligible effect, but in small airways the blockage caused by the instrument, hand and arm will force the airstream to accelerate slightly as it passes the rotating vane. This effect is somewhat variable depending on the size of the airway and the distance from the duct walls.

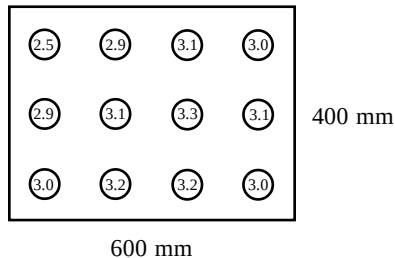
- The error can be virtually eliminated by mathematical correction to allow for the reduction of free area caused by the obstruction.
- For this purpose the effective front area of the instrument (not including hand or arm) can be taken as  $0.019 \text{ m}^2$  ( $0.204 \text{ ft}^2$ ).
- The effect can be ignored completely if the duct exceeds about 500 mm diameter (1'9").

# Calculating Volume Flow Rate

Volume flow rate through airways or apertures may be calculated if the cross-sectional area of the airstream and its average velocity are known.

To arrive at volume flow rate, the cross-sectional area of the airstream is multiplied by the average airstream velocity, using the same units of linear measurement throughout the calculation.

**Example:** A rectangular duct measures 600 mm  $\times$  400 mm and twelve readings of velocity have been taken, as shown in the diagram below. The readings are added together and the result is divided by the numbers of readings to give an average velocity for the whole duct. In this example, the average velocity is 3.025 meters per second.



The duct cross-sectional area is:  $0.600 \times 0.400 = 0.240$  meters<sup>2</sup>, therefore, the volume flow rate is  $0.240 \times 3.025 = 0.726$  cubic meters per second.

This figure should be multiplied by 3600 to arrive at cubic meters per hour, or by 1000 to give the answer in liters per second.  $0.726 \times 3600 = 2613.6$  m<sup>3</sup>/h or  $0.726 \times 1000 = 726$  liters/s.

The procedure is the same when working in English units, but the velocity readings will be in ft/min. The duct area should be calculated in square feet, and the answer will be in cubic ft/min.

## **Recalibration**

If an instrument's calibration becomes suspect because of accidental mishandling, it should be returned to Alnor for recalibration to original standards. It is recommended that the instrument be checked/calibrated at least once a year.

## Repair Information

Contact the distributor in your country, or Alnor Instrument Company directly, before returning your instrument. See INSTRUCTIONS FOR RETURN. Follow the procedure carefully as it will expedite processing. Failure to follow the procedure may cause return of the unit unrepaired. Send your instrument to Alnor transportation prepaid. To assure fast turn-around time, photocopy and fill out this form with as much detail as possible and attach it to the instrument.

RMA Number \_\_\_\_\_

Instrument Model \_\_\_\_\_

Serial Number \_\_\_\_\_

Date of Purchase \_\_\_\_\_

Where Purchased \_\_\_\_\_

Describe Malfunction \_\_\_\_\_

Describe Environment \_\_\_\_\_

Return Instrument to:

Name \_\_\_\_\_

Company \_\_\_\_\_

Address \_\_\_\_\_

Telephone \_\_\_\_\_

Address Correspondence to:

Name \_\_\_\_\_

Company \_\_\_\_\_

Address \_\_\_\_\_

Telephone \_\_\_\_\_

# Instructions for Return

## Damaged in Transit

All shipments are examined by Alnor's Service Department and carefully packed for shipment. On receipt, if the shipping container appears to have been damaged during shipment, the instrument should be thoroughly inspected. The delivering carrier's papers should be signed noting the apparent damage.

If the instrument itself has been damaged, a claim should be promptly filed against the carrier by the customer. The selling agent will assist the customer by supplying all pertinent shipping information; however, the claim must be filed by the insured.

If the instrument is damaged beyond use, a new order should be placed with Alnor while awaiting reimbursement from the carrier for the damaged instrument.

Call Alnor directly for assistance if necessary.

## Repair/Calibration

Please follow these steps should you require factory service or repair of your Alnor instrument:

1. Contact the Alnor distributor in your country for the cost of repair or recalibration and shipping instructions. Obtain a purchase order number from your Purchasing Department showing instrument model number and cost of repair and/or recalibration. Securely package your instrument in a strong container surrounded by at least two inches (5 cm) of suitable shock-absorbing material. Reference the purchase order number on your packing slip. Forward the instrument prepaid. See back cover for address.

OR

2. Contact the Service Department at Alnor for the cost of repair or recalibration, Return Material Authorization (RMA) number, and

shipping instructions. For instruments being returned to the factory for recalibration, determine whether you prefer:

- Certificate of Calibration, no data (states instrument checked and found to be within accuracy claimed and specifications listed in current literature).
- Certificate of Traceability to National Institute of Standards and Technology (NIST, formerly NBS) with data (states instrument compared with factory standard traceable to NIST, lists of calibration data, i.e., “Standards reads. . .” and “This instrument reads. . .”)

Obtain a purchase order number from your Purchasing Department showing instrument model number and cost of repair and/or recalibration. Securely package your instrument in a strong container surrounded by at least two inches (5 cm) of suitable shock-absorbing material. Reference the purchase order number on your packing slip. Mark the outside of the shipping container with the RMA number. Forward the instrument prepaid. See back cover for address.

Please note that instruments received improperly marked or without an accompanying purchase order may be returned at your expense. Please also note that if an RMA number has been assigned, it will be canceled if the instrument is not received by Alnor within 60 days.

# Ownership/Calibration Log

## Equipment Log

Date of Purchase \_\_\_\_\_

Calibration Record \_\_\_\_\_

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11. \_\_\_\_\_
12. \_\_\_\_\_

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# Warranty

Alnor Instrument Company (Alnor) warrants this product to be free of defects in material and workmanship for a period of one year from the date of original purchase. If the product should become defective during the warranty period, Alnor will repair it or elect to replace it free of charge under the following conditions:

1. Product is returned postpaid per the instructions for return, located in the owner's manual.
2. Owner submits proof of original date of purchase.
3. Alnor will inspect product for defects in material and workmanship. Alnor's decision as to existence of defect, and in the case of defect, to repair or replace will be final.

THIS WARRANTY IS EXCLUSIVE. THERE ARE NO OTHER WARRANTIES EITHER EXPRESSED OR IMPLIED. SPECIFICALLY AND WITHOUT LIMITATION, THERE IS NO WARRANTY, EXPRESSED OR IMPLIED, OF MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSE.

This warranty is void if product is misused, used contrary to procedures set forth in the owner's manual, or if product is serviced by anyone other than Alnor's authorized service. This warranty does not cover consumables such as light bulbs, paper, batteries, etc.

Alnor's liability for this product is limited to the above stated warranty and shall not in any event exceed the cost of the product. In no event will Alnor be liable for any direct or consequential damages, including but not limited to lost profits, loss of use, inaccuracies, loss of data, dismantling or reinstallation.