

AV-2 Operating Instructions

**Please read these instructions carefully before using the instrument.
Shortform instructions appear on the back of the instrument.**

1. Introduction

The AV-2 is a rotating vane anemometer featuring digital display of velocity and volume flow rate in metric or imperial units.

The AV-2 is designed to be easy to use with only one operational control on the front of the instrument. Three slide switches provide the metric/imperial, average/continuous, and off/velocity/volume/area options.

A 100mm rotating vane head is provided as standard, whilst a 35mm head is available as an optional extra. A telescopic probe, capable of extending up to 900mm (35in), fitted with a swivel head is provided.

- 1.1 The 100mm head may be used to measure velocity within the range of 0.25 to 30 m/s or 50 to 6000 ft/min.
- 1.2 The 35mm head may be used to measure velocity within the range of 0.5 to 20 m/s or 100 to 4000 ft/min.
- 1.3 Volume flow rate can be displayed from 0.002 to 3000 m³/s, 4.000 to 999999 ft³/min with duct cross sectional areas programmable within the range of 0.008 to 90.00m², 0.08 to 900.0 ft².
- 1.4 A 0-1 volt output proportional to velocity or volume flow rate is provided.

2. Battery Information

- 2.1 The AV-2 is supplied without a battery fitted in the instrument.

However, a 'standard' 9v PP3 (IEC 6F22) battery is provided in the carrying case. Alkaline, rechargeable or 'standard' batteries may be used in the instrument.

2.2 To fit the battery:

Press firmly on the battery compartment cover on the back of the instrument case, and slide it in the direction of the arrow. Pull out the connector and flying lead and fit the battery to it. Insert the battery and connector into the compartment, connector end first. Refit the cover.

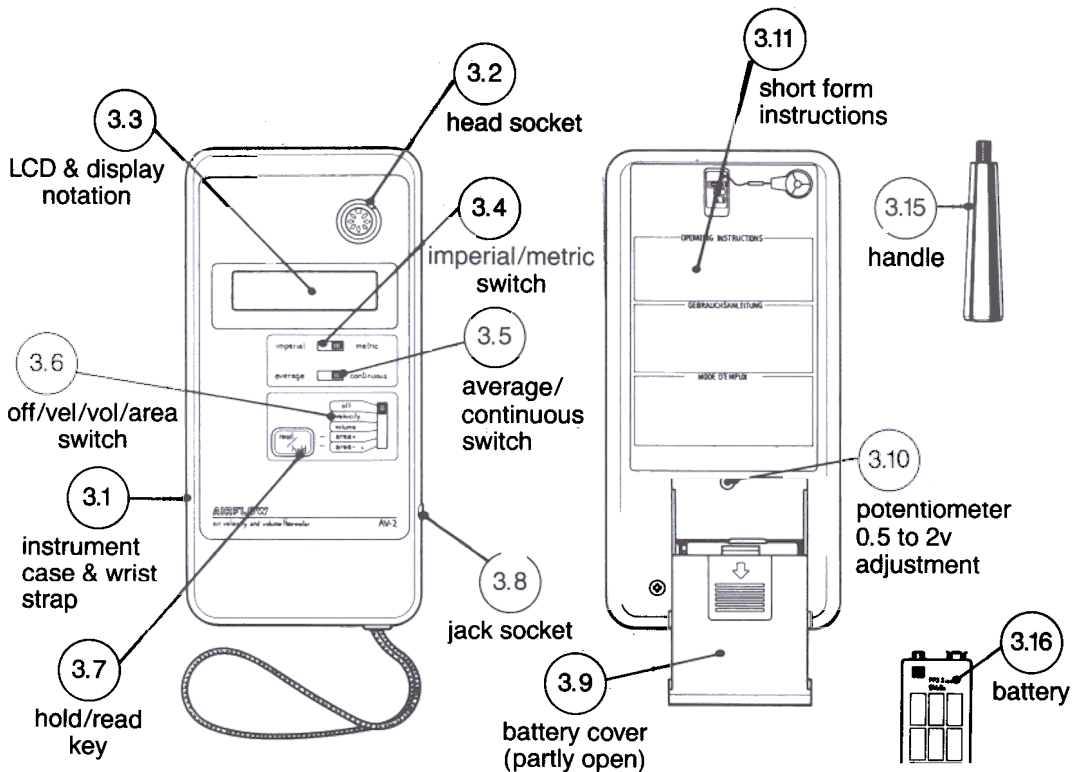
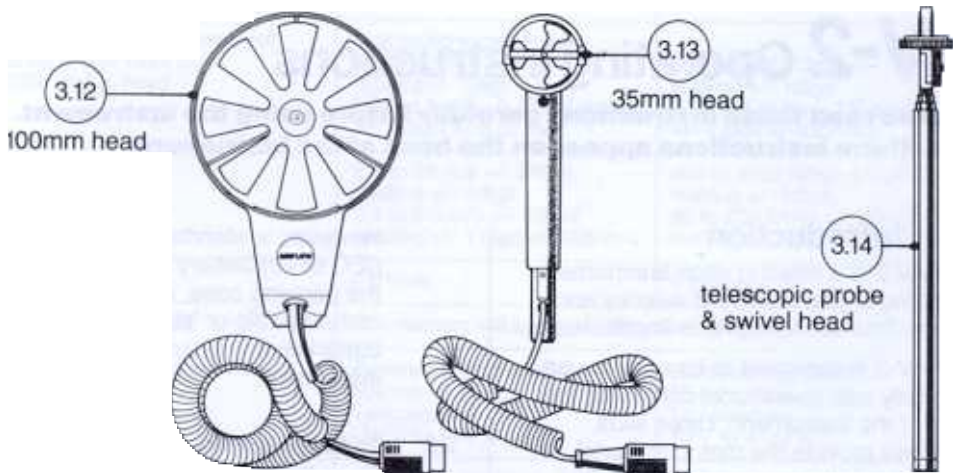
2.3 To remove the battery:

Remove the battery from the instrument using the ribbon. Using a small screwdriver remove the connector from battery. Do not disconnect by pulling on flying lead.

2.4 Low battery indication

If the battery voltage falls below a pre-determined level, the whole display will flash on and off. The instrument will still operate correctly, but only for a limited time, so the battery should be replaced as soon as possible.

3 Description of the instrument



3.1 Instrument case and wrist strap

3.2 Head socket

7 pin DIN socket for 100mm and 35mm anemometer heads.

3.3 Six digit LCD, and display notation

3.4 Imperial/metric switch

Use at any time to switch between imperial and metric units. The chosen units are indicated by a chevron on the display.

Note: When changing from imperial to metric, and metric to imperial there is the possibility of small rounding errors.

3.5 Average/continuous switch

3.5.1 Average mode

In 'average' mode, the first measured reading is displayed after about 2 seconds and is then updated every 0.8 seconds.

3.5.2 Continuous mode

In 'continuous' mode, the instantaneous reading is displayed, updated every 0.8 seconds.

**3.6 Off/velocity/volume/area+/
area- switch**

3.6.1 Velocity

For velocity readings switch to 'velocity'. The selected units are shown by a flashing chevron on the display in 'average' mode or a chevron in 'continuous' mode.

**3.6.2 Volume/area+/
area-**

To read volume flow rate direct, after first determining the cross sectional area of the duct or airway for which volume flow readings are required (in m² or ft²). The selected units are shown by chevron on the display.

3.7 Read/hold key

This is a multi-function key the use of which is determined by the parameter selected.

3.7.1 Averaging mode – velocity or volume displayed

Press the read/hold key to start the averaging period. Press again to hold the latest average reading on the display. A 'held' reading is indicated by a flashing chevron. Press a third time to clear the previous average and initiate a new averaging period.

3.7.2 Continuous mode – velocity or volume displayed

In this mode the instantaneous reading is displayed without the read/hold key being pressed. Press the key to hold the last measured reading on the display. A 'held' reading is indicated by a flashing chevron. Press the key again to revert to instantaneous reading.

3.8 Jack Socket, 3.5mm diameter

For use with compatible mono jack plug (not supplied). The socket gives a 0 to 1 volt output proportional to velocity and volume flow rate and is adjustable between 0.5 and 2.0 volts (see 5.8). It is intended for use with, for example, a suitable data logger such as the Airflow AM2.

3.9 Battery cover

This slides and 'snaps in' at the rear of the instrument case.

3.10 Potentiometer for the adjustment of voltage output

3.11 Shortform instructions in English/German/French

3.12 Rotating vane head and connecting cable 100mm diameter

3.13 Rotating vane head and connecting cable 35mm diameter (optional extra).

Telescopic probe and swivel head

Screw in handle for use with 100mm, 35mm heads or telescopic probe

Battery

Item not shown:
Carrying case

4. To use the instrument

4.1 To read velocity

Prepare the rotating vane head for use by either screwing the handle or the telescopic probe and handle to it. Using the telescopic probe fully extended gives a range of about 1.6 metres (5 ft) from the instrument case. The swivel head at the end of the probe allows the vane head to be set at almost any angle relative to the probe, though the head must always be square with the airstream. Note the direction of the flow arrow.

Choose imperial or metric units, and average or continuous mode (see 3.5), hold the rotating vane head in the airstream and after a few seconds to allow the vane to reach a steady speed, switch to 'velocity'.

If average mode is chosen, press the read/hold key momentarily and after about 2 seconds the first reading is displayed. This reading is updated at 0.8 second intervals, and is the average velocity until the period is ended by again pressing the read/hold key.

This is indicated by a flashing chevron. To start another averaging period, press the read/hold key again. If the instrument is used in this mode for long periods, the memory will become full after about 3 hours, and the display will read 'full'. Press the read/hold key to show the average over this period. Press again to initiate a new averaging period.

4.1.4 If continuous mode is chosen, the first reading is displayed after about 2 seconds, without pressing the read/hold key. This reading is updated at 0.8 second intervals showing the latest velocity reading. Press the read/hold key to hold the last measured reading on the display. A 'held' reading is indicated by a flashing chevron. Press again to revert to a continuous reading.

4.2 To read volume flow rate

4.2.1 Prepare the rotating vane head for use (see 4.1.1).

4.2.2 Choose imperial or metric units, and average or continuous mode (see 4.1.2). Switch to 'volume'.

4.2.3 Find the area of the duct or airway for which the volume flow rate is required in m^2 or ft^2 . Switch to area+. The area displayed will be the last area recorded in the memory. If the new area to be entered is greater than the displayed area, press and hold down the read/hold key until the display shows the required area. If the area is less, switch to area- before pressing and holding down the read/hold key.

If the battery has been disconnected since the instrument was last used, the

display will show 1.000 m², or 1.000 ft².

When the correct area is displayed, place the rotating vane head in the airstream.

- 4.2.4 If average mode is chosen, press the read/hold key momentarily and after about 2 seconds the first reading is displayed. This reading is updated at 0.8 second intervals, and is the average volume flow rate until the period is ended by again pressing the read/hold key. This is indicated by a flashing chevron. To start another averaging period, press the read/hold key again. If the instrument is used in this mode for long periods, the memory will become full after about 3 hours, and the display will read 'full'. Press the read/hold key to show the average over this period. Press again to initiate a new averaging period.
- 4.2.5 If continuous mode is chosen, the first reading is displayed after about 2 seconds, without pressing the read/hold button. This reading is updated at 0.8 second intervals to show the latest volume flow rate reading. Press the read/hold key to hold the last measured reading on the display. A 'held' reading is indicated by a flashing chevron. Press again to revert to continuous reading.
- 4.3 **NOTE:** If the rotating vane head is subjected to a velocity of more than 32 m/s (6400 ft/min) the display will indicate 'vel hi'. To cancel this message the instrument must be switched off, and on again, before further use.
- 4.4 **NOTE:** Incorrect readings may be displayed if the metal plate within the anemometer ring is touched whilst using the instrument.

5. Checking the instrument

The AV-2 instrument is programmed with a self test routine which may be initiated by holding down the read/hold key, switching to 'velocity', and immediately releasing the read/hold key. If the read/hold key is not released immediately, a fault is indicated. Switch off and start the routine again. This process causes the following sequence to occur.

- 5.1 Displays the word 'HELP' to indicate to the user that the instrument has entered the test mode.
- 5.2 Displays the version of the software used in the instrument (e.g. V2.5).
- 5.3 Displays 'lo bat' if the battery needs replacing and stops the test routine pending replacement.
- 5.4 Displays 'Error 0' if the read/hold key has not been released or the key is faulty.
- 5.5 Displays 'VEL' if no faults are found.
- 5.6 The three slide switches may be checked at this point.
- 5.6.1 Imperial/metric. When switched, 'inp' (imp) or 'net' (met) is shown.
- 5.6.2 Average/continuous. When switched, 'Avg' or 'Cont' is shown.
- 5.6.3 Off/velocity/volume/area. This switch is already in 'velocity' position as part of the self test routine. Switch to 'volume', ('VOL' is displayed), area+, (Area⁺ is displayed), area-, (Area⁻ is displayed). Return switch to 'velocity'.

5.7 If no faults have been found, press the read/hold key momentarily, '00000' is displayed. Each time the key is pressed '11111' through to '99999',, ~~~~~ 'analog', are displayed. If in metric mode, pressing the read/hold key again displays '00.00', '30.00', '15.00', 'End'. In imperial mode, pressing the read/hold key displays '0000', '6000', '3000', 'End'.

5.8 Setting up and testing the analog output.

The output is factory set to give 1 volt at 30.00 m/s, and is proportional to velocity or volume flow rate. The voltage may be adjusted between 0.5 and 2.0 volts by means of the potentiometer in the battery compartment (see 3.10).

To reset the voltage output, connect a voltmeter across a mono jack plug (not supplied), and follow 'Checking the instrument' section 5 (above) until '30.00' ('6000') is displayed and adjust the output as required. Press the read/hold key again to display '15.00' ('3000') and check that the voltmeter reading is halved. Press again, and 'End', 'VEL' and then '00.00' ('0000') is displayed. The voltmeter should then read zero.

Example: The maximum volume flow rate in an air system is 750 m³/hr. Set the output to give 0.75 volt at '30.00' ('6000'). 1 mv is then equal to 1 m³/hr.

Note: The analogue voltage output is 'stepped' in about 230 steps of 0.13 m/s (26 ft/min) at 30 m/s (6000 ft/min).

5.9 If no faults have been found, switch off and on again and the instrument is now ready for use.

If a fault is found at any of these stages, return the instrument to Airflow Developments Service Department, Telephone (0494) 525252, or to your local agent or distributor.

6. Where to use the instrument

6.1 Checking air velocity or volume flow rate in small areas.

The instrument 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 (113mm diameter). The AV-2 head is calibrated for use in free air conditions.

6.2 Checking air velocity or volume flow rate over larger areas.

When checking over larger areas, a number of spot readings should be taken as described in section 4.1.4 (velocity), or section 4.2.5 (volume flow rate).

Alternatively, the instrument will provide the mathematical average automatically, when steadily scanned across the whole area, if used in average mode as described in section 4.1.3 (velocity), or 4.2.4 (volume flow rate).

When taking 'spot' readings, it should be noted that quite 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, so long as they are equally spread to cover the whole area.

7. Use on grilles

- 7.1 Avoid the intrusion of the hand, arm or handle of the instrument into the face area of the grille.
- 7.2 The instrument is suitable for use with both supply and extract grilles. Whilst it is acceptable to hold the anemometer head against the grille on extract it is advisable to hold it slightly away from the grille on supply to avoid excessive turbulence and any vena-contracta effects.

8. Use in Airways

In large airways the presence of the instrument has a negligible effect, but in small airways, the blockage caused forces the airstream to accelerate slightly as it passes the rotating vane. This effect is variable depending on the airway size and the distance from the duct walls. Any 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 frontal area of the head is 0.019m^2 (0.204ft^2). The effect can be ignored completely if the duct exceeds 500mm (1' 9") diameter.

9. Possible sources of error

Using an AV-2 instrument to automatically average velocity or volume flow rate (see sections 4.1.3 and 4.2.4), can result in incorrect readings being displayed where there is a significant variation in velocities across the test area. This is caused by the inability of the rotating vane to speed

up or slow down instantly when moved to an area where the velocity is substantially different. This error can be largely eliminated by retaining the head at each sampling position for longer periods. For proportional balancing this does not matter, but for quantitative measurement it should be taken into consideration.

10. Uncertainty of measurement

Due to characteristics common to all rotating vane anemometers, the minute amount of bearing friction causes the head signal to depart from a linear signal/velocity relationship by an insignificant amount at higher velocities but with progressively more effect below 2 m/s (400 ft/min). In the AV-2 instrument means of compensation for this is provided in the software enabling accuracy over most of the range to be maintained to within $\pm 1\%$ of reading ± 1 digit using the 100mm diameter head (see section 12 specification).

11. Recalibration

If an instrument's calibration becomes suspect, it should be returned to Airflow for recalibration to original standards. It is, in any case good practice to have the instrument checked at least once a year.

In the U.K., Airflow Ventilation Supplies (AVS) operates an instrument hire service for the convenience of customers having equipment repaired or recalibrated. To use this facility, contact AVS, telephone (01494) 463490, fax (01494) 471507, to make arrangements prior to returning your instrument.

12. Specification

Parameter	Metric Mode	Imperial Mode
Velocity range 100mm dia. head 35mm dia. head	0.25-30 m/s 0.5-20 m/s	50-6000 ft/min 100-4000 ft/min
Uncertainty of Measurement at 20°C and 1013 mb 100mm dia. head	Calibrated to better than: 1.0 to 30 m/s +/- 1% of reading +/- 1 digit 0.25 to 1 m/s +/- 1% of reading +/- 1 digit +/-0.02 m/s	200 to 6000 ft/min +/- 1% of reading +/- 1 digit 0.25 to 1 m/s +/- 1% of reading +/- 1 digit +/-0.02 m/s
35mm dia. head	2.0 to 20 m/s +/- 2% of reading +/- 1 digit 0.4 to 2.0 m/s +/- 2% of reading +/- 1 digit +/-0.05 m/s	400 to 4000 ft/min +/- 2% of reading +/- 1 digit 80 to 200 ft/min +/- 2% of reading +/- 1 digit +/-0.05 m/s
Resolution	0.01m/s	1 ft/min
Max. operating time	The memory will become full in about 3 hours	
Operating environment Indicator unit	Barometric pressure 500 mb to 2 bar Temperature -10°C to +50°C	Barometric pressure 15 in Hg to 60 in Hg Temperature 14°F to +122°F
Operating environment rotating vane heads	Barometric pressure 500 mb to 2 bar Temperature -10°C to +70°C (short periods to -30°C)	Barometric pressure 15 in Hg to 60 in Hg Temperature 14°F to +158°F (short periods to -22°F)
Storage temp. range	-10°C to 60°C	14°F to 140°F
Volume flow rate range displayable	0.002 to 3000 m ³ /S	4.000 to 999999 ft ³ /min
Duct cross-sectional area range	0.004 to 90.00 m ²	0.043 to 900.00 ft ²
Battery	1 only 9v PP3 or equivalent (IEC ref 6F22) Alkaline, rechargeable, or 'standard'	
Battery life	14 hours approximately ('standard battery') 30 hours approximately (alkaline battery)	
Output	0 to 1 volt (adjustable from 0.5v to 2.0v) proportional to velocity or volume flow rate	
Uncertainty of output measurement	+/-0.5% of display f.s.d	

AIRFLOW™

QUALITY ASSURED TO ISO 9001

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