AIRFLOW

EDRA 6

Operating Instructions 9005000/D/694

1. Introduction

The EDRA 6 is a battery operated, rotating vane anemometer featuring direct readout of air velocity on an analogue meter which is marked with both Imperial and Metric scales. EDRA 6 is suitable for most applications where the airstream is large enough to accommodate the 100mm diameter measuring head or the 35mm measuring head and is especially useful for proportional balancing of air distribution systems. The EDRA 6 can also be used for long-term monitoring in airways where the mains adaptor capability and the 0-1mA output facility are of particular value.

The smaller 35mm diameter rotating vane head is not suitable for long-term monitoring.

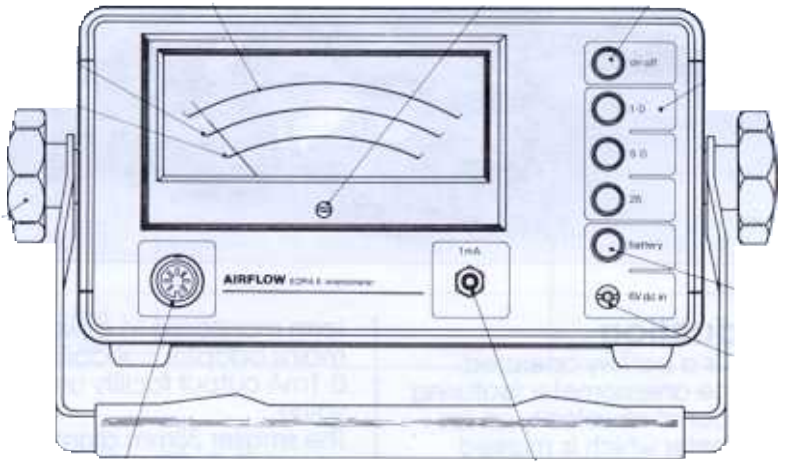
A mains operated output convertor with an output capability of either 4-20mA, 0-20mA or 0-1v linear with the 0-1mA output is available as an optional extra from Airflow Developments.

2. To fit the battery cells

The EDRA 6 is supplied without battery cells. The cells are fitted behind a panel at the rear of the instrument. To release the panel pull back the centre studs of the three plastic fasteners. Insert four 1.5v cells, IEC designation R20, taking care to observe the correct polarity. Replace the back panel. Do not leave discharged battery cells in the instrument, or leave cells in place if the instrument is out of use for a long time.

3. External Power Supply

An external d.c. supply may be used to power the instrument via the "6v d.c. in" jack socket. The input voltage of the EDRA 6 may vary from 5 to 13v. The positive connection must be made to the centre pin. No damage will result if the wrong connection is made. Inserting the plug automatically by-passes the battery circuit. The jack plug is not supplied but a suitable mains adaptor is available from Airflow Developments.



4.1 4.2 4.3 4.4 4.5 4.6 4.7 4.8 4.9 4.10 4.11

FIGURE 1

4. Description of the instrument.

The EDRA 6 has been designed with ease of operating in mind. Before using the instrument the users should familiarise themselves thoroughly with its features.

4.1. Locking knobs for the adjustable foot/carrying handle. These fittings also provide anchor points for the shoulder/neck strap provided. The foot/handle may be adjusted by releasing the knobs, rotating to the required position and retightening the knobs.

4.2. Input socket for the 100mm or 35mm measuring heads.

4.3. Output jack socket (3.5mm diameter) suitable for driving a chart recorder, remote meter etc. 0-1mA range, linear with scale reading on each of the three scale ranges. Maximum impedance 3kΩ. The 0-1mA output may be used to derive 4-20mA, 0-20mA or 0-1v by use of an output convertor (see 1 above).

4.4. '6v d.c. in' jack socket (2.5mm diameter) for external power supply via suitable mains adaptor (see 3 above).

4.5. On-Off switch. Press to latch in for 'on' position. **Press to switch off when not in use**.

4.6. Battery check. Unplug any remote reading device from the 1mA Socket. Switch on the instrument and press the 'Battery' button. The meter pointer must move to the right of the "LOW BATT" mark on the meter face. If it does not, check the polarity of the cells and replace them if the pointer is still to the left of the "LOW BATT" mark.

4.7. Mechanical meter zero. With the instrument switched off, zero the meter by using the screw on the meter face to adjust the pointer. This should not normally require resetting.

4.8. Range selection buttons. Press button for required range until it latches in. The displayed button colour indicates the chosen range. The same colour is used on the related scale on the meter face.

4.9. Low Velocity scale (orange), range 0.25 to 1m/s (50-200 ft/min) with 100mm head
range 0.40 to 1m/s (80-200 ft/min) with 35mm head.

4.10. Medium Velocity scale (green), range 1 to 5m/s (200-1000 ft/min) (both heads)

4.11. High Velocity scale (blue), range 5 to 25m/s (1000-5000 ft/min) (both heads)

4.12. 100mm rotating vane head and/or 35mm rotating vane head. These are adjusted during manufacture to be interchangeable within the limits described in the specification.

Items not shown

4.13 Telescopic extension rod set. This may be screwed into the threads on either of the anemometer heads to permit readings to be taken in less accessible situations. It is fitted with an all angle swivel bracket which allows an anemometer head to be set at almost any angle relative to the handle. The telescopic rod can be extended to 900mm

4.14 Handle. This screws to either the telescopic extension rod set or to the anemometer heads.

4.15. Carrying case.

4.16. Shoulder/neck strap.

4.17 3.5mm jack plug for 0-1mA output.

5. Optional Extras

	Part Number
5.1. Mains adaptor 5-13v d.c. 20mA 240v input	71694301
5.2. Mains adaptor 5-13v d.c. 20mA 110v input	71694302

5.3. Grille hood
152mm x 152mm 7839201
5.4. Grille hood
229mm x 152mm 7839202
5.5. Grille hood
305mm x 222mm 7839203
NB:5.4,5.5 and 5.6 are suitable for 100mm diameter head only.
5.6. Head extension cables
– various lengths to order

6. To use the Instrument

6.1. Before using the instrument check the battery state (see 4.6.). If the instrument is being operated via a mains adaptor, it may be used immediately irrespective of the battery state.
6.2. Connect the anemometer head to the indicator unit.
6.3. Fit extension rods and/or handle to the head as required.
6.4. Select a suitable velocity range. No damage will occur if the wrong range is used initially, but velocities exceeding 30 m/s (6000 ft/min) may damage the anemometer head.
6.5. Hold the head squarely in the airstream with the arrow on the guard ring pointing in the direction of air flow.
6.6. Allow the pointer on the meter to reach a steady value. This is almost instantaneous at higher velocities but may take up to 15 seconds at very low velocities.

Note 1: The EDRA 6 may be used with the meter face vertical, inclined at an angle by means of the adjustable foot, or horizontal when using the neck strap.

Note 2: EDRA 6 is suitable for use in airstreams which are larger than the face of the chosen anemometer head.
For smaller airstream, e.g. slot diffusers, vent pipes etc, Airflow Developments TA range of anemometers is recommended.

7. Where to use the Instrument

7.1. Checking the Air Velocity over large areas.
When checking flow over large areas a number of separate 'spot' readings must be taken, spaced to give even coverage of the whole area. The mathematical average of these readings gives the average velocity. It should be noted that quite large variations may be observed between individual readings.
In general, the larger the number of readings taken, the more accurate the result will be. It does not matter if the spot reading positions overlap somewhat, so long as they are equally spaced and cover the entire area.

7.2. Use on Grilles
Note: See comments under 7.4 "Volume flow-rate calculations" regarding limitations of method. Avoid intrusion of the arm and hand 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. The telescopic extension rod can be useful in avoiding this problem. Better measuring conditions can be obtained on grilles with adjustable direction vanes if the vanes are temporarily straightened before making measurements. This should not significantly affect the flow-rate so long as any built-in dampers are not accidently disturbed. The instrument is suitable for both supply and extract grilles, and the procedure for both is the same except that the measuring head must be turned through 180° to align the

direction arrow correctly. Whilst it is acceptable to hold the anemometer head against the grille on extract, it is usually recommended to hold it slightly away from the grille face on supply to avoid excessive turbulence and vena-contracta effects.

7.3. Use in airways.

In large airways the presence of the measuring head will have a negligible effect, but in small airways the blockage caused by the head will force the airstream to accelerate slightly as it passes the head. This effect is somewhat variable depending on the size of the airway and the distance of the head from the duct walls. The error can be virtually eliminated by mathematical correction, to allow for the reduction in free area caused by the obstruction. For this purpose, the effective frontal area of the measuring head including cable and a short length of extension rod can be taken as 0.01m^2 (0.107ft^2) for the 100mm diameter head 0.003m^2 (0.032ft^2) for the 35mm head, and ignored completely if the duct exceeds about 500mm diameter.

7.4. Volume flow-rate calculations.

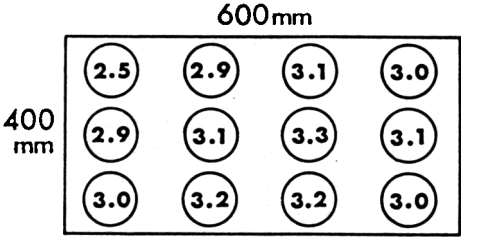
Volume flow-rate through airways or apertures may be calculated if the cross-sectional area of the airstream and its average velocity are known. The principal units of measurement in use at present are:–

Cubic metres per second
Cubic metres per hour
Litres per second
Cubic feet per minute

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:

Air velocity has been measured in a 600mm x 400mm rectangular duct at 12 different positions as shown in the diagram below.



Readings in m/s

The readings are added together, and the result is divided by the number of readings to give an average velocity for the whole duct. In this example, the average velocity is 3.025 metres per second.

After finding the average velocity find the duct cross sectional area

0.6 x 0.4 = 0.24 metres^2.

Therefore the Volume Flow-rate is 0.24 x 3.025 = 0.726 cubic metres per second.

This figure should be multiplied by 3600 to arrive at cubic metres per hour or by 1000 to give the answer in litres per second

0.726 x 3600 = 2613.6m/h

or

0.726 x 1000 = 726 litre/s

The procedure is the same when working in imperial 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.

8. Possible sources of error

The above method ignores the effects of the reduced velocity at the duct walls. A more precise method is shown in BS1042 Part 2 – Log Tchebycheff method.

The above procedure is satisfactory for use in ducts, and at unobstructed apertures. Significant errors may occur if the aperture is covered by a grille, particularly if this is of the type having adjustable direction vanes and/or dampers. The airstream issuing from such a grille is invariably very disturbed, consisting of many small areas of high velocity interspersed with areas of low velocity.

The transitions between these areas are highly turbulent and there may even be some reversed flow. If maximum accuracy is required, it is advisable to make up a short length of test ducting which is just larger than the overall dimensions of the grille.

This duct can be of any convenient rigid material (e.g. stiff cardboard) and should have a length about twice the diagonal measurement of the grille. The duct should be placed over the grille, and sealed to the wall with adhesive tape. Measurements of flow can now be conducted, as already described, at the unobstructed end of the test duct. Use the cross-sectional area of the duct (not the grille) for the calculations.

9. Permanent monitoring

The EDRA 6 is well suited to this as it can be powered continuously from the mains supply via a mains adaptor. For long term monitoring only use the 100mm measuring head, not the 35mm head.

It is difficult to forecast the serviceable life of the bearings used in the 100mm head as it is affected by many factors including temperature, velocity and

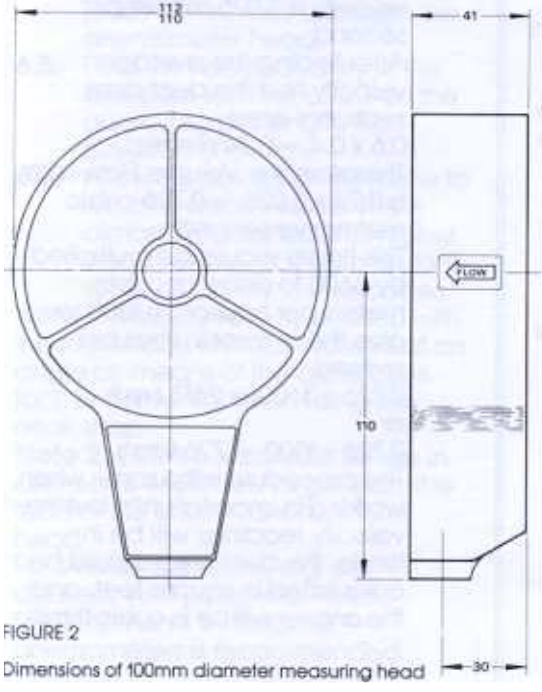


FIGURE 2

Dimensions of 100mm diameter measuring head

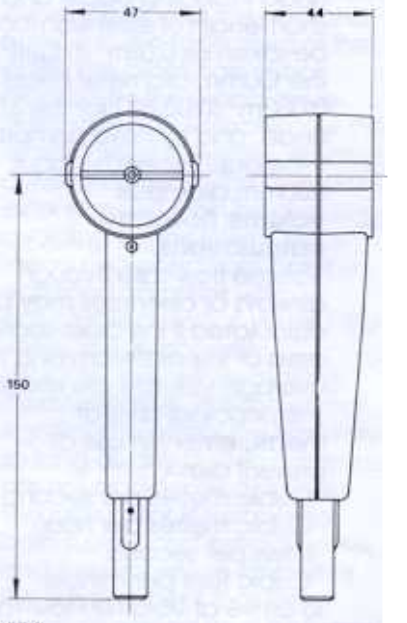


FIGURE 3

Dimensions of 35mm diameter measuring head

dust concentration in the airstream. By far the most important of these is dust and the EDRA 6 is not recommended for use in airstreams where the dust burden is heavy or where the dust is highly abrasive.
As a general guide, it can be said that, if the environment is safe for people to breathe, the bearing life should be between 10,000 and 30,000 hours depending on the average velocity.

10. Fault Finding

Symptom	Probable Cause
Meter pointer below "LOW BATT" mark.	Batteries flat or incorrectly fitted. Battery eliminator in circuit not switched on. Remote 1mA device not removed
Meter will not zero	
a) with instrument 'OFF'	Meter needs mechanical zeroing.
b) with instrument 'ON'	Batteries may be flat.
Battery eliminator is ineffective	Wrong polarity (positive should be to centre pin). Fuse faulty in mains plug.

If the instrument is still not working correctly contact your nearest Airflow Agent or UK Service Department on High Wycombe (01494) 525252.

11. Recalibration

If an instrument's calibration becomes suspect because of accidental mishandling, it should be returned to Airflow Developments for recalibration to original standards. In any event, it is good practice to have the instrument checked at least once a year.
Airflow Developments operate an Instrument Hire Service for the convenience of customers having equipment repaired or recalibrated. If you intend to take advantage of this facility please contact our Service Department to make arrangements prior to returning your equipment.

12. Specification

Parameter	Metric	Imperial
Velocity ranges	0-25 m/s 0-5 m/s 0-1 m/s	0-5000 ft/min 0-1000 ft/min 0.200 ft/min
Accuracy at 20°C and 1013 mb (68°F and 30 in Hg)	100 mm head calibrated to better than: **range:** 5 to 25 m/s ±1% of reading/± 0.05 m/s 0.25 to 5 m/s ±1% of reading/± 0.02 m/s	**range:** 1000 to 5000 ft/min ±1% of reading/±10 ft/min 50 to 1000 ft/min ±1% of reading/± 4 ft/min
	35 mm head calibrated to better than: **range:** 1 to 20 m/s ± 2% of reading/± 0.05 m/s 0.4 to 1 m/s ± 5% of reading/± 0.02 m/s	**range:** 200 to 4000 ft/min ± 2% of reading/±10 ft/min 80 to 200 ft/min ± 5% of reading/± 4 ft/min
Operating Environment Indicator Unit	Barometric pressure 500 mb to 2 bar Temperature −10°C to +60°C	Barometric pressure 15 in Hg to 60 in Hg Temperature 14°F to 140°F
Operating Environment Measuring 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 −22°F)
Battery cells	4 x 1.5v cells, IEC R20 or equivalent	
Battery life	In excess of 800 hours using standard cells	
External power supply	Mains adaptor range 5v to 13v d.c. 20 mA	
Indicating Meter	0-1 mA taut band	
Recorder Output	0-1 mA on each range. Load 3kΩ maximum	
Overall dimension of indicator only	255mm x 240mm x 118mm	10.0 in x 9.4 in x 4.6 in
Weight of instrument only (less battery cells)	1.6 kgs	3.5 lbs

AIRFLOW

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