AIRFLOW

MEDM 5k

Operating Instructions 9020618/B/694

Please read these instructions carefully before attempting to use the instrument.

For shortform instructions on the use of the instrument see section 6.

For detailed instructions on the use of the instrument see sections 7-10.

WARNING:

THE MAXIMUM OVERLOAD (STATIC) PRESSURE WHICH MAY BE APPLIED IS ±100kPA (400 in wg) THE MAXIMUM OVERLOAD DIFFERENTIAL PRESSURE IS 5kPA (200 in wg). THE INSTRUMENT IS DESIGNED FOR USE WITH AIR/ GASES ONLY (SEE MATERIAL SPECIFICATION – SECTION 14) AND CARE MUST BE TAKEN TO AVOID LIQUID ENTERING THE INSTRUMENT THROUGH THE PRESSURE CONNECTORS.

1. Introduction

1.1 The MEDM 5k is an all electronic manometer intended to read pressure from 0-5000 Pa (0-20 in wg), velocity up to 91.0 m/s (17960 ft/min) and volume flow up to 999.9 m^3/sec (9.999 x 10^6 cfm), when used with a pitot static tube in air of density 1.2 kg/m^3 (0.075 lbs/ft^3). The instrument can also be used to give velocity and volume flow with other differential pressure devices for which the 'K' factor is known between the limits of K = 1.00 and K = 2.99, and at other than standard temperatures and pressures.

Note. K is the magnification factor of the differential pressure device.

$$\text{i.e. } K = \frac{\text{Diff. press. from D.P. device}}{\text{actual velocity pressure}}$$

1.2 The instrument is intended to be powered by six 1.5 V cells which are not supplied.

1.3 The MEDM 500 may also be used for long term monitoring where the mains adaptor capability and the 0-1 mA output facility are of particular value.

1.4 A suitable mains adaptor and in addition a mains operated output convertor with an output capability of 4-20 mA, 0-20 mA or 0-1 volt linear with the 0-1 mA output are available as optional extras from Airflow Developments.

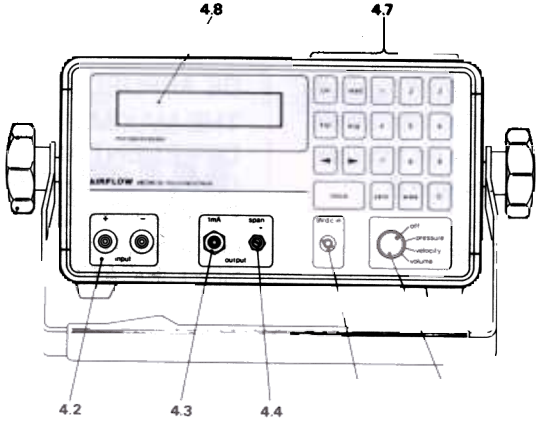
2. To fit the Battery Cells

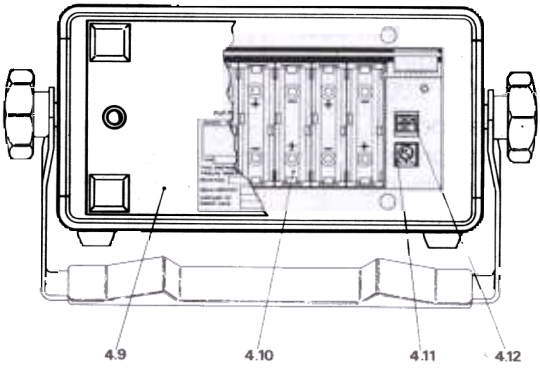
The MEDM 5k is supplied without battery cells. The cells are fitted behind the panel at the back of the instrument. To release the panel pull back the centre studs of the three plastic fasteners. Insert six 1.5 volt AA size cells (IEC designation R6) taking care to observe the correct polarity. Replace the back panel. Do not leave discharged cells in place if the instrument is out of use for a long time.

3. External Power Supply

An external power supply may be used to power the instrument via the "9 V dc in" jack socket. The input voltage may vary from 8 volts to 10 volts and the supply must be capable of supplying 200 mA. The positive connection must be made to the centre pin. Inserting the plug

Fig. 1





automatically by-passes the battery circuit. The jack plug is not supplied but a suitable mains adaptor is available from Airlow Developments.

4. Description of the Instrument (see Figs 1 & 2)

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 Pressure connectors suitable for flexible tubing from 2mm to 5mm inside diameter. (Both sizes are available from Airflow Developments).

4.3 Output jack socket (3.5mm diameter) suitable for driving a chart recorder, remote meter, etc. 0-1 mA range, linear with the digital display. Maximum load impedance 1.5 k Ω. The 0-1 mA output may be used to derive 4-20 mA, 0-20 mA or 0-1 V by use of an output convertor (see 1 above).

4.4 'Span' control gives users the choice of relationship between the 0-1 mA output and pressure, velocity or volume. To obtain the required relationship use a pressure source and an ammeter. (See also 11.1.6).

4.5 '9 V dc in' jack socket (2.5 mm diameter) for external power supply via suitable mains adaptor (See 3 above).

4.6 Rotary switch to select off, pressure, velocity or volume flow modes. When switched to 'off' all memorised data is lost. When switched between modes only readings in the memory are lost.

4.7 Keypad area.

4.7.1 **CM** Clear Memory. Pressing 'CM' only clears recorded readings. It does not affect K, t, p or area. The memorised readings are cleared automatically if the rotary switch position is changed.

4.7.2 **Ktp** Pressing this key allows entry of 'K' factor, *duct* temperature 't' and duct

absolute pressure 'p'. Note that K is the coefficient of the in duct differential pressure device e.g. pitot-static tube K = 1.00.

To enter 'K' press once, 't' press twice and 'p' press 3 times each followed by the required data using the numeric keys. Press again after entering the figures to return the instrument to 'read' mode. If no amendments are made, the compensation calculations assume standard conditions. (K = 1, Density of air 1.2 Kg/m^3 (0.075 lbs/ft^3)

4.7.3 [◁] [▷] These keys are used for two purposes: Firstly, for editing the Ktp and area data, in which case the cursor will continue to flash showing which digit may be modified. Press ◁ to step back, ▷ to step forward, and secondly, from the 'read' mode for stepping through the memorised readings. ◁ to step back, ▷ to step forward. The stepping is automatic if the key is held down.

4.7.4 [**store**] Pressing this key when in the 'read' mode places the displayed reading into the memory, at the same time indicating the number of readings stored.

The memory can contain up to 80 readings. This key is also used to place the area data into its dedicated memory.

4.7.5 [**avg**] Pressing this key when the display is in the read mode will average all the readings recorded. The result is displayed until the 'read' or 'CM' keys are pressed. If 'read' is pressed further readings can be added to the memory.

4.7.6 [**read**] This key is used to return to the read mode from avg, from memory recall using ◁ ▷ keys and area.

4.7.7 [**0**] → [**9**] These keys are used to enter data for Ktp and area.

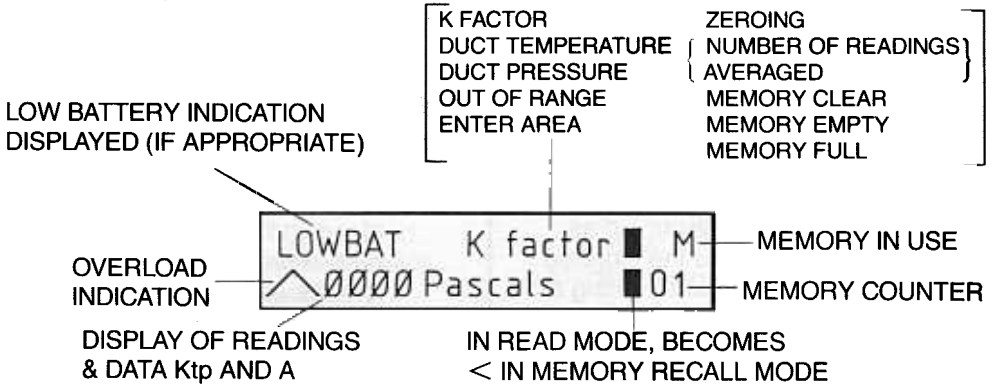
4.7.8 [**zero**] This key may be used at any time from the read mode to re-zero the instrument. It may be used whether autozero is engaged or not (see also 4.12.1).

4.7.9 [**area**] This key is only used in connection with the volume mode, but entries may be made in the velocity or volume modes.

When the rotary switch (4.6) is turned to 'volume' the display asks for area to be entered. If an area is already stored, this area will be used for volume flow calculations unless altered.

Note: A buzzer is incorporated to enhance keypad operation (short buzz) and to draw attention to a fault condition (long buzz). See also section 11.

4.8 Display



NOTE: WHEN 'avg' OR 'area' KEYS ARE USED, THE MEMORY INDICATION BLOCK IS ELIMINATED FOR REASONS OF SPACE.

Battery Cover (see 2 above). Also covers the display contrast adjustment (see 4.11 below) and switches SW1 to SW4 (see 4.12 below).

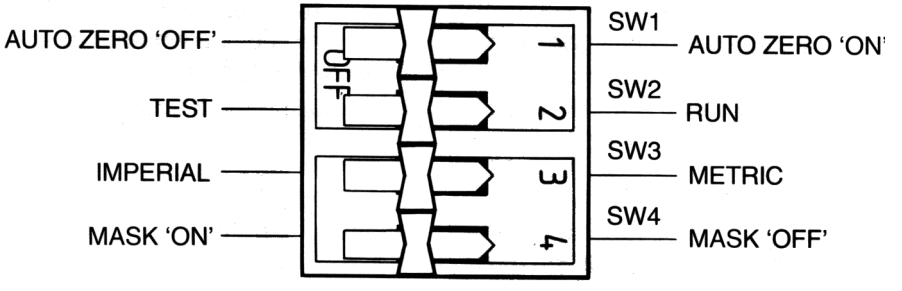
4.10 Battery cell holders marked with cell polarity.

Display contrast adjustment (VR2). This is factory set to give an acceptable level of contrast at normal operating temperatures, but may need adjustment to achieve optimum contrast at temperatures below about 15°C (60°F).

Switches SW1 and SW4.

4.12.1 Autozero. When the switch is in the 'on' position, the instrument will be re-zeroed every 4 minutes. When the switch is in the 'off' position re-zeroing will only be carried out at initial switch on and each time the zero button is pressed. Re-zeroing causes a current drain on the battery cells, so for longest battery life reduce re-zeroing to a minimum.

4.12.2 Test/Run. For normal use the instrument is used with the switch in the 'run' position. The 'test' position is used when it is required to check the instrument using the integral diagnostic routine (see Section 11). Only make the change from 'test' to 'run' with the instrument switched off.



4.12.3 Metric/Imperial. This gives the user a choice of metric or imperial units. Only make the change from one to another with the instrument switched off.

4.12.4 Mask 'On'/Mask 'Off'. When 'on' any velocity reading below 2 m/s (400 ft/min) or related volume reading will be displayed as zero, to eliminate the extreme sensitivity of square rooting at low velocity levels. These readings are fully displayed when the switch is 'off', but non-zero readings may occur.

Items not shown.

4.13 Shoulder/Neck strap.

4.14 3.5mm Jack Plug for 0-1 mA output.

5. Optional Extras

		Part No.
5.1	Carrying case for instrument	81506801
5.2	Mains adaptor 9 V dc 200 mA output, 240 V input	71776401
5.3	Mains adaptor 9 V dc 200 mA output, 110 V input	71776402
5.4	Accessory Kit	71509501
	This kit comprises:	
	Carrying case for accessories	81548301
	Pitot static tube 8mm dia x 0.48m long	7013501
	Instruction book for pitot static tubes	9004474
	Manometer balancing valve	71157001
	9m length of blue pvc tubing	61571803
	9m length of red pvc tubing	61571903
	Air velocity calculator	81661801
	Glass thermometer 0-60°C	9004007
	Glass thermometer 0-400°C	9004017

Note: All items listed in the accessory kit can be supplied separately if required.

5.5 Airflow Developments Ltd can also supply a wide range of pitot static tubes of many lengths and diameters all of which are compatible with the MEDM 5k instrument.

6. To use the instrument – short form instructions

6.1 Switch to required mode: Pressure/Velocity/Volume – for volume flow area input is required.

6.2 Allow to zero.

6.3 Connect to pressure device.

6.4 Appropriate readings will be displayed assuming standard air conditions.

6.5 Press 'store' to put readings into memory.

6.6 Press 'avg' to display average of stored readings.

7. To use the instrument – detailed instructions

Decide whether to use autozero 'on' or 'off' (see 4.12.1 above).

Decide whether metric or imperial units are required (see 4.12.3 above).

If velocity or volume flow options are to be used decide whether to switch mask 'on' or 'off' (see 4.12.4 above).

Before using the instrument check the battery state by switching 'on' to any option on the rotary switch. If after a short delay 'LOBAT' is indicated, replace the battery cells. The unit will still read accurately for about one

hour after the first appearance of this warning. The 'LOBAT' indication is only given when the instrument is being used in the 'read' mode.

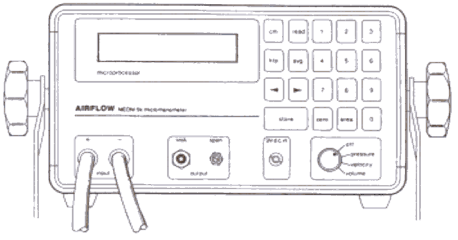
If the instrument is being used via a mains adaptor it may be used immediately regardless of the battery state.

Note: The MEDM 5k may be used with the front face of the instrument vertical, inclined at an angle by means of the adjustable foot or horizontal when using the neck strap. For maximum accuracy, zero the instrument in the orientation in which it is to be used.

8. Taking Pressure Readings

8.1 Connect the pressure source to the appropriate connector or connectors depending on the type of measurement required.

Pressure relative to atmosphere



Differential pressure

The MEDM 5k may be used to indicate positive or negative static pressure or differential pressure up to 5000 Pa (20 in wg).

8.2 Turn rotary switch to 'pressure'.

8.3 After a short delay, the display will indicate a pressure reading, updating itself every half second whilst in the 'read' mode.

8.4 If it is required to store readings in the memory, enter by pressing the 'store' key. The number of readings stored will be shown on the right of the display. The stored readings may be averaged and displayed by pressing the 'avg' key. To return to read mode press 'read'. Stored readings are retained in the memory until the 'cm' key is pressed, the instrument switched off, or the rotary switch position changed.

8.5 To inspect any of the stored readings press either ◁ or ▷ keys. To return to read mode press 'read'.

9. Taking Velocity Readings

9.1 Connect the pitot static tube or similar device to both connectors to read differential pressure. See operating instruction for the pitot static tube Airflow Developments publication No. 9004474.

9.2 Turn rotary switch to 'velocity'.

9.3 After a short delay, the display will indicate the velocity derived from the velocity pressure in the duct, updating itself every half second whilst in the read mode.

The instrument assumes a 'K' factor of 1.00 for a pitot static tube and air of density 1.2 kg/m^3 (0.075 lbs/ft^3) unless otherwise instructed (see 9.6 below).

9.4 If it is required to store readings in the memory enter by pressing the 'store' key. The number of readings stored will be shown on the right of the display. The stored readings may be averaged and displayed by pressing the 'avg' key. To return to read mode press 'read' key. Stored readings are retained in the memory until the 'cm' key is pressed, the instrument is switched off, or the rotary switch position is changed.

9.5 To inspect any of the stored readings press either ◁ or ▷ keys. To return to read mode press 'read'.

9.6 If using a measuring device with a 'K' factor other than 1.00 and/or non standard air conditions, proceed as follows.

9.6.1 Input 'K' by pressing 'Ktp' once. 'K' factor 1.00 will be displayed. This may be changed by keying in the new factor using the numeric keys. The new 'K' factor will be displayed. This may be altered by moving the flashing cursor using the ◁ ▷ keys and entering the revised factor. Return to read mode by pressing 'Ktp' key three times.

9.6.2 Input *duct* temperature 't' by pressing 'Ktp' key once if 'K' is already selected and twice if it is not. Standard air temperature will be displayed. This may be changed by keying in a new figure and again altered if necessary as in 9.6.1. Return to read mode by pressing 'Ktp' key twice.

9.6.3 Input duct absolute pressure 'p' by pressing 'Ktp' key once if K and t are already selected and three times if they are not. Standard duct pressure will be displayed. This may be changed by keying in a new figure and again altered if necessary as in 9.6.1. Return to read mode by pressing 'Ktp' once.

10. Taking Volume Readings

10.1 Connect the pitot static tube or similar device to both connectors to read a differential pressure.

See operating instructions for pitot static tubes, Airflow Developments publication 9004474.

10.2 Turn rotary switch to 'volume'.

10.3 After a short delay the display will request 'enter area'. Area is entered using the numeric keys. The maximum areas that it is possible to enter are 99.99999 m^2 (Metric) and 999.9999 ft^2 (Imperial).

Areas may be changed by keying in new figures using the numeric keys. The revised areas will be displayed. These may be altered by moving the flashing cursor using the ◁ ▷ keys and entering revised figures.

10.4 After entering area, press 'store' or 'read' key if it is required to retain the area. These put area into memory space dedicated only to area. In each case volume flow

readings will be displayed. In the metric mode all readings will be directly indicated, however, in the Imperial mode only volume readings below 1000 cfm are directly indicated, those above 1000 are indicated in the form:

eg: 4.432 ^ 3 cfm meaning 4.432 x 10^3 cfm, whilst those above 10^6 cmf are indicated in the form:

eg: 4.432 ^ 6 cfm meaning 4.432 x 10^6 cfm.

As volume is derived from area and velocity so the standard or modified air conditions apply as described in section 9.6 above.

10.5 If it is required to store, average or inspect stored readings the procedure is the same as in section 9.4 and 9.5.

10.6 Area data may be changed at any time by pressing the 'area' key and then the numeric keys. Clear any volume measurements in the memory first, to avoid confusion, by pressing the 'cm' key.

11. Diagnostic Routine

The diagnostic routine is intended primarily for the authorised service and repair of instruments but may be used by customers for confirmation of faults.

The MEDM diagnostics (Test) facility is an integral part of the software provided within the instrument. When the Diagnostics function is selected, the instrument automatically conducts a series of internal tests, providing a message on the display to identify any fault found. The diagnostics sequence also enables setting-up adjustments to be made and interactive checks to be carried out on the instrument.

Guidance is provided for the diagnostic process by a series of messages on the display, which should be read in conjunction with the detailed instructions below. Each message will either disappear after a fixed period or will indicate which key should be pressed to move into the next step.

11.1 To start the diagnostic routine. Switch off the instrument, remove the battery cover (4.9) and move SW2 (see 4.12) to the 'test' position. Turn the rotary switch to the 'pressure' position. The buzzer will sound once.

11.1.1 The displayed message *'Diagnostics V——'* indicates the version of the software in use. If this does not appear adjust the display contrast VR2 (see 4.11). If this does not provide a readable display. refer direct to Airflow Developments or your supplier.

11.1.2 The internal buzzer will sound twice more to give an audible indication that the programme is running and if this is heard but the display remains blank, then the display module or its control circuitry is suspect, in which case refer direct to Airflow Developments or your supplier.

11.1.3 After the buzzer sounds *'Diagnostic V——'* is replaced by *'KEYTEST press each Key 0 will end test'*. Press each key on the keyboard to ensure that it is closing. When pressed the legend of that key will appear in the top left of the display

accompanied by a short buzz. End test by pressing Key '0'. If a fault is found, refer direct to Airflow Developments or your supplier.

11.1.4 *'Adjust VR2 for best display then press 1'* is now displayed. Adjust VR2 to provide the best display contrast. No further adjustment should normally be required (see 4.11). Press '1' to continue.

11.1.5 Next the display alternates between *'Dots missing press 0. All dots OK press 1'*, and all of the elements of the dot matrix. If any element does not show, press Key '0'. The message *'FAULT 05 – see booklet'* will appear. Refer direct to Airflow Development or your supplier. If all dots are ok Press '1'.

11.1.6 *'1 mA O/P – see booklet press 1 to continue'* is displayed. This allows the user to set up and prove the 1 mA current output facility. A suitable ammeter is required which is connected to the 0-1 mA output socket (see 4.3) using the jack plug (see 4.14).

When '1' is pressed *'Adjust VR4 for 0 mA press 1 to continue'* is displayed. If output is not 0 mA refer direct to Airflow Developments or your supplier. Press '1' to continue.

'Adjust VR3 for 1 mA press 1 to continue' is displayed. VR3, the span control (see 4.4) on the front panel is provided to adjust the current output to provide a more useful relationship between it and the displayed reading. At this stage it should be adjusted to give an output of 1 mA. This enables the next steps in the sequence to be made to provide proportionally lower readings and so check the accuracy of the analogue output facility. When adjusted press '1'.

'Output is now 0.75 mA press 1 to continue' is displayed, similarly *'Output is now 0.50 mA/0.25 mA/0 press 1 to continue'* are displayed. If the current given on the ammeter does not match that on the display then the setting of 0 mA and 1 mA should be repeated, by switching off and on to restart the diagnostic sequence. If the figures still disagree the instrument is faulty, in which case refer direct to Airflow Developments or your supplier. If correct press '1'.

11.1.7 *'Pcb temp is ——— °C press 0 to continue'* is now displayed. For effective temperature compensation within the instrument, the temperature inside the case is measured continually. Check that the temperature displayed is within 2°C of the ambient temperature, after sufficient time has been allowed for temperature stabilisation. If outside this limit a fault is indicated in which case refer direct to Airflow Developments or your supplier. If correct press '0'.

11.1.8 *'TRANSDUCER TEST – see booklet press 1'* is now displayed. The transducer comprises an electrode on each side of a thin diaphragm. The capacitance of each

electrode to the metal diaphragm is used to measure the bowing effect of the applied pressure on the diaphragm. Press '1'.

'A = ——— ——— ———press'

'B = ——— ——— ——— 0'.

is displayed.

Each side of the transducer is connected alternately to an oscillator giving frequency values linear with the capacitances. The difference between these readings constitutes the pressure reading. By reading these frequency related figures the conditions of the transducer can be checked.

A and B represent the two sides of the transducer. In each case the first group of 3 numbers should be between 002 and 005. If either figure is outside these limits refer direct to Airflow Developments or your supplier. If within limits press '0'.

11.1.9 *'Diagnostics ended'* is displayed. The sequence can be repeated by turning the instrument 'off' and 'on' again. Normal operation of the instrument can be selected by switching 'off', returning switch SW2 (see 4.12) to the 'run' position, and switching 'on' again.

12. Recalibration

If an instrument's calibration becomes suspect for any reason it should be returned to Airflow Developments or your supplier for recalibration to original standards. In any case 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 the service please contact our Service Department to make arrangements prior to returning your equipment.

13. Specification

Parameter	Metric	Imperial
Pressure Range	+/— 5000 Pa	+/— 0-20 in wg
Velocity Range @ STP*	Up to 91.0 m/s	Up to 17960 ft/min.
Volume Range @ STP*	Up to 999.9 m^3/s	Up to 9.999 x 10^6 cfm
Max. overload differential pressure	50 kPa	200 in wg
K factor range	1.00 to 2.99	1.00 to 2.99
t Duct temperature	0 to 699°C	0 to 1299°F
p Duct absolute Pressure	70 to 140 kPa	20 to 39″ Hg
Area input range (vol. flow)	0.00001 to 99.9999m^2	0.0001 to 999.9999ft^2
Vol. range displayable	0.001 to 999.9m^3/s	0.1 to 9.999 x 10^6 cfm
Memory size	80 Pressure, Velocity, or volume flow readings.	
Accuracy of displayed reading	+/-1% of reading +/- 1 digit	
Accuracy of output from 0-1 mA socket	As displayed with additional max error of +/- 0.25% F.S.D. due to D to A convertor	
Output facility	0-1 mA adjustable to suit relationship required with pressure velocity or volume.	
Temp coeff (pressure reading)	< 0.1%/°C of reading	< 0.06%/°F of reading
Storage temperature	— 10°C to + 60°C	14°F to 140°F
Recommended usable temperature range	0°C to 40°C	32°F to 104°F
Power supply	6 x 1½ Volt cells IEC R6 or equivalent	
Battery Life	Over 60 hours using alkaline cells with auto zero 'off'	
External Power Supply	Mains adaptor range 8-10 V dc regulated, 200 mA minimum capacity	
Overall Dimensions	255 x 240 x 118mm	10.0″ x 9.4″ x 4.6″
Weight of instrument Less battery cells	2.4 kg	5.3 lbs

*Maximum velocity or volume flow is dependant on the factors K, t and p. Figures are based on 'dry' air. Errors will occur if moist air or other gases are used and velocity or volume flow derived.

14. Material Specification

The following materials interface with the air/gases introduced into the instrument.

Copper
Brass
Stainless Steel
Beryllium Copper
Ceramic
Nitrile Rubber
Silicone Rubber
Nickel
Solder
Cyanoacrylate adhesive
P.T.F.E

AIRFLOW

AIRFLOW DEVELOPMENTS LIMITED, Lancaster Road, High Wycombe, Buckinghamshire HP12 3QP, England.
Telephone: (01494) 525252/443821. Facsimile: (01494) 461073.

AIRFLOW LUFTTECHNIK GmbH., Postfach 1208, D53349, Rheinbach, Germany.
Telefon: 02226-9205-0. Telefax: 02226-9205-11.

AIRFLOW TECHNICAL PRODUCTS inc., 23 Railroad Avenue, Netcong, N.J. 07857 USA.
Telephone: 201-691-4825. Fax: 201-691-4703.

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