OAF OVAL ATTENUATOR FLOWPROBE

Ideal for installation in existing attenuators
Spring loaded to push into attenuator airway
Multiple differential pressure sensing points
Averaging impact pressure measurement
Averaging static pressure measurement
Ultra low repeatable velocity detection
Made to measure from 500 mm to 3000 mm
Length manufactured in 10 mm increments
The spring can be compressed by 16 mm
Easy retro-fit installation on site.
The Flowprobe is made of anodized aluminium
35 years in service worldwide

OAF Oval Attenuator Flowprobe

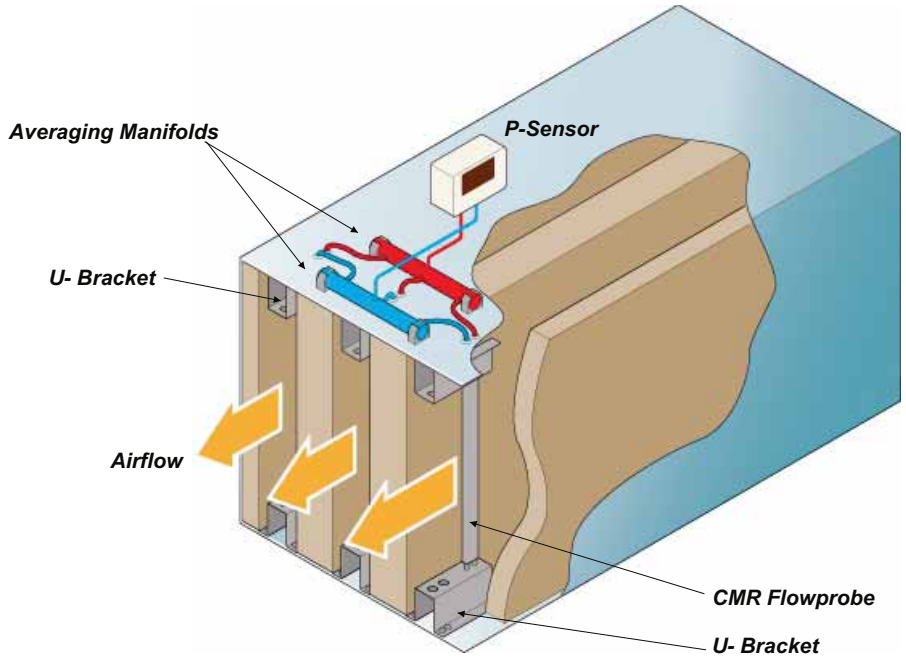
The OAF Oval Attenuator Flowprobes have been designed to fit into the passage way of an attenuator in ventilation ducts to measure air volume. They work in conjunction with the CMR P-Sensor as it provides a linear output signal in m^3/s, m^3/h, l/s or m/s. This means, the combination OAF Oval Flowprobes and P-Sensor provide an accurate and repeatable air volume measurement. The OAF Flowprobes are mounted in the attenuator by simply using the spring action of the bottom bracket pushing it into one end of the attenuator and securing the top and bottom bracket with two screws. OAF Flowprobes can be mounted in each attenuator slot to form a combined velocity pressure using the CMR averaging manifold to provide a very accurate air volume measurement.

The P-Sensor can be mounted anywhere in the plant room for easy maintenance. The red tube is used for the capture of the impact pressure and is connected to the OAF nipple which faces the oncoming airflow.

This produces a higher pressure. The blue tubing is connected to the nipple at the rear of the OAF Flowprobe which produces a lower pressure because the leaving air has a suction effect. Low velocities can be measured as the average measuring points produce a magnified pressure.

In order to convert the velocity pressure into an air volume i.e. m^3/s, m^3/h or l/s, the height of the free attenuator slot must be entered into the P-Sensor via the keyboard. The open slot widths must be added up to get the total width of the open slot area. This width must also be entered into P-Sensor which will calculate the total open area in m2. After having adjusted the magnification factor, the P-Sensor shall provide an accurate volume output signal for the BMS or Scada system. Take a Pitot travers reading and compare the actual volume with the displayed volume. Simply re-adjust the magnification factor on the P-Sensor to get the same results. The P-Sensor can also linearize the measurements.

OAF Oval Flowprobe fitted into the airways of a typical attenuator



CMR CONTROLS Ltd
Precision Air Pressure and Volume Sensors

22 Repton Court Repton Close
Basildon Essex SS13 1LN GB
web www.cmr-controls.com

Phone +44 (0) 1268 287222
Fax +44 (0) 1268 287099
mail sales@cmr-controls.com

OAF FLOW PROBE SPECIFICATIONS

Selection of OAF Flowprobes
It is essential to determine the air volume during the design stage. Normally there is a minimum and a maximum volume which has to be measured. The free duct area should be calculated so that the velocity is approximately 2.5 m/s at the minimum volume and preferably 5 m/s at the operating point if possible. If the velocity is more than 5 m/s at the maximum volume then the noise level criteria of the whole installation needs to be considered. The maximum velocity should not exceed 9 m/s as the duct resistance shall increase and the overall energy consumption shall go up. Use selection Table 1 on page 5.

Installation
The CMR OAF Flowprobes are made in increments of 10 mm length which means the correct length can be ordered to suit the height of the attenuator. It is very important that the height is chosen correctly so that it can slide into the air passage way by pressing down the springs which are fitted to the U-Chanel mounting bracket. The tolerance of movement is approx.16 mm which means if the attenuator is made with an internal height of 1000 mm then the OAF Flowprobe would be manufactured to 1000 mm. The spring movement can compensate 8 mm up and 8 mm down to cater for the tolerances of the attenuator internal height.

The drawing on the right shows the OAF fitted into the air ways of the attentuator. It is important to observe the air flow direction. If the access allows, the OAF should be fitted on the leaving side of the attenuator. Sometimes there is no access on the leaving side, so the OAF has to be pushed into the entry of the attenuator. The bracket is off-set so that the flowprobe is already further into the air way. To fasten the U-bracket it is sufficient to secure the bracket with two self-tapping screws where the drill can reach on the top and bottom.

The red and blue PVC tubing has to be fitted to the OAF flowprobes first. The tubes can come out of the attenuator via grommets or electrical glands to make it more airtight. Thereafter, the red tube is connected to a manifold which collects the impact pressure of the velocity and the blue tube is connected to a manifold which collects the static pressure. The impact pressure manifold shall be connected with a red PVC tube to the red nipple of the P-Sensor. The static pressure manifold shall be connected with blue tube to the blue nipple of the P-Sensor. The differential pressure is the velocity pressure which the P-Sensor converts into a linear volume signal in m³/s or m³/h.

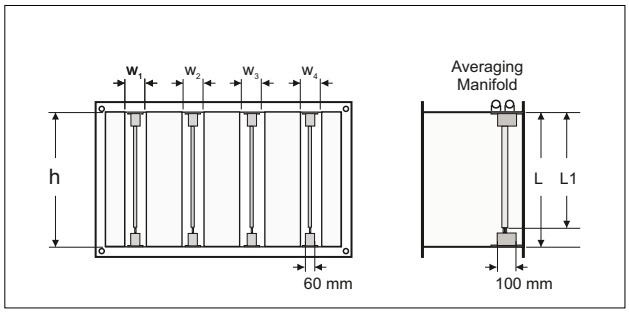
Attenuator free area calculation
To calculate the free area of the attenuator it is important to get the correct measurement of the w_1 w_2,w_3 and w_4. All w measurements must be added up and then multiplied by the h (height) to come to the area of m^2. The w and h must be entered into the P-Sensor via the keyboard as well as the magnification factor of approx 1.650. The P-Sensor should then indicate the volume in m³/s or m³/h or l/s. If this is incorrect then the magnification factor must be changed until the volume is similar to the commissioning engineer's measurements.

Accuracy
Using the OAF Flowprobe together with the P-Sensor and its linearisation function can achieve high accuracy and repeatability. As the attenuators and the site conditions vary it is not possible to state an accuracy but better than 3% have been achieved on many installations in the past.

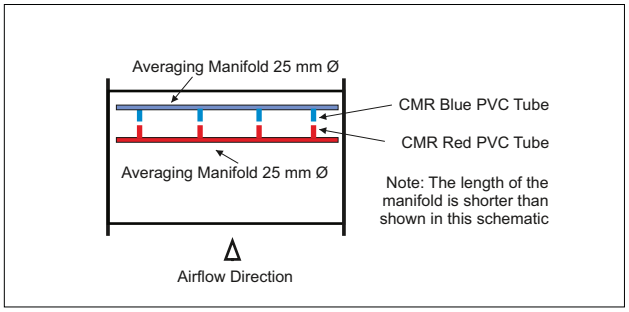
Maintenance
The OAF Flowprobe is maintenance free and when used with the P-Sensor there is no air flow going through the Flowprobes. Therefore no dust particles can enter the measuring holes as they are pressurised and any particles would be deflected from the Flowprobes.

Materials

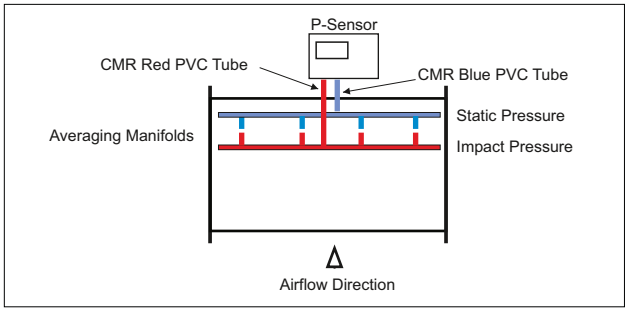
Oval Flowprobes	-	Anodized Aluminium 16x36
U-bracket	-	Stainless Steel 304
Tube nipples	-	Stainless Steel 304 M12/ 6.0mm Ø
Springs	-	Stainless Steel



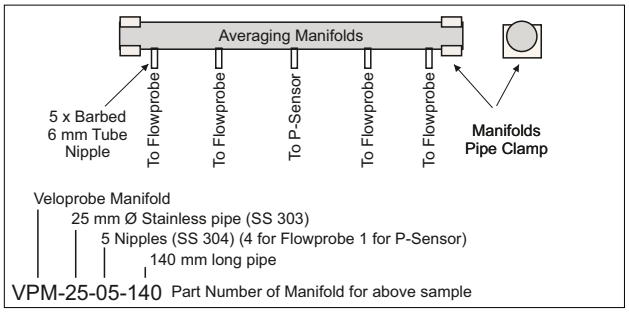
OAF Flowprobes built into an attenuator



OAF Flowprobes, manifold and tube connection



OAF Flowprobes connected to manifolds and P-Sensor



OAF Flowprobe manifold specifications

Specifications
Vertical duct height '**h**' from 500 up to 3000 mm in 10 mm steps

Spring movement 16 mm total

Recommended minimum air velocity is	2.5 m/s
Recommended operating air velocity is	5.0 m/s
Recommended maximum air velocity is	9.0 m/s

Humidity 10% to 90% non condensing.
Operating temperature (dry condition) -5 to 60°C
Air density factor must be considered

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OAF AND VPS VOLUME MEASUREMENT

GENERAL

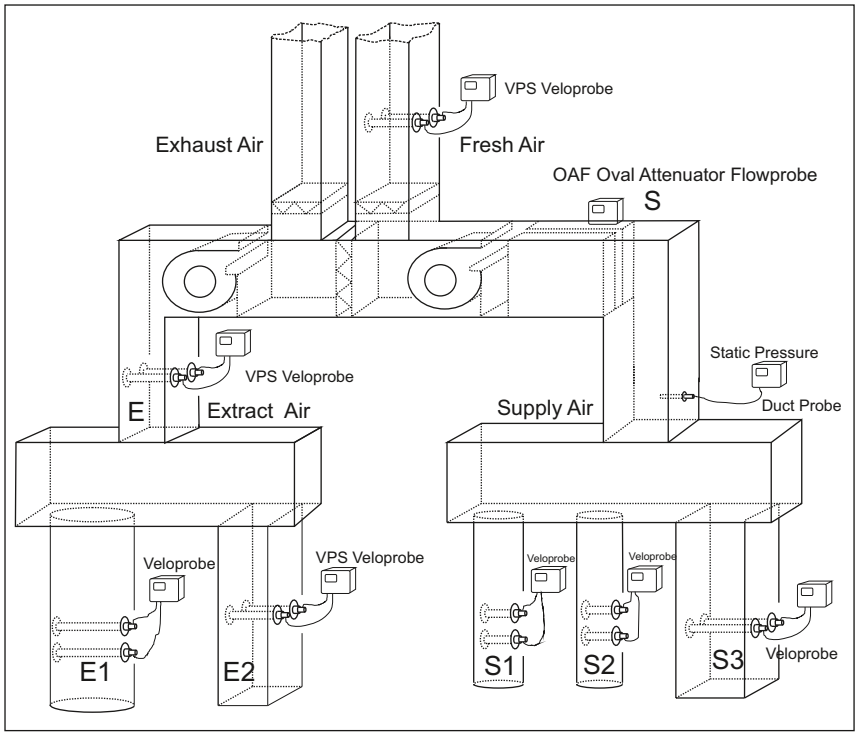
The drawing shows a typical application for OAF Oval Attenuator Flowprobes and the VPS Veloprobes. The supply air duct is fitted with OAF Oval Attenuator Flowprobe sets (S) and individual VPS Veloprobes on each of its branches (S1 to S3). The extract duct has a central VPS Veloprobe (E) and individual VPS Veloprobes on each of its branches (E1 to E2).

In many cases, the positions of the Veloprobes are very much dictated by the design of the building. The CMR Veloprobe can be fitted in almost any position in order to provide accurate measurements.

In a single supply and extract duct application, the OAF (S) measures the building's actual total supply and the VPS (E) the actual return volume. As both P-Sensors are calibrated to provide a linear air volume signal, tracking of supply and extract air is now made easy.

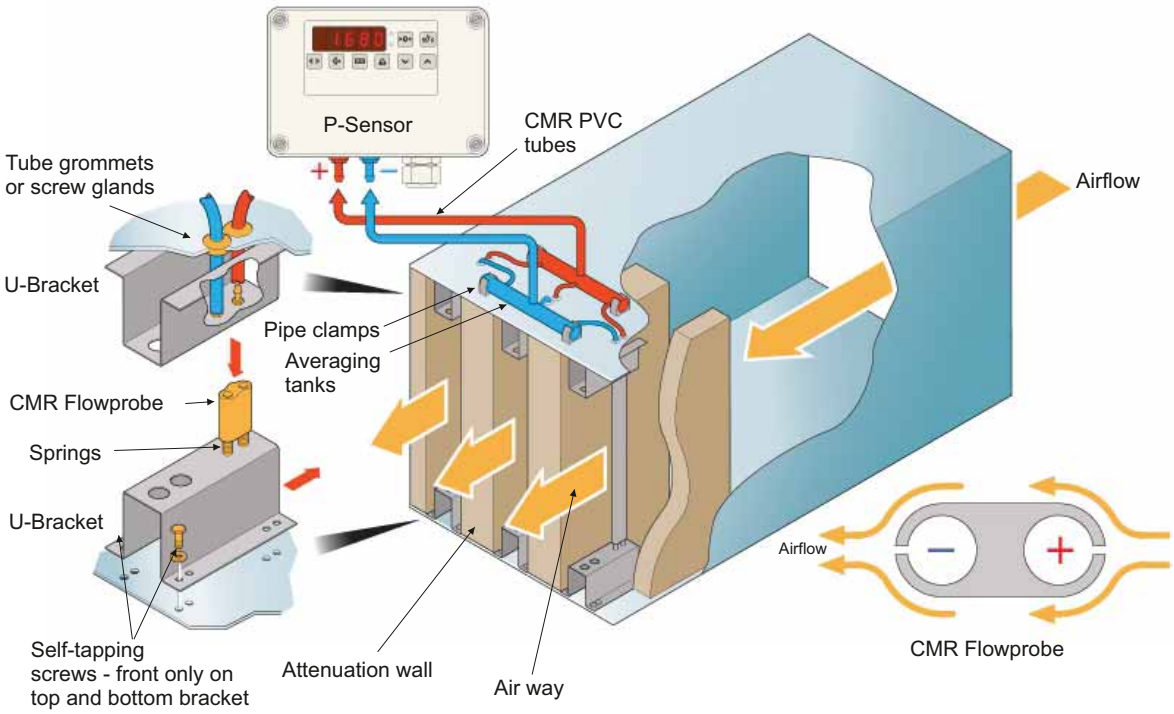
The duct height, width or diameter, density and magnification factor (mf) can be entered in the P-Sensor via the keyboard and only the range for 0-10 V or 4-20 mA must be given to the BMS at final commissioning.

For multiple duct applications, the total supply and extract air volume is derived by adding all air volumes from the individual ducts.



Example of Volume adding: S = E ± an offset for positive or negative building pressure
S1 + S2 + S3 = E1 + E2 ± offset or S = E1 + E2 ± offset - etc

OAF Oval Attenuator Flowprobe installation guidance



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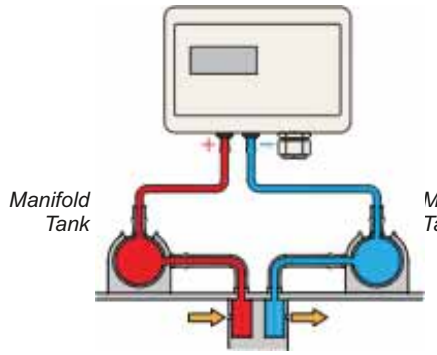
OAF FLOWPROBE VELOCITY PRESSURES



Oval Flowprobe in Attenuator Airway

Oval Flowprobe and P-Sensor tube connections

The velocity pressure is measured by the Flowprobe mounted in the attenuator. The total impact pressure is measured on the positive (+red) and the static pressure is measured on the negative (- blue) Flowprobe. The P-Sensor shall be connected to the corresponding (+) and (-) port using CMR PVC red and blue tube.

If the P-Sensor is ordered with the OAF Flowprobe then it is pre-adjusted at the factory - i.e. free attenuator width and height, density, OAF Flowprobe magnification factor (mf) and the range in l/s, m^3/s or m^3/h. It is ready for connection to the control system.

If the P-Sensor is ordered separately and is not factory adjusted then it is quite simple to adjust the parameters on site.

The P-Sensor has a keyboard and the free attenuator duct height and width must be entered. The magnification factor of the OAF Flowprobe, which is normally 1.650, must be entered. One Flowprobe is installed in every free air way of the attenuator.

If the volume indicated on the P-Sensor display is deviating from the actual measurements, then the magnification factor can be adjusted to suit the installation abnormalities via the P-Sensor keyboard.

Adjust the fan to a constant volume – start with 50% of the minimum and maximum operating volume and take a Pitot travers reading with an independent instrument. Once the average volume has been established and it is not the same as displayed on the P-Sensor, then adjust the magnification factor (mf) until the same display is achieved. For higher accuracy try this at 25%, 75% and 100% volume set point. The P-Sensor has parameters to linearize the measurements for more precise applications.

Useful OAF Flowprobe scaling formula:

$$\text{velocity m/s} = \sqrt{\frac{2 \times (\Delta P \text{ in Pa} / \text{mag factor})}{1.2 \quad \text{Density}}}$$

Example:
2 x (50 Pa on the OAF / 1.650 mf) = 60.6 / 1.2 =50.505
$\sqrt{}$ 50.505 = 7.1066 m/s
6.454 m/s x (duct height 'h' x duct width 'w') = ... m^3/s * 3600 = m^3/h

Conversion table - velocity in m/s at standard density to velocity pressure in Pa

m/s	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
0	0.00	0.01	0.02	0.05	0.10	0.15	0.22	0.29	0.38	0.49
1	0.60	0.73	0.86	1.01	1.18	1.35	1.54	1.73	1.94	2.17
2	2.40	2.65	2.90	3.17	3.46	3.75	4.06	4.37	4.70	5.05
3	5.40	5.77	6.14	6.53	6.94	7.35	7.78	8.21	8.66	9.13
4	9.60	10.09	10.58	11.09	11.62	12.15	12.70	13.25	13.82	14.41
5	15.00	15.61	16.22	16.85	17.50	18.15	18.82	19.49	20.18	20.89
6	21.60	22.33	23.06	23.81	24.58	25.35	26.14	26.93	27.74	28.57
7	29.40	30.25	31.10	31.97	32.86	33.75	34.66	35.57	36.50	37.45
8	38.40	39.37	40.34	41.33	42.34	43.35	44.38	45.41	46.46	47.53
9	48.60	49.69	50.78	51.89	53.02	54.15	55.30	56.45	57.62	58.81
10	60.00	61.21	62.43	63.65	64.90	66.15	67.42	68.69	69.98	71.29
11	72.60	73.93	75.26	76.61	77.98	79.35	80.74	82.13	83.54	84.97
12	86.40	87.85	89.30	90.77	92.26	93.75	95.26	96.77	98.30	99.85
13	101.40	102.97	104.54	106.23	107.74	109.35	110.98	112.61	114.26	115.93
14	117.60	119.29	120.98	122.69	124.42	126.15	127.90	129.65	131.42	133.21
15	135.00	136.81	138.62	140.45	142.30	144.15	146.02	147.89	149.78	151.69
16	153.60	155.53	157.46	157.46	159.41	161.38	163.35	165.34	167.33	169.34
17	173.40	175.45	177.50	179.57	181.66	183.75	185.86	187.97	190.10	192.25
18	194.40	196.57	198.74	200.93	203.14	205.35	207.58	209.81	212.06	214.33
19	216.60	218.89	221.18	223.49	225.82	228.15	230.50	232.85	235.22	237.61
20	240.00	242.41	244.82	247.25	249.70	252.15	254.62	257.09	259.58	262.09
21	264.60	267.13	269.66	272.21	274.78	277.35	279.94	282.53	285.14	287.77
22	290.40	293.05	295.70	298.37	301.06	303.75	306.46	309.17	311.90	314.65
23	317.40	320.17	322.94	325.73	328.54	331.35	334.18	337.01	339.86	342.73
24	345.60	348.49	351.38	354.29	357.22	360.15	363.10	366.05	369.02	372.01
25	375.00	378.01	381.02	384.05	387.10	390.15	393.22	396.29	399.38	402.49

To get the range of the P-Sensor use the keyboard and display the range. This is the sensor range in l/s, m^3/s or m^3/h at 10 V / 20 mA. Enter this range into your control system. No further calculations are necessary. If you want to use the table above, use the range of the transmitter in Pa and divide it by the magnification factor (mf) of the OAF. Look up the velocity above. i.e. 100 Pa / 1.650 (mf) = 60.6 Pa.
Look up above ~ 60.6 Pa and read on side and top ~ 10.05 m/s then multiply with the duct area in m^2 to get m^3/s and multiply by 3600 to get m^3/h.

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OAF FLOWPROBE ORDER SELECTION

HOW TO ORDER

Call sales at CMR and provide the attenuator dimension of each slot such as the slot height and slot width, the minimum and maximum air volume in l/s, m3/s or m3/h and how it is to be mounted in the attenuator.

You can however configure the part number yourself by using the table below. The selection table has been prepared to make ordering easy. Each column contains some options which can be selected to configure a part number.

Example Part Number configuration
The code after the [=] sign is used to form the number

OAF-	36-	0500
Flowprobe	Probe	Attenuator Slot
Part No.	Type	height in mm
		Probe Length 'L'
Base = OAF	Type = 36	L = 0500
	Aluminium	L = 0510
	Anodized	L = 0520
		L = 0530
		L = 0540
		L = 0550
		L = 0560
		L = 0570
		L = 0580
		L = 0590
		L = 0600
		L = 0610
		L = 0620
		L = 0630
		L = 0640
		L = 0650
		L = 0670
		L = 0680
		L = 0690
		L = 0700
		L= 0710 to 3000
		in 10mm steps

HOW TO ORDER

EXAMPLE
An attenuator mounted air flow probe is required
The Flowprobe is made of Anodized Aluminium
The attenuator slot height is 1425mm.

The part number for this OAF Flowprobe is OAF-36-1420

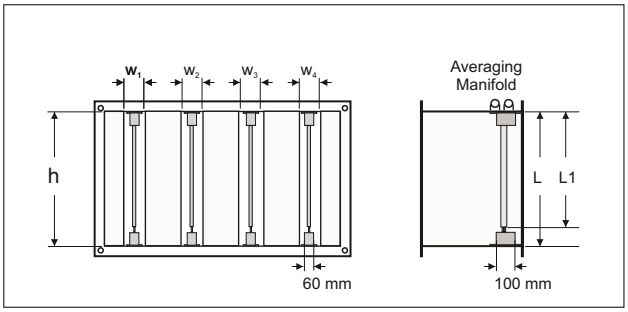
Now select an OAF Flowprobe for your installation

OAF -	x	-	xxxx

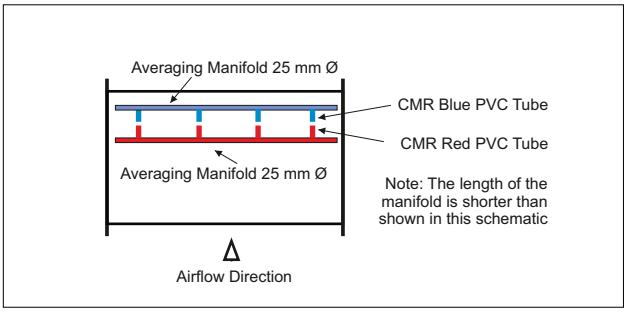
Call CMR for free assistance at any time.

The example part number OAF-36-0500 which is printed above the selection table can be used to try to configure a Part Number to be used in your new application.

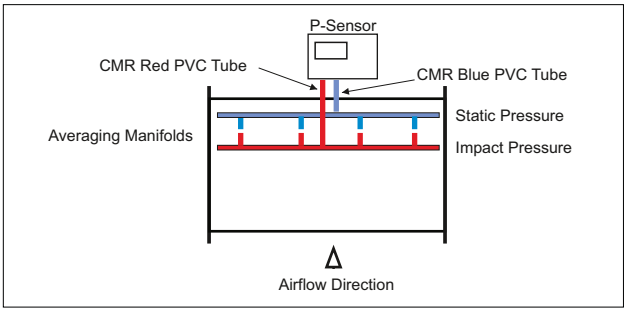
The sample shows it is an OAF Attenutor Flowprobe, having a base part number of 'OAF' - the Probe Type '36' - the internal Slot Dimension where the probes are to be mounted 'L' = 500 mm.



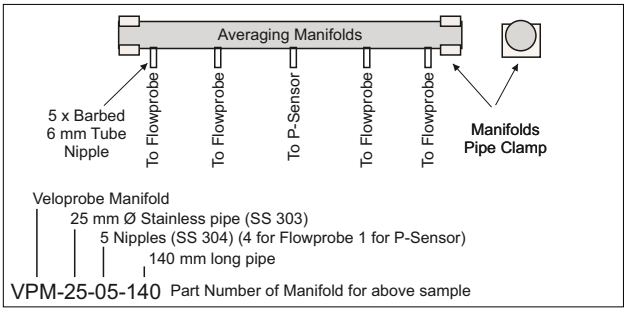
OAF Flowprobes built into an attenuator



OAF Flowprobes, manifold and tube connection



OAF Flowprobes connected to manifolds and P-Sensor



OAF Flowprobe manifold specifications

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