OAF OVAL ATTENUATOR FLOWPROBE

Ideal for installation in existing attenuators
Spring loaded to push into attenuator air way
Multiple differential pressure sensing points
Averaging impact pressure measurement
Averaging static pressure measurement
Ultra low repeatable velocity detection
Made to measure from 500mm to 2500mm
Length manufactured in 25mm increments
The spring can be compressed by 16mm
Easy retro-fit installation on site.
The Flowprobe is made of anodized aluminium
35 Years in Service worldwide

OAF Oval Attenuator Flowprobe

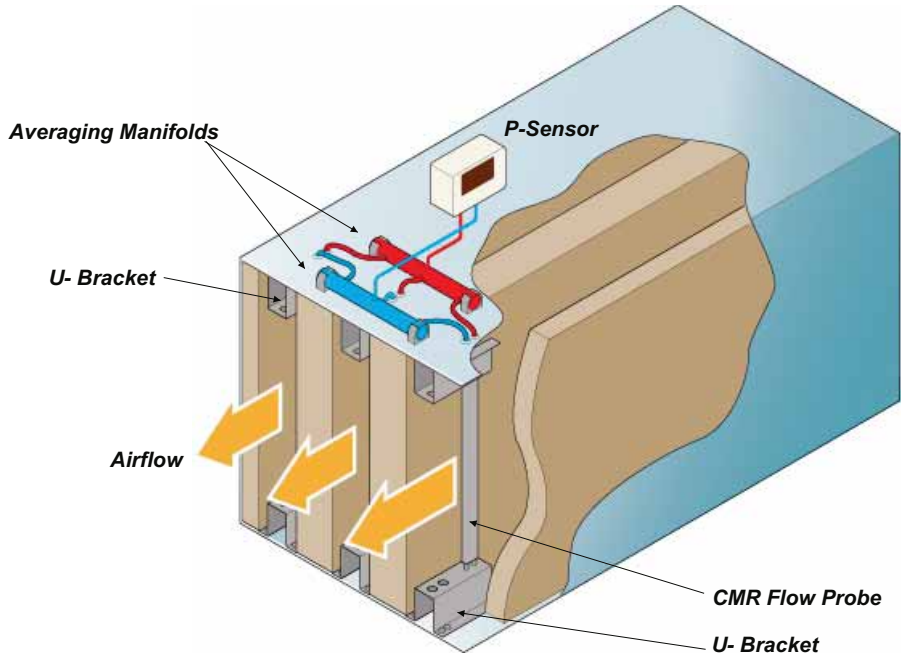
The OAF Oval Attenuator Flowprobes have been designed to fit into the passage way of an attenuator in ventilation ducts to measure air volume. They work in conjunction with the CMR P-SENSOR as it provides a linear output signal in m^3/s, m^3/h, l/s or m/s. This means, the combination OAF Oval Flowprobes and P-Sensor provide an accurate and repeatable air volume measurement.The OAF Probes are mounted in the attenuator by simply using the spring action of the bottom bracket and pushing it into one end of the attenuator and securing the top and bottom bracket with two screws. OAF Probes 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 Probe 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. m3/s, m3/h or l/s the height of the free attenuator slot must be entered into the P-Sensor via the keyboard and the open slot width must be added together to achieve a 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 and simply re-adjust 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 air ways of a typical attenuator



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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 2.5m/s at the minimum volume and preferably 5m/s at the operating point if possible. If the velocity is more than 5m/s at the maximum volume then the noise level criteria needs to be considered of the whole installation. The maximum velocity should not exceed 9m/s as the duct resistance shall increase and the overall energy consumption shall go up. Use selection Table 1 on page 6.

Installation
The CMR OAF Probes are made in increments of 25 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 16mm which means if the attenuator is made with an internal height of 1000mm then the OAF Flow Probe would be manufactured to 1000mm but the spring movement can compensate 8 mm up and 8mm 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 selftapping screws where the drill can reach on the top and bottom.

The red and blue PVC tubing has to be fitted to the OAF probes first and the tubes can come out of the attnuator via grommets or electrical glands to make it more air tight. Thereafter the red tube is connected to a manifold which collects the impact pressure of the velocity and the blue tube is conneted 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.

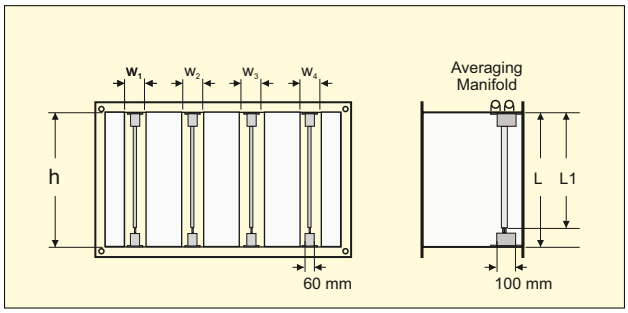
Attenuator free area calculation
To calculate the free area of the attenuator it is important to get the correct measurement of the w_1 w_2,w_3 and w_4. All w measurements must be added together and then multplied by the h (height) to come to the area of m^2. The w and h must be entered into the P-Sensor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

Accuracy
The OAF Flow Probe together with the P-Sensor and utlising the linearisation function can achieve a 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..

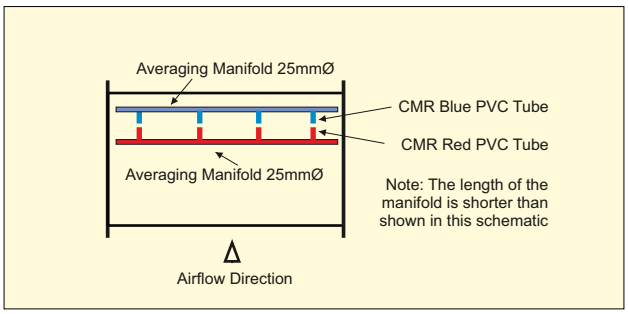
Maintenance
The OAF Flowprobe is maintenance free and when used with the P-SENSOR there is no air flow going through the Flowprobes and therefore no dust particles can enter the measuring holes as they are pressurised and any particles would be deflected from the Flowprobes.

Materials

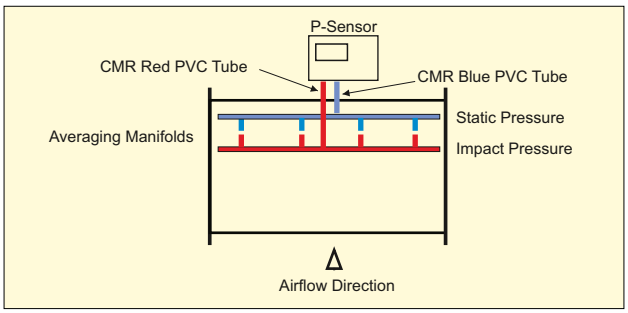
Oval Flowprobes	- Anodized Aluminium 16x36
U-Bracket	- Stainless Steel 304
Tube Nipples	- Stainless Steel 304 M12/ 6.0mm Ø
Springs	- Stainless Steel



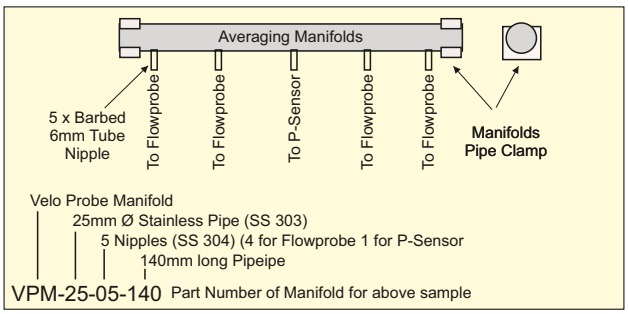
OAF Flow Probes built into an attenuator



OAF Flow Probes Manifold and Tube connection



OAF Flow Probes connected to Manifolds and P-Sensor



OAF Flowprobe Manifold Specifications

Specifications
Vertical Duct height '**h**' from 500 up to 2000mm in 25mm steps

Spring Movement 16mm 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

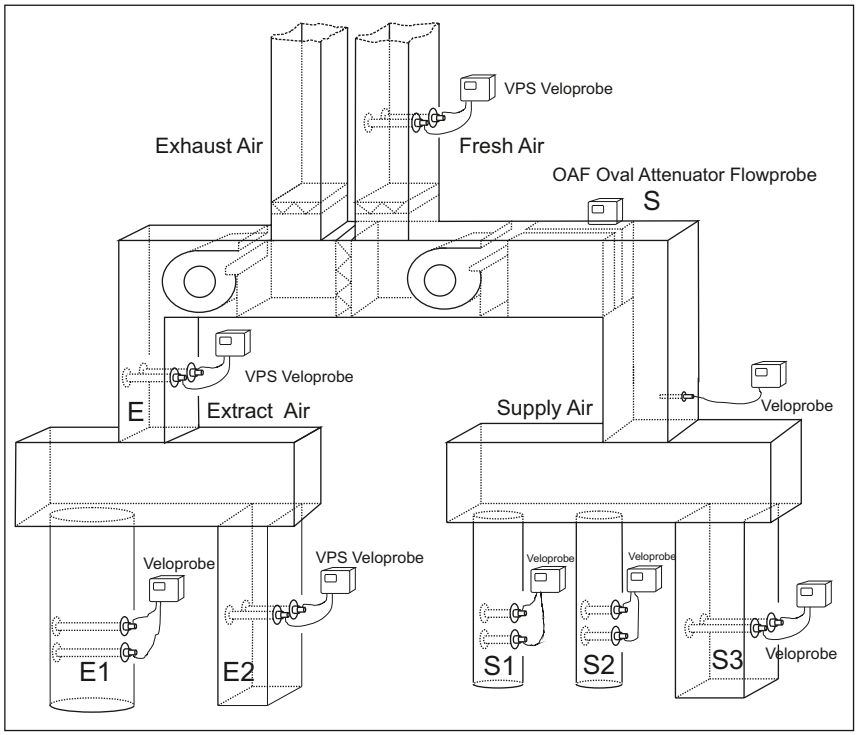
The drawing shows a typical application for OAF Oval Attenuator Flowprobes and the VPS Veloprobes .The supply air duct is fitted with OAF Oval Attenuator Flowprobe sets (S) and individual VPS Veloprobes on each of its branches. (S1 to S3) The extract duct has s central VPS Veloprobe (E) and and individual 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 return volume (E). As both P-Sensors are calibrated to provide a linear air volumel, tracking of supply and extract air is now made easy.

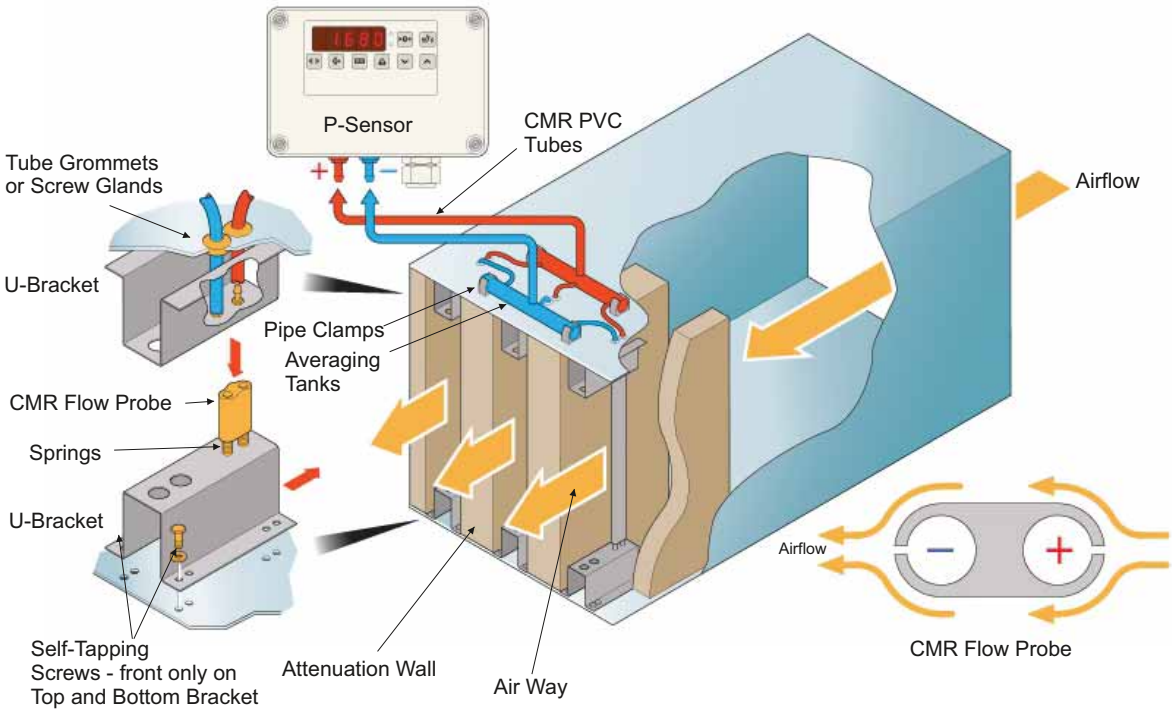
The duct height, width or diameter, density and magnification(mf) can be entered in the P-Sensor via the keyboard and only the range for 0..10V or 4..20mA must be given to the BMS at final commissioning.

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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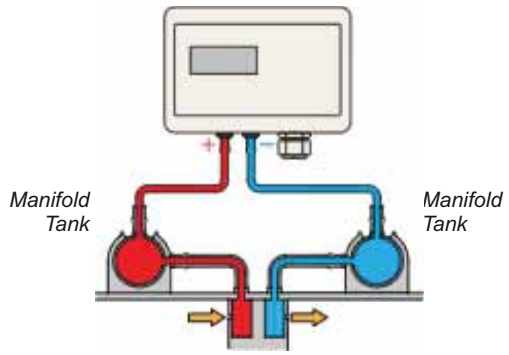
OAF FLOWPROBE VELOCITY PRESSURES



Ovalprobe in Attenuator Airway

Oval Flowprobe and P-Sensor tube connections

The velocity pressure is measured by the Flowprobes 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 and OAF Flowprobe Magnification Factor (mf) and the range is in l/s, m^3/s, m^3/h. It is ready for connection to the control system.

If the P-Sensor was ordered separately and it was 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 must be entered which is normally 1.650, it 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 (50Pa 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 10V / 20mA. 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 (mf) of the OAF. Look up the velocity above. i.e. 100Pa / 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 OVAL FLOWPROBE SELECTION

Part Number	Description	Overall Length with Bracket L mm	Probe Length L1 mm	Probe Depth D mm	Probe Width W mm	Bracket Depth mm	Bracket Width mm	Weight kg Packed in Carton kg	Carton Size 65 x 105 x L4 L4 mm
OAF-36-0500	Oval Attenuator Flowprobe 0500 mm	500	375	36	16	100	60	0.70	580
OAF-36-0525	Oval Attenuator Flowprobe 0525 mm	525	400	36	16	100	60	0.73	605
OAF-36-0550	Oval Attenuator Flowprobe 0550 mm	550	425	36	16	100	60	0.75	630
OAF-36-0575	Oval Attenuator Flowprobe 0575 mm	575	450	36	16	100	60	0.78	655
OAF-36-0600	Oval Attenuator Flowprobe 0600 mm	600	475	36	16	100	60	0.80	680
OAF-36-0625	Oval Attenuator Flowprobe 0625 mm	625	500	36	16	100	60	0.83	705
OAF-36-0650	Oval Attenuator Flowprobe 0650 mm	650	525	36	16	100	60	0.85	730
OAF-36-0675	Oval Attenuator Flowprobe 0675 mm	675	550	36	16	100	60	0.88	755
OAF-36-0700	Oval Attenuator Flowprobe 0700 mm	700	575	36	16	100	60	0.90	780
OAF-36-0725	Oval Attenuator Flowprobe 0725 mm	725	600	36	16	100	60	0.93	805
OAF-36-0750	Oval Attenuator Flowprobe 0750 mm	750	625	36	16	100	60	0.95	830
OAF-36-0775	Oval Attenuator Flowprobe 0775 mm	775	650	36	16	100	60	0.98	855
OAF-36-0800	Oval Attenuator Flowprobe 0800 mm	800	675	36	16	100	60	1.00	880
OAF-36-0825	Oval Attenuator Flowprobe 0800 mm	825	700	36	16	100	60	1.03	905
OAF-36-0850	Oval Attenuator Flowprobe 0850 mm	850	725	36	16	100	60	1.05	930
OAF-36-0875	Oval Attenuator Flowprobe 0875 mm	875	750	36	16	100	60	1.08	955
OAF-36-0900	Oval Attenuator Flowprobe 0900 mm	900	775	36	16	100	60	1.10	980
OAF-36-0925	Oval Attenuator Flowprobe 0925 mm	925	800	36	16	100	60	1.13	1005
OAF-36-0950	Oval Attenuator Flowprobe 0950 mm	950	825	36	16	100	60	1.15	1030
OAF-36-0975	Oval Attenuator Flowprobe 0975 mm	975	850	36	16	100	60	1.18	1055
OAF-36-1000	Oval Attenuator Flowprobe 1000 mm	1000	875	36	16	100	60	1.20	1080
OAF-36-1025	Oval Attenuator Flowprobe 1025 mm	1025	900	36	16	100	60	1.23	1105
OAF-36-1050	Oval Attenuator Flowprobe 1050 mm	1050	925	36	16	100	60	1.25	1130
OAF-36-1075	Oval Attenuator Flowprobe 1075 mm	1075	950	36	16	100	60	1.28	1155
OAF-36-1100	Oval Attenuator Flowprobe 1100 mm	1100	975	36	16	100	60	1.30	1180
OAF-36-1125	Oval Attenuator Flowprobe 1125 mm	1125	1000	36	16	100	60	1.33	1205
OAF-36-1150	Oval Attenuator Flowprobe 1150 mm	1150	1025	36	16	100	60	1.35	1230
OAF-36-1175	Oval Attenuator Flowprobe 1175 mm	1175	1050	36	16	100	60	1.38	1255
OAF-36-1200	Oval Attenuator Flowprobe 1200 mm	1200	1075	36	16	100	60	1.40	1280
OAF-36-1225	Oval Attenuator Flowprobe 1225 mm	1225	1100	36	16	100	60	1.43	1305
OAF-36-1250	Oval Attenuator Flowprobe 1200 mm	1200	1075	36	16	100	60	1.40	1280
OAF-36-1275	Oval Attenuator Flowprobe 1275 mm	1275	1150	36	16	100	60	1.48	1355
OAF-36-1300	Oval Attenuator Flowprobe 1300 mm	1300	1175	36	16	100	60	1.50	1380
OAF-36-1325	Oval Attenuator Flowprobe 1325 mm	1325	1200	36	16	100	60	1.53	1405
OAF-36-1350	Oval Attenuator Flowprobe 1350 mm	1350	1225	36	16	100	60	1.55	1430
OAF-36-1375	Oval Attenuator Flowprobe 1375 mm	1375	1250	36	16	100	60	1.58	1455
OAF-36-1400	Oval Attenuator Flowprobe 1400 mm	1400	1275	36	16	100	60	1.60	1480
OAF-36-1425	Oval Attenuator Flowprobe 1425 mm	1425	1300	36	16	100	60	1.63	1505
OAF-36-1450	Oval Attenuator Flowprobe 1450 mm	1450	1325	36	16	100	60	1.65	1530
OAF-36-1475	Oval Attenuator Flowprobe 1475 mm	1475	1350	36	16	100	60	1.68	1555
OAF-36-1500	Oval Attenuator Flowprobe 1500 mm	1500	1375	36	16	100	60	1.70	1580
OAF-36-1525	Oval Attenuator Flowprobe 1525 mm	1525	1400	36	16	100	60	1.73	1605
OAF-36-1550	Oval Attenuator Flowprobe 1550 mm	1550	1425	36	16	100	60	1.75	1630
OAF-36-1575	Oval Attenuator Flowprobe 1575 mm	1575	1450	36	16	100	60	1.78	1655
OAF-36-1600	Oval Attenuator Flowprobe 1600 mm	1600	1475	36	16	100	60	1.80	1680
OAF-36-1625	Oval Attenuator Flowprobe 1625 mm	1625	1500	36	16	100	60	1.83	1705
OAF-36-1650	Oval Attenuator Flowprobe 1650 mm	1650	1525	36	16	100	60	1.85	1730
OAF-36-1675	Oval Attenuator Flowprobe 1675 mm	1675	1550	36	16	100	60	1.88	1755
OAF-36-1700	Oval Attenuator Flowprobe 1700 mm	1700	1575	36	16	100	60	1.90	1780
OAF-36-1725	Oval Attenuator Flowprobe 1725 mm	1725	1600	36	16	100	60	1.93	1805
OAF-36-1750	Oval Attenuator Flowprobe 1750 mm	1750	1625	36	16	100	60	1.95	1830
OAF-36-1775	Oval Attenuator Flowprobe 1775 mm	1775	1650	36	16	100	60	1.98	1855
OAF-36-1800	Oval Attenuator Flowprobe 1800 mm	1800	1675	36	16	100	60	2.00	1880
OAF-36-1825	Oval Attenuator Flowprobe 1825 mm	1825	1700	36	16	100	60	2.03	1905
OAF-36-1850	Oval Attenuator Flowprobe 1850 mm	1850	1725	36	16	100	60	2.05	1930
OAF-36-1875	Oval Attenuator Flowprobe 1875 mm	1875	1750	36	16	100	60	2.08	1955
OAF-36-1900	Oval Attenuator Flowprobe 1900 mm	1900	1775	36	16	100	60	2.10	1980
OAF-36-1925	Oval Attenuator Flowprobe 1925 mm	1925	1800	36	16	100	60	2.13	2005
OAF-36-1950	Oval Attenuator Flowprobe 1950 mm	1950	1825	36	16	100	60	2.15	2030
OAF-36-1975	Oval Attenuator Flowprobe 1975 mm	1975	1850	36	16	100	60	2.18	2055
OAF-36-2000	Oval Attenuator Flowprobe 2000 mm	2000	1875	36	16	100	60	2.20	2080

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OAF MANIFOLD SELECTION

Part Number	Description	Manifold Length L	Manifold Diameter	Nipples Fitted	Weight kg Packed in Carton	Carton Size 65 x 105 x L4
		mm	mm	Qty	kg	mm
VPM-25-03-100	VELOCITY PROBE MANIFOLD	100	25	3	0.30	180
VPM-25-04-125	VELOCITY PROBE MANIFOLD	125	25	4	0.33	205
VPM-25-05-150	VELOCITY PROBE MANIFOLD	150	25	5	0.35	230
VPM-25-06-175	VELOCITY PROBE MANIFOLD	175	25	6	0.38	255
VPM-25-07-200	VELOCITY PROBE MANIFOLD	200	25	7	0.40	280
VPM-25-08-225	VELOCITY PROBE MANIFOLD	225	25	8	0.43	305
VPM-25-09-250	VELOCITY PROBE MANIFOLD	250	25	9	0.45	330
VPM-25-10-275	VELOCITY PROBE MANIFOLD	275	25	10	0.48	355
VPM-25-11-300	VELOCITY PROBE MANIFOLD	300	25	11	0.50	380
VPM-25-12-325	VELOCITY PROBE MANIFOLD	325	25	12	0.53	405
VPM-25-13-350	VELOCITY PROBE MANIFOLD	350	25	13	0.55	430
VPM-25-14-375	VELOCITY PROBE MANIFOLD	375	25	14	0.58	455
VPM-25-15-400	VELOCITY PROBE MANIFOLD	400	25	15	0.60	480
VPM-08-M16	PVC 8mm TUBE GLAND M16	850	36	16	1.05	930

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