FGG FLOWGRID AIR VOLUME SENSOR

Accurate average air volume measurement
Multiple differential pressure sensing points
Average static and impact pressure
Suitable for bi-directional volume measurement
Very low air velocity detection
Frame made of galvanised sheet metal
Standard mounting flange 20 and 30 mm
Height manufactured in 100 mm increments
Width manufactured in 50 mm increments
Works with all CMR transmitters and controllers
CMR standard 24 month warranty
40 years field application experience

CMR FGG FLOWGRID

The FGG Flowgrid has been designed to measure air volume in ventilation ducts. The Flowgrid consists of a galvanised duct section with a length of 200 mm and is available with a 20 or 30 mm flange duct connection to suit standard galvanised duct work. A 300 mm length is used if a sensor or controller has to be mounted on it.

The CMR Ovalprobes made of anodized aluminium are fitted across the internal duct frame area in predefined spacing. Each Ovalprobe has a number of pressure inlet points to measure the impact and static pressure at the same time. Both static and impact pressure ports of the Ovalprobes have independent pressure manifolds which provides a smooth averaged pressure signal of the whole measured area.

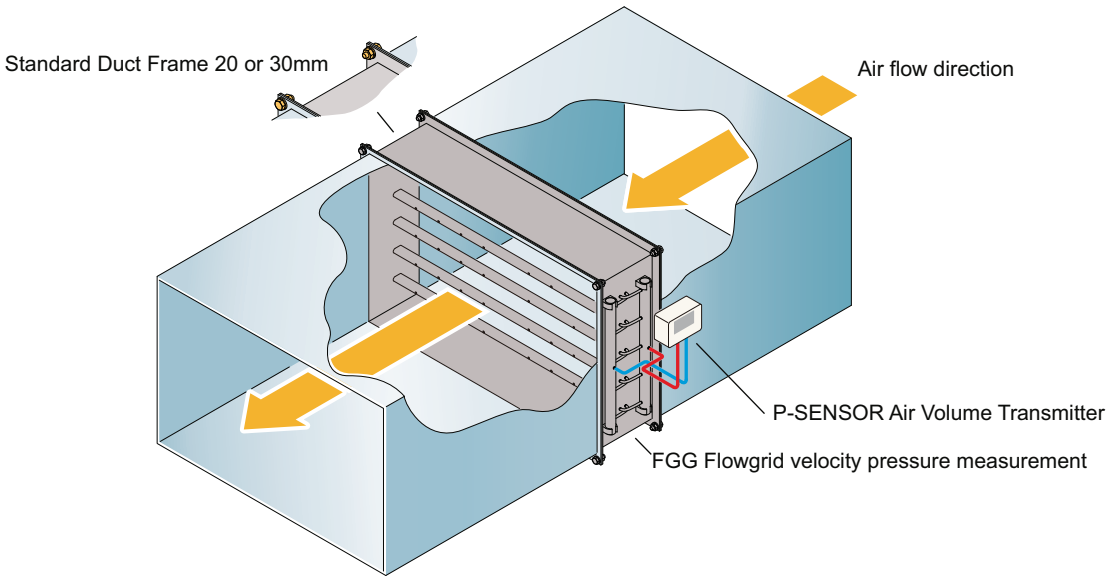
The differential pressure of both impact and static pressure is the velocity pressure which is converted by the P-Sensor to provide a total air volume measurement.

A great advantage of the FGG Flowgrid is, that it can measure bi-directional airflow as it is manufactured equally on both sides. This means, the air flow is measured in one direction and should there be a reverse flow, this can be detected and measured when using the CMR P-Sensor. The installation direction is therefore not important. The FGG Flowgrids are manufactured in standard height increments of 100 mm going up to a maximum height of 1200 mm.

The width of the Flowgrid is manufactured in increments of 50 mm up to 1200 mm. The Ovalprobes are fitted across the width and are equally spaced over the height. If the duct height is 1000 mm then there will be 10 Ovalprobes fitted into this Flowgrid section.

Special dimensions can be manufactured to order.

FGG FLOWGRID and P-SENSOR providing accurate average air volume measurement in a ducts.



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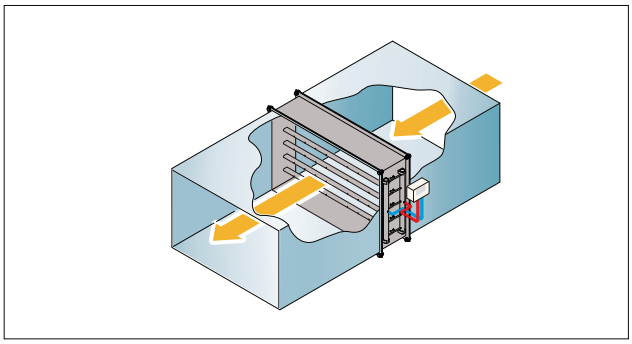
FGG FLOWGRID INSTALLATION

The FGG Flowgrid ist best installed in a straight duct with a length before and after the Flowgrid. A length on the air entering the Flowgrid is more important than the air exit path.

If the air is very turbulent the CMR P-Sensor can be adjusted to provide a smoothed output signal which is a mean air volume measurement. It does not need any duct flow straighteners.

The FGG Flowgrid can be installed vertically or horizontally but care must be taken that the tube connections are either on the side or at the top. Never at the bottom, as condensation might enter the measurement tubes.



FGG FLOWGRID in a straight duct section

The FGG Flowgrid can be installed after an elbow as shown on the right. Best is to have room for a straight duct with a length before and after the Flowgrid. A length on the air entering the Flowgrid is more important than the air exit path.

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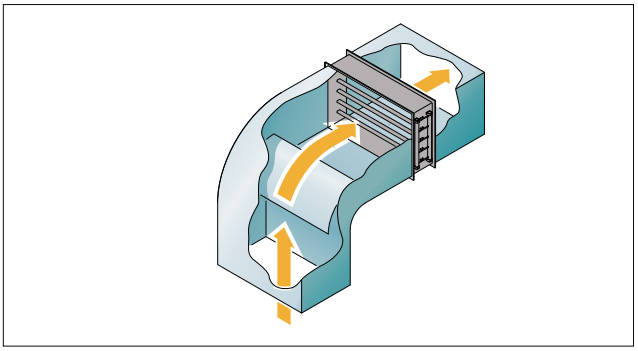
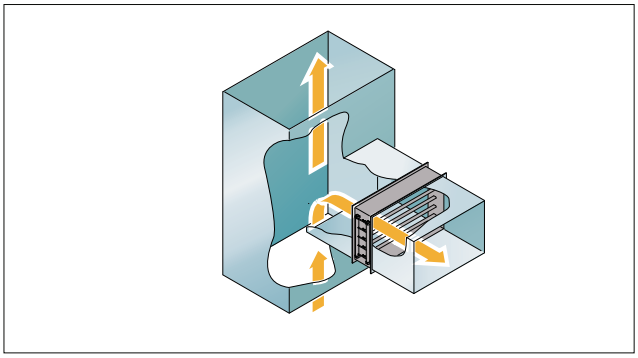


FGG FLOWGRID after an elbow duct section

The FGG Flowgrid can be installed after a T-Section shown on the the right. Best is to have room for a straight duct with a length before the Flowgrid and a length after the Flowgrid. A length on the air entering the Flowgrid is more important than the air exit path.

If the air is very turbulent the CMR P-Sensor can be adjusted to provide a smoothed output signal which is a mean air volume measurement. It does not need any duct flow straighteners.

The FGG Flowgrid can be installed vertically or horizontally but care must be taken that the tube connections are either on the side or at the top. Never at the bottom, as condensation might enter the measurement tubes.

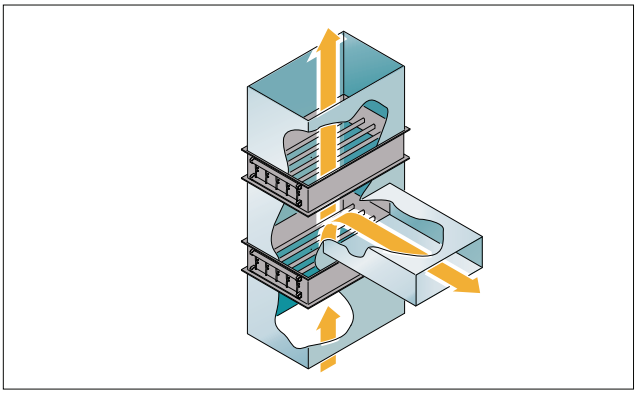


FGG FLOWGRID after a T- duct section

If the duct on the right cannot be fitted with a Flowgrid then the bottom Flowgrid measures the total volume and the top Flowgrid measures what is left over. The difference is the volume which passes through the duct on the right. Both Flowgrids need room for a straight duct with a length before and after. A length on the air entering the Flowgrid is more important than the air exit path.

If the air is very turbulent the CMR P-Sensor can be adjusted to provide a smoothed output signal which is a mean air volume measurement. It does not need any duct flow straighteners.

The FGG Flowgrid can be installed vertically or horizontally but care must be taken that the tube connections are either on the side or at the top. Never at the bottom, as condensation might enter the measurement tubes.



FGG FLOWGRID before and after a T- duct section

Send a drawing to CMR to provide a selection and full dimensional specification of the FGG- Flowgrid.

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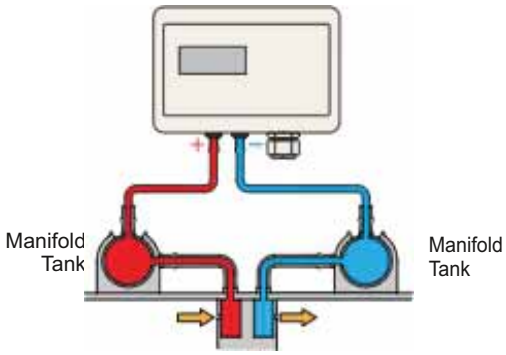
FGG FLOWGRID VELOCITY PRESSURES



FGG Flowgrid and P-Sensor tube connections

The velocity pressure is measured by the Ovalprobe built into the FGG Flowgrid and the total impact pressure is measured on the positive (+red) and the static pressure is measured on the negative (- blue) manifold tanks The P-Sensor shall be connected to the corresponding tanks using CMR PVC red and blue tube.

When the P-Sensor is ordered with the FGG Flowgrid then it is pre-adjusted at the factory - i.e. duct width and height, density and FGG Flowgrid Magnification Factor (mf) and the range is in m^3/s or m^3/h.
It is ready for connection to the control or monitoring 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 internal duct height and width must be entered. The magnification factor of the FGG Flowgrid must be entered which is normally 1.650, if it is installed in a straight duct. 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 a CAL150 or a commissioning air volume measurement 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 also parameters to linearize the measurements for more critical applications.

Useful FGG Flowgrid 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 (100Pa across FGG / 1.65 mf) = 121.21 / 1.2 = 101.01
$\sqrt{101.01}$ = 10.05 m/s
10.05 m/s x (duct height 'h' x duct width 'w' in m) = ... 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 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 FGG. Look up the velocity above. i.e. 100 Pa / 1.65 = 60.60 Pa.
Look up above ~ 60 Pa and read on side and top ~ 10 m/s then multiply with duct area in m^2 to get m^3/s and multiply 3600 to get m^3/h.

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FGG FLOWGRID SPECIFICATIONS

Selection of Flowgrids

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 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.

The maximum velocity should not exceed 9m/s as the duct resistance shall increase and the overall energy consumption shall go up. Use selection page for L=200mm or L=300mm and either 20mm or 30mm flanges.

The FGG Flowgrid has the advantage that it reduces the area internally which increases the velocity pressure momentarily but will have a regain of pressure after passing over the Ovalprobes, which means that the minimum velocity could go down to 1m/s and still providing a reasonable velocity pressure measurement.
Should there be a lot of turbulence i.e. after a fan outlet then the P-Sensor can be adjusted to average out the turbulence and provide a smooth measurement.

Installation

The FGG Flowgrid can be installed horizontally or vertically, but the connection nipples should be on the side or on top. The Flowgrid works best if it has a reasonable length of duct so that the air flow is laminar when approaching the FGG Flowgrid. If a reasonable length is not available then the magnification factor (mf) can be adjusted on the P-SENSOR and it can be linearized over 10 points for unusual measuring positions. This is easily achieved by measuring the air volume at a different location of the duct and adjusting the P-SENSOR via the keyboard accordingly.

Accuracy

The FGG Flowgrid can achieve an accuracy between minimum and maximum design volume of 1% if it is used with a P-SENSOR and the linearisation function .

Maintenance

The FGG Flowgrid is maintenance free.When used in conjunction with the P-SENSOR there is no air flow going through the Ovalprobe and therefore no dust particles can enter the measuring holes as any particles would be deflected from the Ovalprobes.

Materials

Frame	-	Galvanized Sheet Metal
Ovalprobes	-	Natural Anodized Aluminium
Manifold Tank	-	Stainless Steel (304)
Tube Nipples	-	Brass - bright Nickel coated
Mounting Bolts	-	Stainless Steel (316)

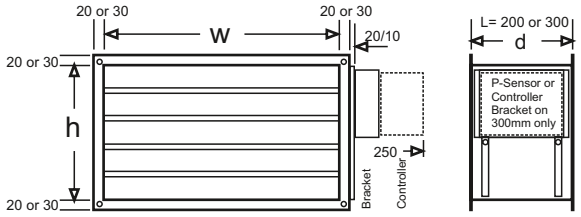
Duct height **'h'** from 100 mm up to 1200 mm in 100 mm steps
Duct width **'w'** from 100 mm up to 1200 mm in 50 mm steps
Duct Length L= 200 mm or 300 mm - other sizes on request
Standard Duct Frame 20 or 30 mm
Sensor/Controller Mounting Bracket on 300 mm duct length only

Specifications

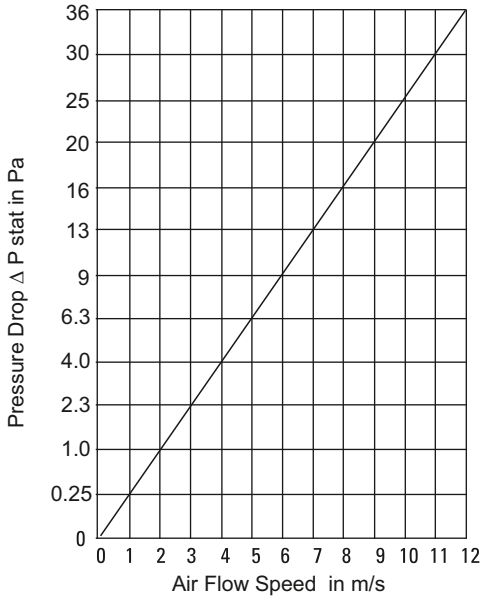
Recommended minimum air velocity is	2.5 m/s
Recommended operating air velocity is	5.0 m/s
Maximum recommended air velocity is	9.0 m/s

Minimum air flow speed is 1 m/s in Laminar Air Pattern using the Ultra Low P-SENSOR transmitter.
Humidity 10% to 90% non condensing.
Operating Temperature (dry condition) -5 to 60°C
Air density factor must be corrected
Free Open Area 84%

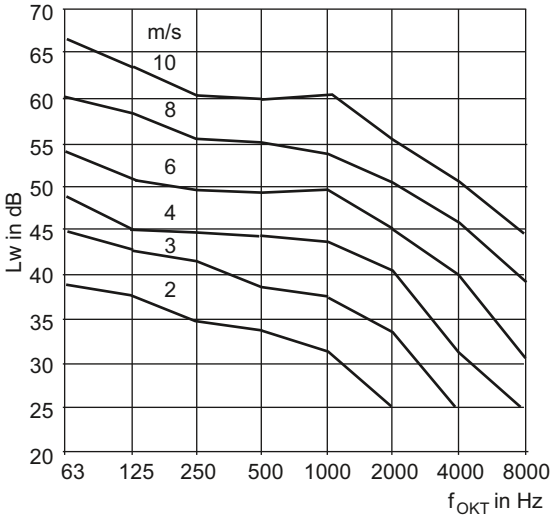
FGG Flowgrid Dimensions



Pressure Drop



Sound Performance Level



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FGG FLOWGRID ORDER SELECTION

HOW TO ORDER

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

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 a number of different options which can be selected to configure a part number using the duct dimensions.

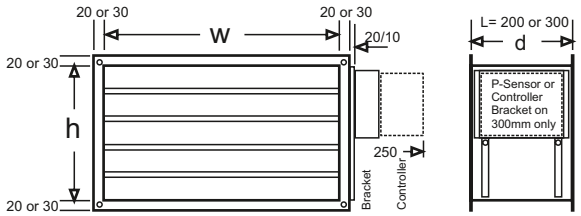
The example part number FGG-0300-0800-300-30 which is printed above the selection table can be used to try to configure a Part Number to be used in your new application.

The sample shows it is a Flowgrid, having a base part Number of FGG - the height 'h' is 300m, the width 'w' is 800mm, the Flowgrid length 'L' is 300mm and the Duct Flange is 30mm,

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

FGG-	0300-	0800-	300-	30
Flowgrid	Height	Width	Length	Flange
Part No.	'h' mm	'w' mm	'L' mm	Size mm
Base = FGG	h = 0100	w = 0100	L = 200	Flange = 20
	h = 0200	w = 0150	L = 300	Flange = 30
	h = 0300	w = 0200		
	h = 0400	w = 0250		
	h = 0500	w = 0300		20 can be
	h = 0600	w = 0350		used up to
	h = 0700	w = 0400		800 x800mm
	h = 0800	w = 0450		30 can be
	h = 0900	w = 0500		used for any
	h = 1000	w = 0550		duct size
	h = 1100	w = 0600		
	h = 1200	w = 0650		
		w = 0700		
		w = 0750		
		w = 0800		
		w = 0850		
		w = 0900		
		w = 0950		
		w = 1000		
		w = 1050		
		w = 1100		
		w = 1150		
		w = 1200		

FGG Flowgrid Dimensions



HOW TO ORDER

EXAMPLE
An Aluminium/Galvanised Flowgrid to measure airvolume is required
The duct height must be 600 mm
The duct width must be 900 mm
The duct is long enough to fit a Flowgrid with a length of 200mm.
The Flowgrid can be mounted onto the duct with a 30mm Mezz Flange..

The part number for this CMR Flowrid is FGG-0600-0900-200-30

Now try to select your FGG Flowgrid for your installation

Call CMR for free assistance at any time.

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