

# VGS VELOGRID

# AIR VOLUME SENSOR

- Accurate average air volume measurement
- Multiple differential pressure sensing points
- Average static and impact pressure
- Suitable for bi-directional volume measurement
- Ultra Low velocity detection
- Frame made of Stainless Steel metal
- Standard mounting flange 30mm
- Height manufactured in 100mm increments
- Width manufactured in 50mm increments
- Works with all CMR Transmitters and controllers
- CMR standard 24 month warranty
- 30 Years field application experience



VGS VELOGRID

The VGS Velogrid has been designed to measure air volume in ventilation ducts. The Flowgrid consists of a stainless steel duct section with a length of 300mm and is available with a 30mm flange duct connection to suit standard stainless steel duct work.

The CMR Veloprobes made of stainless steel are fitted across the internal duct frame area in predefined spacing. Each Veloprobe 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 Veloprobes have independent pressure manifolds which provides a smooth pressure signal of the whole measured area.

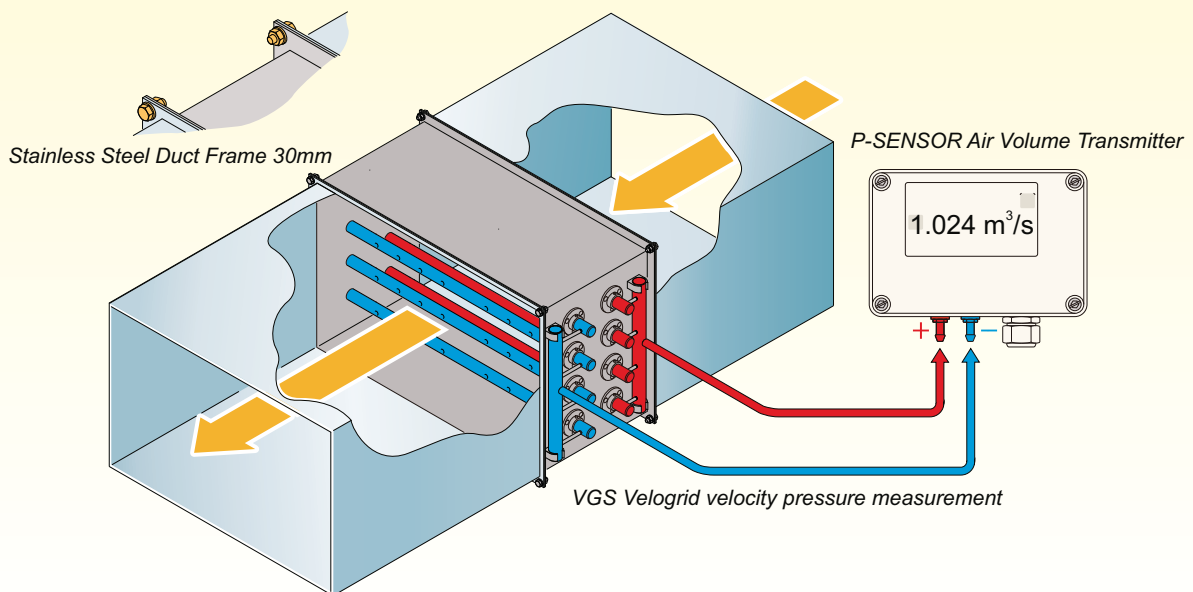
The differential pressure of both impact and static pressure is the velocity pressure is being converted by the P-Sensor to provide a total air volume measurement.

Another great advantage of the VGS Velogrid is, that it can measure bi-directional 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 VGS Velogrids are manufactured in standard height increments of 100mm going up to a maximum height of 1200mm.

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

Larger and fully welded Velogrids can be manufactured to order.

VGS VELOGRID and P-SENSOR providing accurate average air volume measurement in a duct.

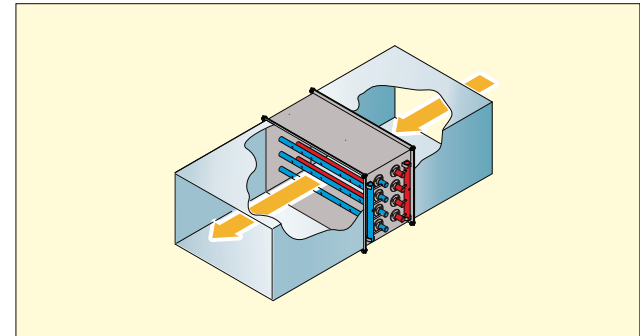


# VGS VELOGRID

The VGS Velogrid is 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 VGS Velogrid 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.

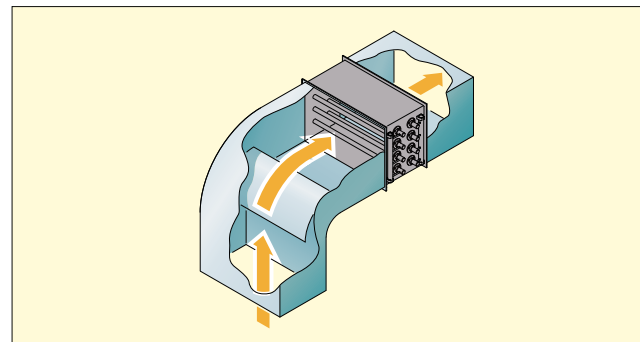


*VGS VELOGRID in a straight duct section*

The VGS Velogrid 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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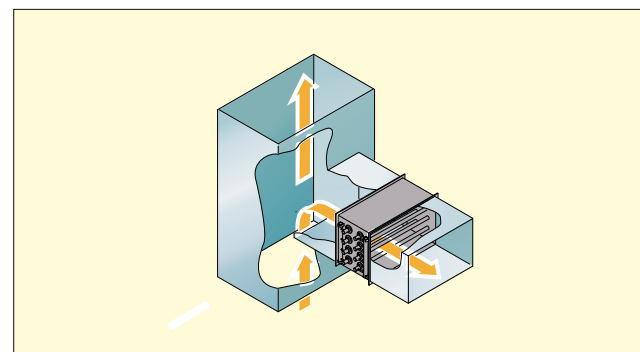


*VGS VELOGRID after an elbow duct section*

The VGS Velogrid can be installed after a T-Section shown on 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 VGS Velogrid 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.

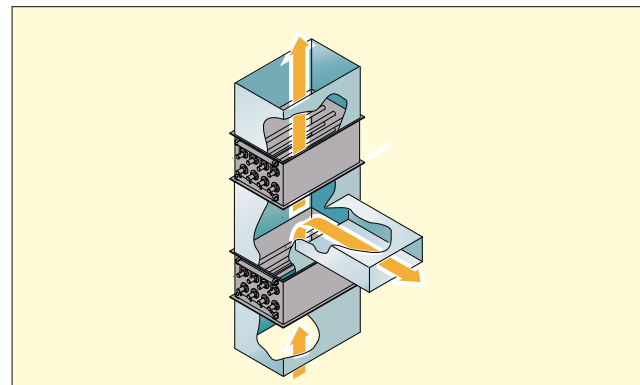


*VGS VELOGRID after a T- duct section*

If the duct on the right cannot be fitted with a VGS Velogrid 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 VGS Velogrid 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.



*VGS VELOGRID before and after a T- section*

**Send a drawing to CMR to provide a selection and full dimensional specification of the VGS Velogrid.**

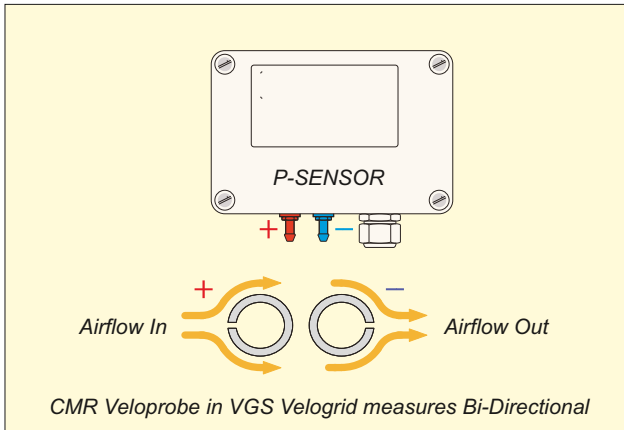
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# VGS VELOGRID VELOCITY PRESSURES



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 duct height and width must be entered. The magnification factor of the VGS Velogrid must be entered which is normally 2.667, 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 any 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 is achieved on the display. 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.

The velocity pressure is measured by the Veloprobes built into the VGS Velogrid 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.

Useful VGS Velogrid scaling formula:

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

Example:

$$2 \times (100 \text{ Pa across VGS} / 2.667 \text{ mf}) = 74.99 / 1.2 = 62.48$$

$$\sqrt{62.48} = 7.905 \text{ m/s}$$

$$7.905 \text{ m/s} \times (\text{duct height 'h' x duct width 'w'}) = \dots \text{ m}^3/\text{s} \times 3600 = \text{m}^3/\text{h}$$

When the P-Sensor is ordered with the VGS Velogrid then it is pre-adjusted at the factory - i.e. duct width and height, density and Magnification Factor (mf) and the range is in m<sup>3</sup>/s, m<sup>3</sup>/h or l/s. It is ready for connection to the control or monitoring system.

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	159.41	161.38	163.35	165.34	167.33	169.34	171.35
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<sup>3</sup>/s, m<sup>3</sup>/h or l/s 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 VGS. Look up the velocity above. i.e. 100Pa / 2.667 = 37.49 Pa. Look up above ~ 37.5 Pa and read on side and top ~ 8 m/s then multiply with duct area in m<sup>2</sup> to get m<sup>3</sup>/s and multiply 3600 to get m<sup>3</sup>/h.

# VGS VELOGRID

# SPECIFICATIONS

## Selection of Velogrids

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 Table 1 to 4 on page 5 to 8.

The VGS Velogrid 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 Veloprobes, which means that the volume could go down to very low limits and still providing a reasonable velocity pressure measurement.

## Installation

The VGS Velogrid can be installed horizontally or vertically but the tube connections should be on the side or on top. It works best if it has a reasonable length of duct so that the air flow is laminar when approaching the VGS Velogrid. If a reasonable length is not available then the magnification factor (mf) can be adjusted on the P-SENSOR and it can also 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 VGS Velogrid can achieve a very high accuracy between minimum and maximum design volume if it is used with a P-SENSOR and the linearisation function.

## Maintenance

The VGS Velogrid is maintenance free and when used in conjunction with the P-SENSOR there is no air flow going through the Veloprobes and therefore no dust particles can enter the measuring holes as they are pressurised and any particles would be deflected from the Veloprobes.

## Materials

- Frame - Stainless Steel Sheet Metal
- Veloprobes - Stainless Steel 304
- Pipe Flanges - Stainless Steel 303
- Manifold Tank - Stainless Steel 304
- Tube Nipples - Stainless Steel 303
- Mounting Bolts - Stainless Steel 316
- Duct height 'h' from 100mm up to 1200mm in 100mm steps
- Duct width 'w' from 100mm up to 1200mm in 50mm steps
- Duct Length 300mm - other sizes on request
- Standard Duct Frame 30mm
- Sensor/Controller Mounting Bracket on 300mm duct length only

## Specifications

- Recommended minimum air velocity is 2.5 m/s
- Recommended operating air velocity is 5 m/s
- Maximum recommended air velocity is 9 m/s

A very air low flow can be measured using the Ultra Low P-SENSOR transmitter..

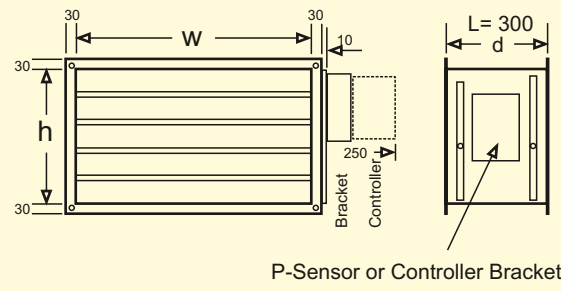
Humidity 10% to 90% non condensing.

Operating Temperature (dry condition) -5 to 60°C

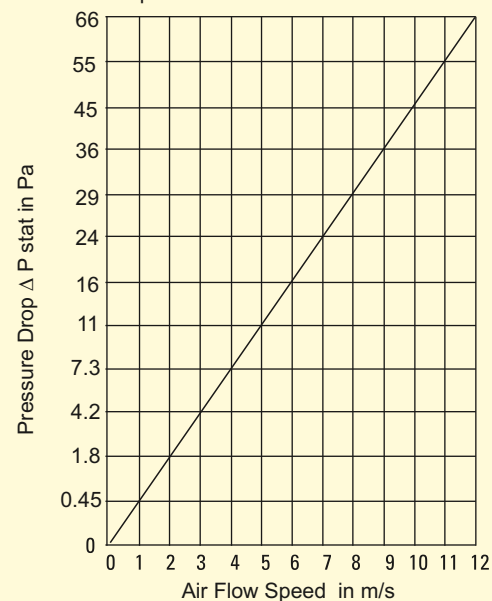
Air density factor must be considered

Free Open Area 75%

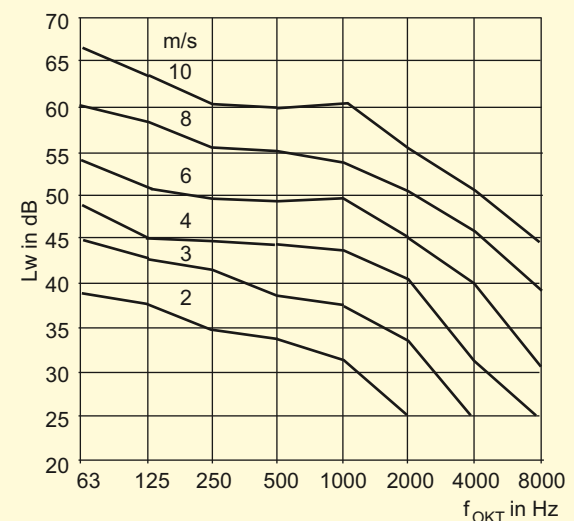
VGS Velogrid Dimensions



Pressure Drop



Sound Performance Level



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