PFR PPs VENTURI AIR CONTROL VALVE

- Precision Venturi Air Measurement
- Venturi according to DIN 1952/ISO 5167
- External Air Tight to DIN 24194 Part 4
- Shut off Air Tight to DIN 1946 Part 4
- Embedded moving damper Blade Seal
- Solid drive shaft for fast speed
- Max. speed 0..90° rotation is 1s
- Damper Plastic bearings for low rotation torque
- Flange connection for easy site installation
- CMR fast actuator and DPC is factory fitted
- Incorporating the high accuracy CMR sensors
- 24 month warranty
- 30 Years field application experience

PFR Venturi Valve with fast Actuator on standard 'A' bracket

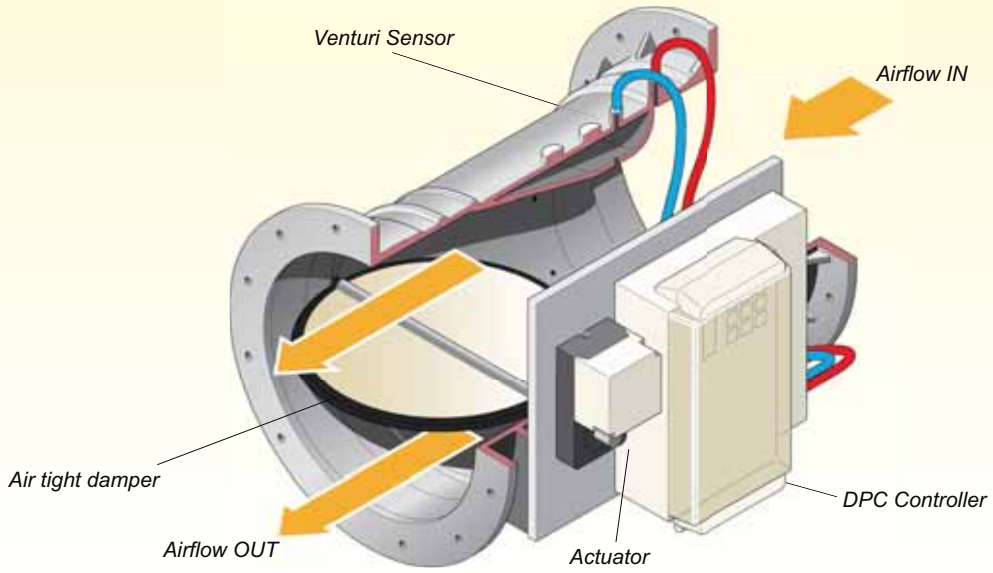
Valve Body Construction
The PFR Venturi Valve is manufactured to the highest engineering precision with plastic high pressure forming machines. The valve is manufactured with all cut outs for the damper axle, venturi, tube fittings and special motor bracket. The Venturi is formed and welded into the body. All connections are welded.

The damper blade consists of a round plate which has a seal embedded. A drive shaft is fitted is fitted into air tight bearings on both sides of the valve to provide smooth action with very low torque. All components which are in the air stream are PPs. The blade and drive shaft are designed for very fast motor rotation i.e. 1 second from open to closed position. With such high speeds, the shaft will withstand the enormous torque which develops on the shaft when turning from open to close in small steps to provide high accuracy control without a fluctuating Hysteresis. The valve is factory assembled and tested.

Venturi Construction
The Venturi is designed for each Size and formed to the same precision with high pressure plastic forming machines. It consists of total averaging pressure measurement holes on the inlet of the venturi. The venturi is welded into the inside of the valve which has a reduced open area. The air is forced through the nozzle at higher speed and static averaging pressure holes pick up the increased static pressure.

Venturi Measurement
The total and the static pressure is then converted by the CMR Volume Sensor into a scaled and linear air volume providing either l/s, m3/s or m3/h. The venturi in combination with the CMR Sensor's and DPC's are factory calibrated and provide an accurate and repeatable measurement. Due to the very unique shape of the venturi, the pressure is regained and a low total overall pressure drop is achieved.

PFR Venturi Valve with DPC Controller and fast Actuator 0-90° and Modbus rtu communication



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PFR VENTURI VALVE SPECIFICATIONS

Selection of Volume Control Damper

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 controlled.

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 on page 5.

The PFR Venturi Valves is equipped with a bracket to fit the actuator and Controller. It has a damper blade with an embedded seal. The venturi reduces the diameter for a very short length and it is formed for pressure regain. The reduced internal area of the valve shall increase the velocity pressure momentarily but will have a regain of pressure after passing through the venturi, which means that the overall pressure drop can be kept at a minimum.

The drive shaft which is heat welded to the valve blade is designed to withstand the very high momentary torque developed by the fast actuator. The shaft is guided by sealed bearings on either side of the valve body.

Installation

The PFR Venturi Valve works in any position provided it is used in non condensing conditions. It can be installed vertically or horizontally with the actuator being on the side rather then having the actuator hanging down. This way, the weight is reduced on the seals and provides a long term efficient operation. It is also easier for the maintenance engineers to replace an actuator. When the damper is installed, Care must be taken to leave sufficient space for the engineers to inspect the DPC and the motor - a 500mm space would be perfect.

Hysteresis

The PFR Venturi Valves have a very low hysteresis due to the sturdy single blade construction and therefore the damper can be moved very accurately to a control position.

Maintenance

The PFR Venturi Valve is maintenance free.

Materials

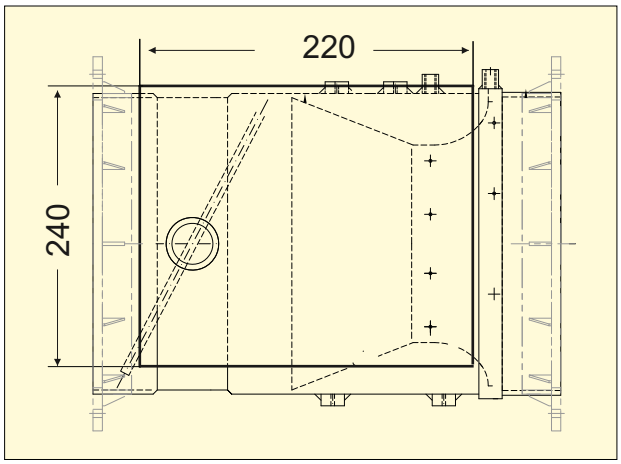
PFR valve Body	- PPsl
Blade	- PPs
Drive Shaft	- PPs
Drive Shaft Seal	- 'O'Ringsl
Bearing	- PPs
Outer Duct Seals	- Formed
Actuator Brackets	- PPs

Valve sizes see table on right.
Valve diameters are sized to fit standard round PPs duct.
Alternative Brackets on request.

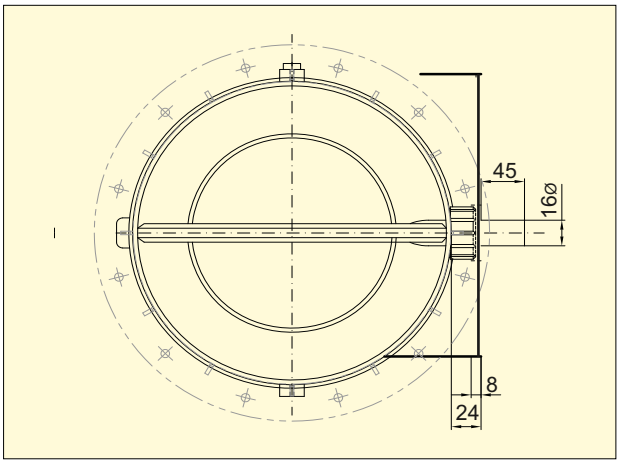
Specifications

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

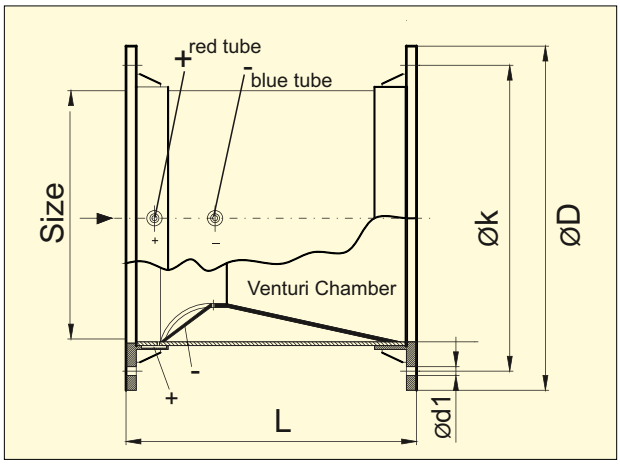
Humidity 10% to 90% non condensing.
Operating Temperature (dry condition) -20 to 70°C



PFR Venturi PPs Valve with DPC Bracket



PFR Venturi PPs Valve with DPC Bracket



PFR Venturi PPs Valve Dimensions

PFR Venturi Valve dimensions and magnification factor (mf)							
Size Ø	Stock Code	L	ØD	Øk	Ød1	Qty	mf
160 mm	PFR-A-160	310	230	200	7	8	5.169
200 mm	PFR-A-200	350	270	240	7	8	5.077
250 mm	PFR-A-250	400	320	290	7	12	5.072
315 mm	PFR-A-315	490	395	350	9	12	5.080

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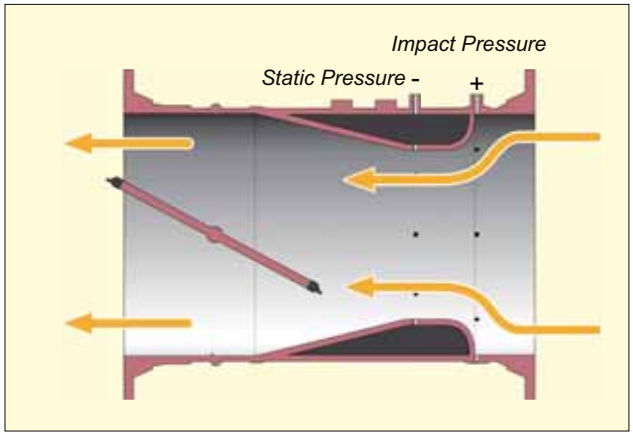
PFR VENTURI VELOCITY PRESSURES



PFR Venturi tube connections

The velocity pressure is measured by the Venturi built into the PFR Valve and the total impact pressure is measured on the positive (+red) and the static pressure is measured on the negative (- blue) tube connections. The CMR Volume Sensor shall be connected to the corresponding nipples using CMR PVC red and blue tube.
When the CMR Sensor is supplied with the PFR Venturi then it is pre-adjusted at the factory - i.e. duct diameter, density and PFR Venturi Magnification Factor (mf) and the range is in m^3/s ,m^3/h, l/s or ACR (air change rate). It is ready for connection to the control or monitoring system.

If the CMR Volume Sensor such as P-Sensor, V-Sensor, DPM-Sensor or DPC-Controller was supplied separately and it was not factory adjusted then it is quite simple to adjust the parameters on site. All Sensor have a keyboard and display. The duct diameter and the magnification factor of the PFR Venturi Valve must be entered which is stated on each valve size on page 2 .

If the volume indicated on the CMR Sensor display is deviating from the actual measurements, then the magnification factor can be adjusted to suit the installation abnormalities via the Sensor's keyboard. To find the best possible accuracy for your application, 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 instrument. Once the average volume has been established and it is not the same as displayed on the CMR Sensor, then adjust the Magnification Factor (mf) until the same display is achieved. Check at 25%, 75% and 100% volume set point The CMR Sensors have also parameters to linearize each point of the measurement for more critical applications.

Useful PFR Venturi scaling formula:

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

Example:

2 x (100Pa across PFR-315 / 5.784 mf) = 17.289 / 1.2 = 14.907
$\sqrt{14.907}$ = 3.861 m/s
3.861 m/s x (duct area 0.07744) = 0.298m^3/s * 3600 = 1076 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 CMR 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 PFR. Look up the velocity above. i.e. 100Pa / 5.784 (315 Valve) = 17.289 Pa.
Look up above ~ 17.50 Pa and read on side and top ~ 5.4 m/s then multiply with duct area 0.07744(315 Valve) m^2 to get m^3/s then multiply by 3600 to get m^3/h.

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PFR SELECTIONS AND PERFORMANCE

Part Number Selection Table 1

Part Number	Description	Size DN mm	Length L3 mm	Area m2	Volume at 3m/s m3/s	Volume at 5m/s m3/s	Volume at 9 m/s m3/s	Volume at 3m/s m3/h	Volume at 5m/s m3/h	Volume at 9 m/s m3/h
PFR-A-160	160mm FC Venturi Valve with DPC Bracket	160	310	0.02011	0.060	0.101	0.181	217	362	652
PFR-A-200	200mm FC Venturi Valve with DPC Bracket	200	350	0.03142	0.094	0.157	0.283	339	566	1018
PFR-A-250	250mm FC Venturi Valve with DPC Bracket	250	400	0.04909	0.147	0.245	0.442	530	884	1591
PFR-A-315	315mm FC Venturi Valve with DPC Bracket	315	490	0.07794	0.234	0.390	0.701	842	1403	2525

Performance and Noise Levels

			Static Pressure at Venturi in Pa 100 Pa									Static Pressure at Venturi in Pa 250 Pa									Static Pressure at Venturi in Pa 500 Pa								
Valve	Velocity	Volume	LW (dB/Octave) Power level								Sum	LW (dB/Octave) Power level								Sum	LW (dB/Octave) Power level								Sum
Size Ø	m/s	m3/h	63	125	250	500	1k	2k	4k	8k	dB(A)	63	125	250	500	1k	2k	4k	8k	dB(A)	63	125	250	500	1k	2k	4k	8k	dB(A)
160	2	145	62	56	50	44	38	32	25	20	46	67	61	56	50	44	38	30	25	52	71	66	60	54	48	42	34	29	56
	5	362	71	65	59	53	48	42	36	29	56	77	71	65	59	53	47	41	35	61	81	75	69	63	57	51	46	39	65
	7.5	543	75	69	63	58	52	46	40	33	60	81	75	69	63	57	51	46	39	65	85	79	73	67	62	56	50	43	70
	10	724	78	72	66	61	55	49	43	36	63	84	78	72	66	60	54	49	42	68	88	82	76	70	64	59	53	46	73
200	2	226	63	57	51	46	40	34	26	21	48	69	63	57	51	45	39	32	27	53	73	67	61	55	49	44	36	31	58
	5	565	73	67	61	55	49	43	37	30	57	78	72	66	61	55	49	43	36	63	82	76	71	65	59	53	47	40	67
	7.5	848	77	71	65	59	53	47	42	35	61	82	76	71	65	59	53	47	40	67	87	81	75	69	63	57	51	44	71
	10	1131	80	74	68	62	58	50	44	38	64	85	79	74	68	62	56	50	43	70	89	84	78	72	66	60	54	47	74
250	2	353	65	59	53	47	41	35	27	23	49	70	64	59	53	47	41	33	28	55	74	69	63	57	51	45	37	32	59
	5	884	74	68	62	56	51	45	39	32	59	80	74	68	62	56	50	44	38	64	84	78	72	66	60	54	49	42	68
	7.5	1325	78	72	68	61	58	49	43	36	63	84	78	72	66	60	54	49	42	68	88	82	76	70	65	59	53	46	73
	10	1767	81	75	69	64	58	52	46	39	66	87	81	75	69	63	57	52	45	71	81	85	79	73	67	62	56	49	76
315	2	561	66	60	55	49	43	37	29	24	51	72	66	60	54	48	42	35	30	56	76	70	64	58	53	47	39	34	61
	5	1403	76	70	64	58	52	46	40	34	60	81	75	69	64	58	52	46	39	66	85	80	74	68	62	56	50	43	70
	7.5	2104	80	74	68	62	56	50	45	38	64	85	79	74	68	62	56	50	43	70	90	84	78	72	66	60	54	47	74
	10	2806	83	77	71	65	59	53	47	41	67	88	82	77	71	65	59	53	46	73	93	87	81	75	69	63	57	50	77

Differential Pressure on Venturi

Selection Table

Example:

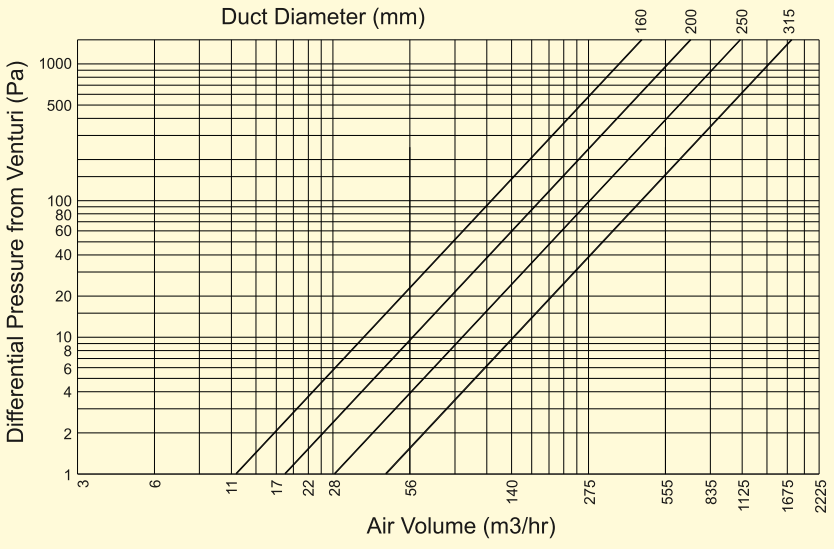
Duct Diameter: 250mm

Air Volume: 275 l/s

Differential Pressure: 100 Pa

Equivalent Velocity: 5.61 m/s

Note:
The minimum recommended velocity is 1.5 m/s, with a suggested maximum of 10m/s



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