PVR VENTURI VOLUME CONTROL VALVE

- Precision PPs 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
- Heavy duty Blade Seal
- 12 mm Ø solid drive shaft for fast speed
- Max. speed 0..60° rotation is 1s
- Shaft bearings for low rotation torque
- Flanged connection for easy site installation
- CMR fast actuators and DPC are factory fitted
- Incorporating the high accuracy CMR sensors
- 24 month warranty
- 30 Years field application experience

PVR Venturi PPs Valve

Valve Body Construction
The PVR Venturi Valve is manufactured to the highest engineering precision with CNC machines. The valve is formed from PPs Plastic and machined to provide very close tolerances. The venturi is formed to provide always the same measurement. The flange connection on either side provide strength to the overall valve body so that it cannot distort during installation.

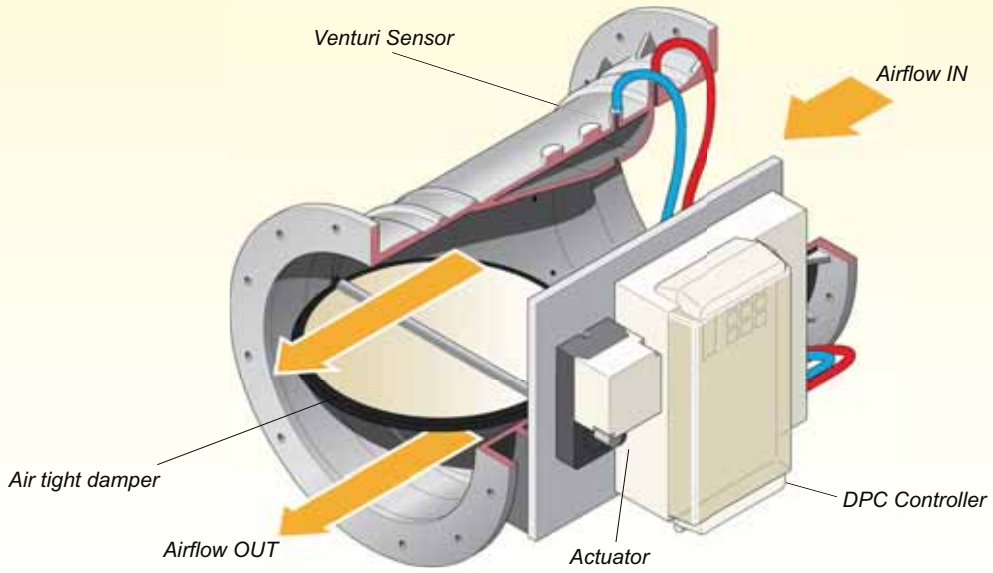
The damper blade consists of two PPs plates which sandwiches a silicone disc seal. A 12mmØ stainless steel axle (PPs coated) is embedded between the two plates to provide a heavy duty functionallity. Air tight bearings on both sides of the valve provide smooth action with relatively low torque. The blade and axle are designed for very fast motor rotation i.e. 1 second from open to closed position. With such high speeds, the axle 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.

Venturi Construction
The Venturi is designed for each Size and formed to the same precision with CNC machines. It consists of a number 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 four static averaging pressure holes pick up the increased static pressure.

Venturi Measurement
The total and the static pressure is then converted by the Volume Transmitter into a scaled and linear air volume providing either l/s, m3/s or m3/h. The venturi in combination with the CMR sensor is factory calibrated and provides 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.

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



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PVR 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 4.

The PVR Venturi Valve is equipped with a motor and controller mounting bracket. It has double damper blades with an embedded silicone seal. Other materials are available on request. 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 heavy duty drive stainless steel shaft and PPs coated is bolted firmly to the valve blade to withstand the very high momentary torque developed by the fast actuator. The shaft is guided by sealed Teflon bearings on either side of the valve body.

Installation

The PVR Venturi Valve works in any position provided it is used in non condensing conditions. It is best if the blades and actuator are positioned horizontally rather then having the actuator hanging down. This way, the weight is reduced on the side 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 and replace the motor - a 500mm space would be perfect.

Hysteresis

The PVR 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 PVR Venturi Valve is maintenance free.

Materials

PVR valve Body - PPs Plastic
Blade/Seal - PPs Plastic with Seal
Drive Shaft - Stainless Steel PPs coated
Drive Shaft Seal - 'O'Ring
Actuator Brackets - PPs

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

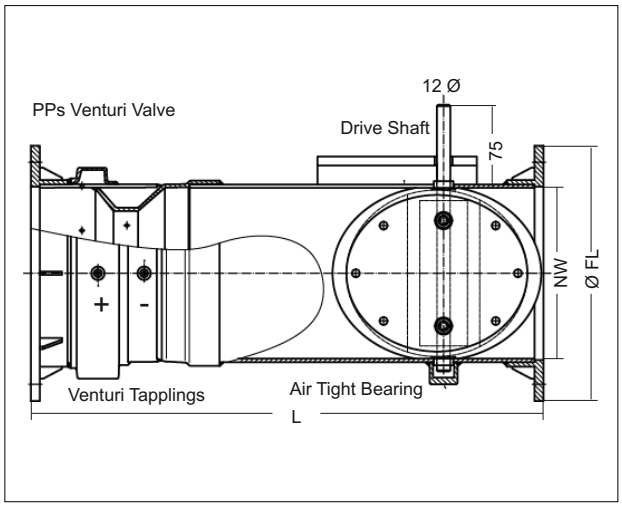
Alternative Brackets and spigot connections on request.

Specifications

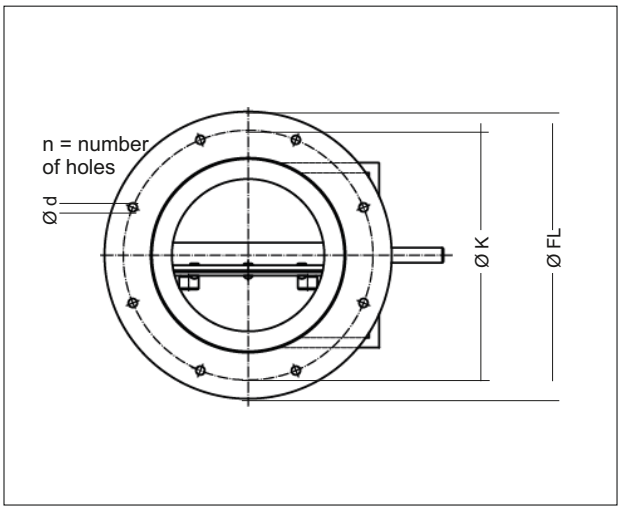
Recommended minimum air velocity is 2.5 m/s
Recommended operating air velocity is 5 m/s
Maximum recommended air velocity is 9 m/s

Humidity 10% to 90% non condensing.
Operating Temperature (dry condition) -20 to 80°C

Airtightness - To DIN 1946 Part 4



PVR Venturi PPs Valve with DPC and Actuator Bracket



PVR Venturi PPs Valve with DPC and Actuator Bracket

PVR Valve dimensions						
Size Ø	Stock Code	L	ØFL	ØK	Ød	n
160 mm	PVR-160	450	230	200	7	8
180 mm	PVR-180	510	250	220	7	8
200 mm	PVR-200	510	270	240	7	8
250 mm	PVR-250	700	320	290	7	12
315 mm	PVR-315	760	395	350	9	12
355 mm	PVR-355	1050	435	400	9	12
400 mm	PVR-400	1100	480	445	9	16
450 mm	PVR-450	1200	520	490	9	20
500 mm	PVR-500	1300	580	550	9	20

PVR Venturi PPs Valve Dimensions

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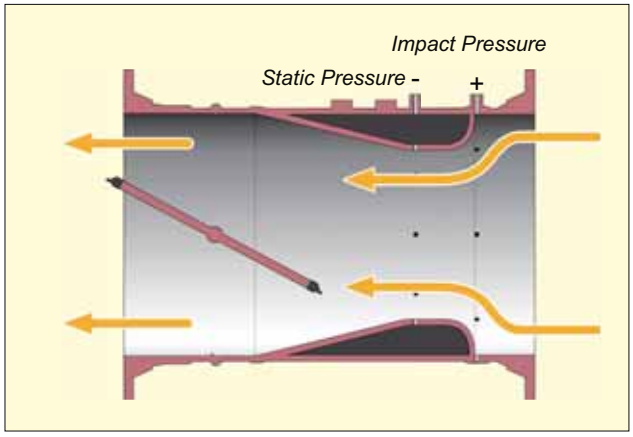
PVR VENTURI VELOCITY PRESSURES



PVR Venturi tube connections

The velocity pressure is measured by the Venturi built into the PVR 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 Sensors are ordered with the PVR Venturi then it is pre-adjusted at the factory - i.e. duct diameter, density and VVR 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 ordered 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 PVR 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 PVR 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 PVR-315 / 4.539 mf) = 44.06 / 1.2 = 36.71
$\sqrt{36.71}$ = 6.058 m/s
6.058 m/s x (duct area 0.07744) = 0.469m^3/s * 3600 = 1688 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 PVR. Look up the velocity above. i.e. 100Pa / 4.539 (315 Valve) = 22.03 Pa.
Look up above ~ 22.03 Pa and read on side and top ~ 6.05 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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PVR SELECTIONS AND NOISE LEVELS

Part Number Selection Table 1

Part Number	Description	Size DN mm	Length L mm	Mag Factor (mf)	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
PVR-160	160mm Venturi Valve with DPC Bracket	160	450	4.510	0.02011	0.060	0.101	0.181	217	362	652
PVR-200	200mm Venturi Valve with DPC Bracket	200	510	4.229	0.03142	0.094	0.157	0.283	339	566	1018
PVR-250	250mm Venturi Valve with DPC Bracket	250	700	3.614	0.04909	0.147	0.245	0.442	530	884	1591
PVR-315	315mm Venturi Valve with DPC Bracket	315	760	4.539	0.07794	0.234	0.390	0.701	842	1403	2525
PVR-355	355mm Venturi Valve with DPC Bracket	355	1050	4.372	0.09899	0.297	0.495	0.891	1069	1782	3207
PVR-400	400mm Venturi Valve with DPC Bracket	400	1100	4.644	0.12568	0.377	0.628	1.131	1357	2262	4072
PVR-450	450mm Venturi Valve with DPC Bracket	450	1200	4.504	0.15906	0.477	0.795	1.432	1718	2863	5154
PVR-500	500mm Venturi Valve with DPC Bracket	500	1300	4.624	0.19638	0.589	0.982	1.767	2121	3535	6363

Performance and Noise Levels

			Static Pressure at Venturi in Pa									Static Pressure at Venturi in Pa									Static Pressure at Venturi in Pa								
			100 Pa									250 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
355	2	713	67	61	55	49	44	38	30	25	52	73	67	61	55	49	43	35	31	57	77	71	65	59	53	47	40	35	61
	5	1782	76	71	65	59	53	47	41	34	61	82	76	70	64	58	53	47	40	67	86	80	74	69	63	57	51	44	71
	7.5	2672	81	75	69	63	57	51	45	38	65	86	80	74	69	63	57	51	44	71	90	84	79	73	67	61	55	48	75
	10	3563	84	78	72	66	60	54	48	41	68	89	83	77	71	66	60	54	47	74	93	87	82	76	70	64	58	51	78
400	2	905	68	62	56	50	44	38	31	26	52	73	68	62	56	50	44	36	31	58	78	72	66	60	54	48	40	36	62
	5	2262	77	71	65	60	54	48	42	35	62	83	77	71	65	59	53	48	41	67	87	81	75	69	63	58	52	45	72
	7.5	3393	81	75	70	64	58	52	46	39	66	87	81	75	69	63	58	52	45	72	91	85	79	74	68	62	56	49	76
	10	4524	84	78	73	67	61	55	49	42	69	90	84	78	72	66	60	55	48	74	94	88	82	76	71	65	59	52	79

For sizes above 400mm the data is on request

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